ANÁLISIS DE LOS INSTRUMENTOS AUTORREPORTADOS DE EVALUACIÓN DE LAS CONDUCTAS DE EJERCICIO POTENCIALMENTE PROBLEMÁTICAS

TESIS DOCTORAL

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ANÁLISIS DE LOS INSTRUMENTOS AUTORREPORTADOS DE EVALUACIÓN DE LAS CONDUCTAS DE EJERCICIO POTENCIALMENTE PROBLEMÁTICAS

ANALYSIS OF SELF-REPORTED INSTRUMENTS FOR ASSESSING POTENTIALLY PROBLEMATIC EXERCISE BEHAVIOURS

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Un buscador es alguien que busca; no necesariamente alguien que encuentra. Tampoco es alguien que, necesariamente, sabe qué es lo que está buscando. Es simplemente alguien para quien su vida es una búsqueda.

Jorge Bucay

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La vida es aquello que te pasa mientras estás ocupado
haciendo otros planes
John Lennon

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Resumen/Abstract

Abstract

In spite of the proven health benefits of exercise, research has shown that some people persist in exercising despite the physical, psychological, social and emotional problems arising as a result of this behaviour. The present PhD thesis was aimed at filling some of the existing gaps concerning the self-report psychometric instruments proposed for assessing problematic exercise. In particular, by examining (i) the theoretical conceptualisations on which these instruments are based (Study 1), (ii) the specific components covered by each of them (Study 2), and (iii) the reliability of their scores (Study 3). These objectives were addressed through the use of systematic review and meta-analysis techniques. Findings from **Study 1** showed that self-report instruments of problematic exercise can be classified into up to five categories depending on whether this phenomenon is conceptualized as (i) the upper end of an exercise continuum, (ii) a means of regulating body size and weight, (iii) a form of dependence, (iv) a behavioural addiction. A fifth category comprised those instruments with no clear conceptualisation. Findings from **Study 2** showed a lack of consensus in the operational definition of the range of components included in the instruments under review. According to their frequency of inclusion in the instruments, these components can be classified as core criteria (i.e., salience, withdrawal, and mood modification) or candidate components (i.e., conflict, and continuance despite problems) of problematic exercise. Components specific to some of the instruments are tolerance, relapse, impaired control, craving, cross-tolerance, exercise volume (e.g., in terms of time, duration, or frequency), and certain exercise motives (e.g., social relatedness, and health or body image improvement). Findings from **Study 3** showed the alpha estimates of both global and subscales test scores of currently available self-report instruments of problematic exercise (i) to vary largely not just from one to the other but also across different applications, and (ii) as being particularly sensitive to the characteristics of the study population. Several deficiencies in terms of reliability reporting were also found, these consisting in (i) the frequent omission of reliability estimates for the data at hand, and (ii)

the (almost exclusive) employment of alpha without proper testing of the assumptions necessary for its unbiased use. The knowledge gained from these three studies provide the basis for future research aimed at achieving a twofold objective. Firstly, to reach consensus on both a definition and the very precise components underpinning problematic exercise that allows for qualifying certain patterns of exercise behaviour as inherently problematic. Secondly, to provide a strong evidence base for the reliability of the self-reported instruments assessing problematic exercise. In the light of the findings, several recommendations are provided for the purpose of improving reliability reporting practices in quantitative primary research within the field of problematic exercise.

Introducción

Introducción

El término "ejercicio físico" hace referencia a aquella actividad planificada, estructurada y repetitiva que, involucrando movimiento corporal, induce a la mejora o mantenimiento de la condición física (Dasso, 2019). La práctica regular de ejercicio físico ha sido reconocida como una estrategia válida de cara a la prevención y tratamiento de un amplio número de patologías (Bennie et al., 2020; Bull et al., 2020; Hu et al., 2020; Thompson et al., 2020). Pese a esto, la investigación ha mostrado que ciertos patrones de conducta de ejercicio no resultan inherentemente saludables (Szabo et al., 2018). Este sería el caso, por ejemplo, de realizar ejercicio hasta el punto de experimentar daños de tipo físico (e.g., persistir en la práctica de ejercicio aun sufriendo una lesión), psicológico (e.g., experimentar empeoramientos en el estado de ánimo ante la imposibilidad de practicar ejercicio), o social (e.g., desatender obligaciones profesionales o sufrir conflictos interpersonales) (Colledge et al., 2020; Juwono & Szabo, 2020). En vista de la posible gravedad de las implicaciones no saludables inherentes a este tipo de conductas de ejercicio, resulta prioritario para la investigación profundizar en su estudio.

Buena parte de las evidencias existentes en el ámbito de las conductas potencialmente problemáticas de ejercicio físico (a las que nos referiremos en lo sucesivo empleando el término paraguas *ejercicio problemático*; Chamberlain & Grant, 2020) han sido obtenidas a partir del empleo de técnicas cualitativas y, en particular, de instrumentos autorreportados (Marques et al., 2019; Szabo et al., 2015). Una importante consideración a realizar respecto a este tipo de instrumentos se deriva del hecho de que el ejercicio problemático no haya sido reconocido como una entidad diagnóstica en ninguno de los principales manuales médicos (e.g., el *Diagnostic and Statistical Manual of Mental Disorders*, DSM-5, American Psychiatric Association, 2013; o la *International Classification of Diseases*, ICD-11, World Health Organization, 2019). Esto supone que, en lugar de emplearse como herramientas de diagnóstico, dichos instrumentos se empleen para obtener puntuaciones de carácter continuo que reflejan en qué medida la persona manifiesta patrones de práctica de ejercicio potencialmente problemáticos (Szabo et al., 2015).

En lo que respecta a los instrumentos autoreportados de ejercicio problemático, dos importantes lagunas de investigación merecen ser destacadas. Una primera se deriva del hecho de que el desarrollo de dichos instrumentos no responda al propósito de evaluar un constructo idéntico y previamente definido sino los patrones conductuales de ejercicio considerados como potencialmente problemáticos desde una determinada perspectiva teórica (Downs et al., 2019; Freimuth et al., 2011). Dichas perspectivas vienen condicionadas por las controversias y fuertes debates que históricamente han caracterizado el estudio del ejercicio problemático (Downs et al., 2019; Egorov & Szabo, 2013; Freimuth et al., 2011). Un claro ejemplo de este tipo de controversias sería la representada por la aparente paradoja de considerar como problemática una conducta por otro lado conducente a numerosos beneficios en términos de salud (Egorov & Szabo, 2013). Otro claro ejemplo de dichas controversias sería la centrada en la conveniencia de diferenciar entre el carácter secundario o primario del ejercicio problemático en función de si el daño asociado a dicho fenómeno se deriva respectivamente o no de la existencia de otros desórdenes, principalmente, los que implican el deseo de controlar las características corporales (e.g., los trastornos de la conducta alimentaria; Cook et al., 2013; Cunningham et al., 2016). Lo anteriormente expuesto se traduce en la existencia de un amplio número de instrumentos que, pese a evaluar un fenómeno con un rasgo común (i.e., el carácter potencialmente problemático de la práctica de ejercicio) podrían realmente hacer referencia a constructos hasta cierto punto diferenciados (Alcaraz-Ibáñez et al., 2020). La identificación y comparación tanto de las conceptualizaciones subyacentes a estos instrumentos como de los componentes o síntomas presentes en cada uno de ellos podría contribuir a facilitar la interpretación de los resultados derivados de los mismos. Dicho trabajo de identificación y comparación también podría contribuir a sentar las bases que permitiesen alcanzar un consenso en torno a las características que calificarían de forma inequívoca ciertos patrones de práctica de ejercicio como problemáticos. En este sentido, existen precedentes del empleo de técnicas de revisión sistemática al objeto de abordar el proceso de identificación y comparación anteriormente descrito en el caso de conductas potencialmente problemáticas como, por ejemplo, el uso de videojuegos (King et al., 2013) o el consumo de pornografía (Fernandez & Griffiths, 2019). No obstante, dicha labor no ha sido abordada hasta la fecha en el ámbito del ejercicio problemático.

Una segunda e importante laguna de investigación relacionada con los instrumentos propuestos para la evaluación autorreportada del ejercicio problemático tiene que ver con las evidencias que soportan las adecuadas propiedades psicométricas de los mismos. En este sentido, cabe destacar que numerosos esfuerzos de investigación han sido realizados al objeto de examinar dichas propiedades en las adaptaciones de las versiones originales en inglés a otros idiomas, por ejemplo, en países europeos (Mónok et al., 2012; Sauchelli et al., 2016; Sicilia et al., 2013; Zeeck et al., 2017), sudamericanos (Alchieri et al., 2015; Sicilia et al., 2017), o asiáticos (Li et al., 2016; Shin & You, 2015). No obstante, muchos menos esfuerzos han sido realizados al objeto de examinar este tipo de propiedades en poblaciones específicas (e.g., en términos de la condición clínica de las mismas; Formby et al., 2014; o la modalidad de ejercicio practicada; Lichtenstein & Jensen, 2016), o para verificar si dichas propiedades resultan equivalentes entre distintos países o idiomas (Griffiths et al., 2015). Esta limitación resulta particularmente importante en el caso de una propiedad que, como la fiabilidad (o, en otras palabras, la precisión de medida) depende en gran medida de las condiciones de aplicación del test y, sobre todo, de las características de la población considerada (Slaney, 2017). Una importante implicación práctica derivada de la existencia de esta laguna concierne a la comparación de las puntuaciones entre grupos. En concreto, por cuanto la existencia de diferentes grados de fiabilidad en dos determinados grupos de interés supondría la presencia de sesgo en la comparación de sus respectivas puntuaciones (Graham & Unterschute, 2015). Esta cuestión resulta particularmente relevante en el contexto del ejercicio problemático por cuanto las características sociodemográficas de las poblaciones de estudio (e.g., la modalidad de ejercicio practicada o la presencia de riesgo de trastorno de la conducta alimentaria) son frecuentemente empleadas como variables de comparación (Di Lodovico et al., 2019; Trott et al., 2020). Las técnicas meta-analíticas de generalización de fiabilidad (i.e., *reliability generalization meta-analysis*) permiten recopilar el conjunto de evidencias disponibles para dicha propiedad e identificar los elementos que contribuyen a la variabilidad de la misma (Vacha-Haase et al., 2000, 2002). Pese a esto, ningún estudio hasta la fecha ha hecho uso de esta técnica al objeto de examinar la fiabilidad de las puntuaciones derivadas de los instrumentos propuestos para la evaluación autorreportada del ejercicio problemático.

Aportar evidencias que permitiesen contribuir a paliar las dos lagunas existentes en torno a los instrumentos autorreportados de evaluación del ejercicio problemático anteriormente expuestas podría contribuir a mejorar los procesos de evaluación de este tipo de conductas y, por extensión, a una mayor comprensión de dicho fenómeno. Por ejemplo, realizar un análisis comparado de las características de las distintas definiciones y componentes propuestos para la evaluación del ejercicio problemático podría representar un sólido punto de partida a partir del cual propiciar acuerdos en torno a los mismos por parte de la comunidad científica. Adicionalmente, recopilar las evidencias relativas a los niveles de fiabilidad de los instrumentos disponibles para la evaluación del ejercicio problemático podría contribuir a orientar a profesionales e investigadores a la hora de escoger un instrumento que resultase fiable de acuerdo a los requisitos de las particulares circunstancias de aplicación y las características de la población objeto de estudio. De igual forma, el análisis de las prácticas de reporte de fiabilidad en el ámbito del ejercicio problemático permitiría detectar posibles lagunas en las mismas y, en consecuencia, formular recomendaciones que contribuyesen a aumentar el nivel de rigor metodológico y la precisión de los hallazgos reportados en futuras investigaciones. Atendiendo a los antecedentes anteriormente expuestos, la presente tesis doctoral recoge los resultados de tres distintos estudios planteados con el propósito de responder a los objetivos que seguidamente se exponen.

Objetivos

El objetivo general de la presente tesis doctoral es cubrir algunas de las principales lagunas de investigación existentes en lo que respecta a los instrumentos psicométricos propuestos para la evaluación de las distintas conductas de ejercicio potencialmente problemáticas. Dichos objetivos se abordarán mediante el empleo de técnicas de revisión sistemática, las cuales serán complementadas en el tercero de los estudios realizados con técnicas meta-analíticas de generalización de fiabilidad. Seguidamente se exponen los objetivos específicos de cada uno de los tres estudios realizados.

- **Estudio 1:** Se plantea un doble objetivo: (i) identificar las herramientas psicométricas desarrolladas para la evaluación autorreportada del ejercicio problemático, e (ii) identificar y comparar las conceptualizaciones teóricas en las que se basan dichos instrumentos.
- **Estudio 2:** Identificar, examinar, y comparar los componentes del ejercicio problemático recogidos en los distintos instrumentos autorreportados propuestos para la evaluación de dicho fenómeno.
- **Estudio 3:** Se plantean tres objetivos diferenciados referidos a las puntuaciones de los principales instrumentos autorreportados propuestos para la evaluación del ejercicio problemático: (i) estimar sus valores medios de fiabilidad; (ii) examinar las características sociodemográficas y metodológicas que pueden afectar a dichos valores de fiabilidad; y (iii) examinar las prácticas de reporte de fiabilidad de los estudios que emplean estos instrumentos. Esto último objetivo será respondido a través del examen de los índices de inducción de la fiabilidad y, adicionalmente y en previsión de que el coeficiente alfa (α) sea el

índice más frecuentemente reportado (Cho, 2016), mediante el examen del grado de comprobación y cumplimiento de los requisitos de aplicación no sesgada de dicho coeficiente.

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Estudio 1

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Theoretical Conceptualisations of Problematic Exercise in Psychometric Assessment Instruments: A Systematic Review

Abstract

The aim of the present systematic review was to identify psychometric tools developed to assess problematic exercise in order to identify and compare their theoretical conceptualisations on which are based. A systematic literature search was conducted in the electronic databases Web of Science, Scielo, PsychINFO, PsycTEST and SCOPUS from their inception to January 2020. Studies developing assessment instruments of some form of problematic exercise were identified. Seventeen instruments met the eligibility criteria to be included in the present review. The instruments were classified according to their conceptualisation into four groups: (i) problematic exercise as an end of an exercise continuum, (ii) problematic exercise as a means of regulating body size and weight, (iii) problematic exercise as dependence; (iv) problematic exercise as a behavioural addiction, and (v) no clear conceptualisation. The results suggest that the conceptualisations of the assessment instruments have resulted in a strong dichotomy in relation to the primary or secondary character of the problematic exercise that might be limiting the capacity of the instruments to adequately capture the multidimensionality of this construct. Given the interest in understanding the complexity surrounding the problematic exercise, future research should develop more comprehensive definitions of this construct. This would allow a greater conceptual consensus to be reached that would allow progress to be made in the study of the problematic exercise.

Keywords: exercise addiction, exercise dependence, compulsive exercise, commitment to exercise, excessive exercise, obligatory exercise, morbid exercise

Introduction

Despite the proven health benefits of exercise, research has repeatedly reported that some individuals continue to exercise despite physical, psychological, social, and emotional problems that arise as a result of this behaviour (Chamberlain & Grant, 2020; Lichtenstein, Nielsen, Gudex, Hinze, & Jørgensen, 2018). Examples of this may be seen among individuals who spend such a large amount of time in their lives exercising that they neglect other obligations (such as their occupation or education) and/or come into conflict with family members (Griffiths, 1997; Kotbagi, Muller, Romo, & Kern, 2014; Morgan, 1979). It can also include cases where exercise becomes an obsession in the individual's life, and which comes to dominate thoughts and actions for much of the daily life (Griffiths, 1997; Veale, 1995; Yates, Leehey, & Shisslak, 1983).

Although the possible negative effects of over-exercising were first indicated more than 50 years ago (Adams, 2009; Carmack & Martens, 1979; Estok & Rudy, 1986), it has never received formal recognition as a mental disorder in leading clinical manuals (e.g., American Psychiatric Association, 2013; World Health Organization, 2018). In 2013, the American Psychiatric Association incorporated gambling disorder along with substance-related disorders, while another group of repetitive behaviours, including exercise, were not included because of the lack of scientific evidence to establish the diagnostic criteria and course descriptions needed to identify these behaviours as mental disorders (American Psychiatric Association, 2013). Contributing to this paucity of evidence has been the lack of consensus on central issues in understanding when and why exercise may become problematic. In the context of problematic exercise, two debates have characterised the historical evolution of the definition of the construct and its assessment.

The first debate began in the 1970s, and raised the issue of whether a behaviour such as exercise, which was perceived as inherently healthy, when engaged in excessively, might lead to health problems and what kind of associated problems there might be. At the centre of this debate is the work of Glasser (1976) who used the term ‘positive addiction’ to highlight the beneficial effects of running, and by extension exercise, as opposed to addiction to other behaviours that might have negative consequences. Since Glasser's conceptualisation, there has been a continuous attempt to delimit the negative aspects of exercise as opposed to its more well-known positive effects (Adams, 2009; Estok & Rudy, 1986; Leedy, 2000). This debate raised awareness of what has been called ‘the exercise paradox’ (Egorov & Szabo, 2013) that is, the fact that an initial healthy and therapeutic activity such as exercise can lead, when control over it is lost, to pathogenic behaviour with negative consequences for the individual.

A second major debate, initiated in the 1980s, was whether the problems caused by problematic exercise are due to the exercise behaviour itself or to other associated disorders (Veale, 1995; Yates et al., 1983). Crucial to this debate was the differentiation that Veale (1987) made between problematic exercise in itself, which he called primary exercise dependence, and problematic exercise as a consequence of the existence of an associated disorder, which he called a secondary exercise dependence. Although some authors do not hesitate to state that exercise may be a primary source of problem for the individual (e.g., Griffiths, 1997), other authors maintain that this phenomenon has rarely been documented and it is difficult to differentiate it from a problematic exercise associated with other disorders (e.g., eating disorders) (Adams, 2009; Bamber, Cockerill, Rodgers, & Carroll, 2003; Blaydon & Lindner, 2002). While the debate initiated in the 1970s reached some consensus on the possible pathological nature that may derive from exercise behaviour, this second debate has not yet been resolved and keeps open the question of the relationship between problematic exercise and other already recognised disorders.

Attempts to explain problematic exercise from theoretical models (Egorov & Szabo, 2013; Freimuth, 2008; Freimuth, Moniz, & Kim, 2011; McNamara & McCabe, 2012; Meyer, Taranis, Goodwin, & Haycraft, 2011; Sussman et al., 2011) reflect to some degree the different ways in which this phenomenon is understood and assessed. Although there are papers summarising the different existing models (Symons-Downs, MacIntyre, & Heron, 2019; Szabo, Demetrovics, & Griffiths, 2018), to date, there have been no efforts that have compared the differences in conceptualisations of problematic exercise despite the fact that the models suggest different conceptualisations. For example, considering the motivation that leads the individual to exercise, the consequences associated with the behaviour, and the frequency and control over the behaviour, Freimuth (2008) proposed a heuristic model comprising four phases: recreational exercise; at-risk exercise; problematic exercise; and exercise addiction. These four phases were proposed as a clinical heuristic to explore when healthy exercise becomes problematic (Freimuth et al., 2011). The conceptualisation underlying Freitmuth's proposed model positions problematic exercise as the end of an exercise continuum. Under this conceptualisation, problematic exercise would always derive from exercise performed relatively frequently and over a long period of time (Freimuth, 2008; Freimuth et al., 2011). Contrary to Freimuth’s model, Egorov and Szabo (2013) proposed an interactional model where the emphasis is placed on the determinants of the choice of exercise as a means of escape from hardship. Therefore, Egorov and Szabo emphasise the interaction between personal factors (i.e., personal values, past experience) and situational factors (i.e., social image, life situation) in determining whether the individual will use exercise for coping or resort to other means of dealing with stress (Egorov & Szabo, 2013; Szabo et al., 2018). What is noteworthy here, is that in contrast to the model proposed by Freimuth (2008), Egorov and Szabo’s model delineates problematic exercise as something revolutionary, that is, that can suddenly surface. Consequently, Egorov and Szabo do not necessarily appear to conceptualise problematic exercise as a continuum that would be represented by an evolution or progression from healthy (or recreational) exercise to problematic exercise.

The variety of perspectives and theoretical models explaining problematic exercise has resulted in a broad set of terms used to refer to and assess this phenomenon. Terms used include commitment to exercise (Corbin, Nielsen, Borsdorf, & Laurie, 1987; Davis, Brewer, & Ratusny, 1993), exercise addiction (Szabo, Pinto, Griffiths, Kovácsik, & Demetrovics, 2019; Terry, Szabo, & Griffiths, 2004), compulsive exercise (Meyer et al., 2016; Taranis, Touyz, & Meyer, 2011), obligatory exercise (Duncan et al., 2012; Pasman & Thompson, 1988), excessive exercise (McCabe & Vincent, 2002), problematic exercise (Chamberlain & Grant, 2020; Kotbagi, Kern, Romo, & Pathare, 2015), exercise dependence (Hausenblas & Symons-Downs, 2002a, 2002b), and morbid exercise (Alcaraz-Ibáñez, Paterna, Sicilia, & Griffiths, 2020; Szabo et al., 2018). In this paper, we use the term 'problematic exercise' for two main reasons. First, it serves as a generic term that covers (in a general way) the common characteristic of all these different denominations. Second, with this term we adopt an exploratory approach, so that far from positioning ourselves on any of the perspectives or theoretical models existing to date, we start only from the consensus reached in the 1970s that exercise, despite its clear positive consequences for health, can become a pathogenic behaviour with negative consequences for a minority of individuals.

However, the future incorporation of exercise behaviour as a mental health disorder appears to be contingent on the scientific community reaching some consensus on a conceptualisation of the phenomenon of problematic exercise, in such a way as to enable a clear rationale, supported by sufficient scientific evidence, that explains the mechanism by which healthy exercise can become problematic. Recent reviews and meta-analyses have highlighted the difficulty of comparing the results of different studies when they use instruments to assess problematic exercise with weak and/or different conceptualisations (Alcaraz-Ibáñez et al., 2020; Colledge, Buchner, Schmidt, & Walter, 2019), which might be seen as a clear limitation to further research in this field. Therefore, an exploration of the conceptualisations of problematic exercise underlying the psychometric assessment instruments appears necessary insofar as the scientific value of research will only be as good as the tools employed in the assessment of the constructs of interest.

While previous studies have reviewed the psychometric properties of problematic exercise assessment instruments (Hausenblas & Symons-Downs, 2002b), to date there are no known studies that have examined the conceptualisations of problematic exercise underlying psychometric assessment instruments. This is a gap in the literature, as knowing how many conceptualisations of problematic exercise underlie the psychometric assessment instruments and how these conceptualisations complement or differ from each other is a first step towards a necessary consensus. A consensus on the definition of problematic exercise would allow progress to be made in the assessment and research of this phenomenon. However, before any consensus can be reached, a prior step would be to map the different conceptualisations of problematic exercise underlying the psychometric assessment instruments. Therefore, the objectives of the present systematic review were to (i) identify psychometric tools developed to assess problematic exercise; and (ii) identify and compare the theoretical conceptualisations on which the assessment instruments for problematic exercise are based. Given the exploratory nature of the present study, conceptualisations of problematic exercise were analysed in psychometric assessment instruments that were developed to be applied to any individual practising any type of exercise. This ensures that similarities or differences in the conceptualisations of problematic exercise in the assessment instruments are not due to the specifics of the type of exercise, but to different perspectives or view on the same phenomenon.

Method

The systematic review was conducted in accordance with the checklist from the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009) (see Appendix A in supplementary material).

Identifying Studies

A systematic literature search was conducted in the electronic databases Web of Science, Scielo, PsycINFO, PsycTEST and SCOPUS from their inception to August 2020. A combination of the following search terms was used: "problematic exercise", "morbid exercise", "exercise addiction", "exercise dependence", "compulsive exercise", "compulsive physical activity", "obligatory exercise", "commitment to exercise", "excessive exercise", "questionnaire", "validation", "validity", "psychometrics", "scale" (see full search strategy in Appendix B in supplementary material). All references were checked and duplicate studies were removed using *EndNote X9* software. The second and third authors reviewed and selected the studies included in the review in two phases: (i) through visualisation of studies' title and abstract, and (ii) by reviewing the studies' full-text in view of the eligibility criteria. Disagreements between reviewers were resolved by consensus and, when needed, by consulting with the first author. In addition, reference lists of all the retrieved studies were checked for possible eligible studies.

Eligibility Criteria

The review gathered data from studies proposing psychometric instruments assessing symptoms of problematic exercise, that is, exercising to the point where the individual loses control over the behaviour such that the latter becomes obligatory and may lead to physical, mental and/or social damage (Szabo et al., 2018). In addition, psychometric studies proposing a modified factor structure of previously validated instruments were also considered (e.g., Exercise Salience Scale, Kline, Franken, & Rowland, 1994; Obligatory Exercise Questionnaire, Steffen & Brehm, 1999).

Inclusion criteria. Studies were considered eligible when the following three criteria were met: (a) studies proposed a self-reported instrument assessing a potential form of problematic exercise; (b) studies were written in English or Spanish (the two languages of the review authors); and (c) studies were published in a peer-reviewed journal.

Exclusion criteria. Studies were excluded on the basis of the following criteria: (a) the proposed instrument examined a potential form of problematic exercise in specific exercise or sport contexts; examples of the latter are the Exercise Dependence in Bodybuilders (Smith & Hale, 2004) or the Commitment to Running (CR, Carmack & Martens, 1979); and (b) the goal was to adapt a pre-existing self-reported instruments assessing a potential form of problematic exercise into a new language/culture (e.g., Sicilia & González-Cutre, 2011), exercise context (e.g., Dance Addiction Inventory, Maraz, Urbán, Griffiths, & Demetrovics, 2015), or subpopulation (e.g., youth version of the Exercise Addiction Inventory [EAI-Y], Lichtenstein, Griffiths, Hemmingsen, & Støving, 2018); and (c) the provided information did not allow the qualitative evaluation of the content (e.g., Excessive Exercise Scale [EES], Long, Smith, Midgley, & Cassidy, 1993).

Coding Procedure

A preliminary search was conducted, and a coding sheet was developed based on the common characteristics of the studies found. The first and third authors systematically coded the data for all the retrieved studies using this coding sheet (see Appendix C in supplementary material). Disagreements in the data coding procedure were resolved by discussion between the two authors. Data from the studies were classified into the following categories: (i) instrument; (ii) author; (iii) sample size; (iv) conceptualisation; (v) item generation; and (vi) factor structure.

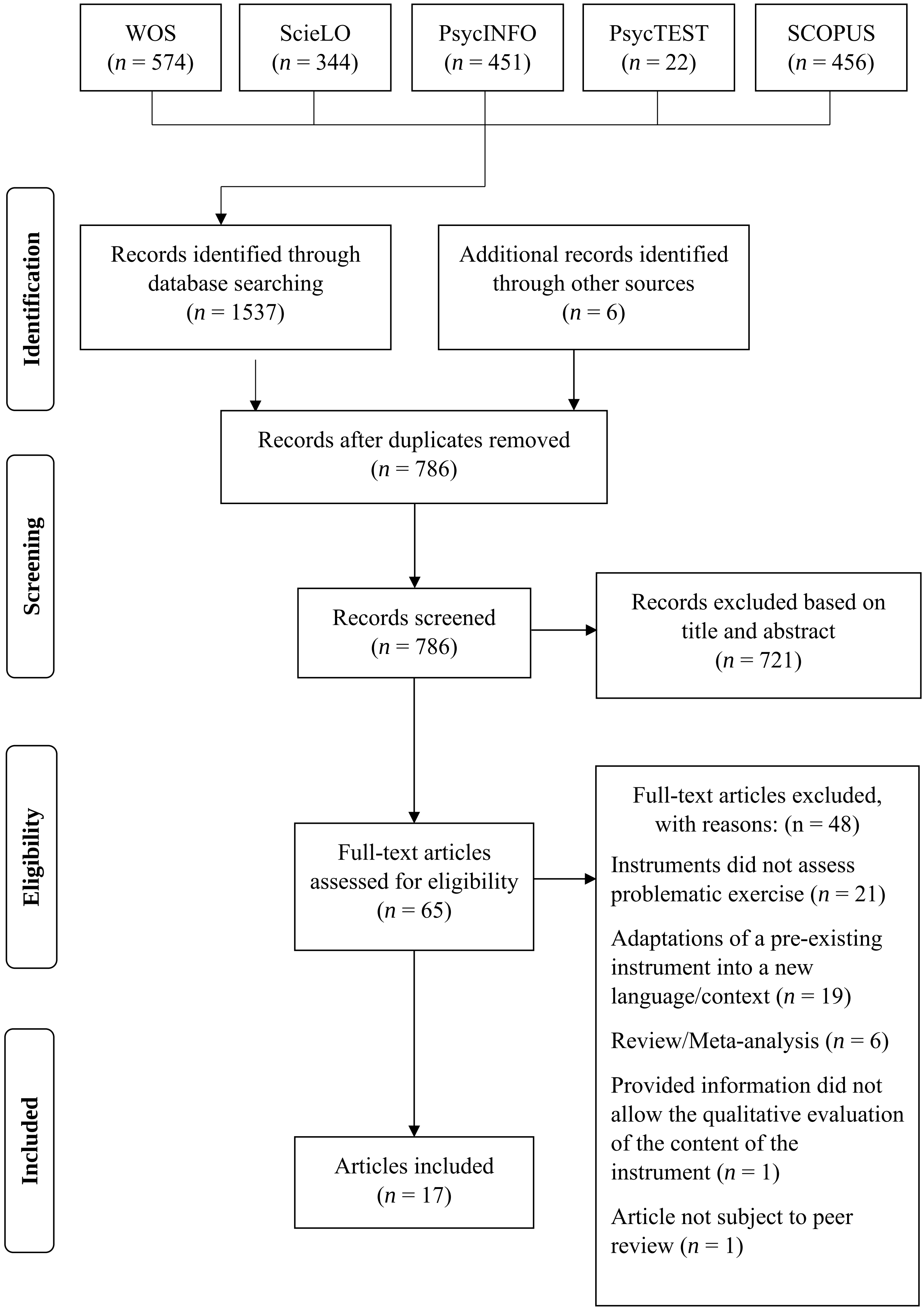

Figure 1.1 PRISMA-based flow diagram of study selection

Results

The search conducted systematically identified 1543 papers of which 65 were reviewed utilizing the full text. Finally, 17 papers met the eligibility criteria to be included in this review (see Figure 1.1). Each of the 17 papers presents either the development of an instrument to assess problematic exercise or new versions of an existing one (e.g., by introducing modifications concerning the number of items and/or the factor structure). The instruments included in the present systematic review (see Table 1.1) were classified into five groups according to their underlying theoretical perspectives (i.e., problematic exercise as end of a continuum of exercise, problematic exercise as a behaviour to regulate body shape and weight, problematic exercise as a dependence/behavioural addiction, and no clear conceptualisation).

Table 1.1

Characteristics and conceptualisation of psychometric instruments assessing problematic exercise

Instrument	Authors	Sample size (characteristics)	Conceptualisation	Items Generation	Factor Structure
Commitment to exercise scale (CES)	Davis et al. (1993)	185 Exercisers recruited from recreational facilities at University, health and fitness clubs and associations in Canada Men (*N*=88; mean age=28.93; SD=9.42) Women (*N*=97; mean age=26.71; SD=8.81)	Problematic exercise as end of a continuum of exercise	Examination of published case studies	8 items (visual analog scale) with 2 factors: Obligatory; Pathological
Commitment to Physical Activity questionnaire (CPA)	Corbin et al. (1987)	450 College students enrolled in PE classes at an USA University (Men=238; Women=212)	Problematic exercise as end of a continuum of exercise	Adaptation of the items of Commitment to Running Scale	12 items (5-point scale) with unidimensional structure
Commitment to Physical Activity Scale –Revised (CPA-R)	DeBate et al. (2009)	937 Girls, aged 8 to 13, from different locations across USA taking part in an PA intervention program	Problematic exercise as end of a continuum of exercise	Review of the 12-item CPA structure	12 items (4-point scale) with 3 factors: Value of PA; Attitudes toward PA; Motivation regarding PA
Compulsive Exercise Test (CET)	Taranis et al. (2011)	367 young women (Mage=20.76, SD=2.39, range=18-30), recruited from a UK university (68,8%) and Australian university (28,1%) engaged in regular exercise or sport over the last 4 weeks (M=4.27 h/w). BMI=21.86 (SD=2.77; range=16.3-38.2)	Problematic exercise as a behaviour to regulate body shape and weight	Pool of 31 items derived from the proposed theoretical model	24 items (5-point scale) with 5 factors: Avoidance and rule-driven behaviour; Weight control exercise; Mood improvement; Lack of exercise enjoyment; Exercise rigidity
Excessive Exercise Scale (EES)	McCabe & Vincent (2002)	413 secondary schools' students (*Boys*=221; Mage=13.76, SD=1.07; Girls=192; Mage=13.81, SD=1.10)	Problematic exercise as a behaviour to regulate body shape and weight	Pool of 10 items adapted from the Excessive Exercise Scale (Long et al., 1993)	8 items (5-point scale) with 2 factors: Need for exercise; Focus on exercise
Exercise Addiction Inventory (EAI)	Terry et al. (2004)	200 university students, (102 sport science students; 98 psychology students), age from 18-40, who reported regular participation in exercise. (Mage=21.24, SD=3.77); Men=111 (Mage=20.82); Women=189 (Mage=21.75)	Problematic exercise as a behavioural addiction	Pool of 6 items based on a modified version of the components of behavioural addictions (Griffiths, 1996)	6 items (5-point scale) with unidimensional structure
Exercise Addiction Inventory (EAI-R)	Szabo et al (2019)	277 young and adult individuals (Men=243; Women=34; aged from 22 to 45) recruited on social media and exercised regularly at least three times per week	Problematic exercise as a behavioural addiction	Pool of 6 items from EAI	6 items (6-point scale) with unidimensional structure
Exercise Beliefs Questionnaire (EBQ)	Loumidis & Wells (1998)	13 exercisers (Male=7; Female=6; aged from 21 to 40) recruited from a university sports centre and who reported exercised over three times a week.	Problematic exercise as a dependence	Pool of 28 items based on beliefs elicited from interviews to 13 exercisers to examine psychological factors associated with being unable to exercise	21 items with 4 factors: Social desirability; Physical appearance; Mental and emotional functioning; Vulnerability to disease and ageing

Exercise Dependence Questionnaire (EDQ)	Ogden et al. (1997)	449 young and adult participants (Male=161; Mage=32.85; Female=288; Mage=31.26) recruited from sports clubs, leisure centres, and ads in magazines, reported exercising more than 4 hours/week.	Problematic exercise as a dependence	Initial pool of 86 items from unstructured self-report questionnaires to subjects who considered themselves to be addicted to exercise	29 items (7-point scale) with 8 factors: Interference with social / family / work life; Positive reward; Withdrawal symptoms; Exercise for weight control; Insight into problem; Exercise for social reasons; Exercise for health reason; Stereotyped behaviour.
Exercise Dependence Scale (EDS)	Hausenblas & Symons-Downs (2002)	266 university students (57,7% men; Mage=21.72, SD=2.89	Problematic exercise as a dependence	Based on the DSM-IV criteria for substance dependence, an initial pool of 35 items from interviews and reviewing existing measures	31 items (6-point scale) with 7 factors: Tolerance; Withdrawal; Intention effects; Lack of control; Time; Reduction in other activities; Continuance.
Exercise Dependence Scale-Revised (EDS-R)	Symons-Downs et al. (2004)	408 university students (65.7% women; Mage = 20.2 years, SD = 2.5) participating in fitness classes at least three times per week	Problematic exercise as a dependence	Pool of 28 items from EDS	21 items (6-point scale) with 7 factors: Tolerance; Withdrawal; Intention Effects; Lack of Control; Time; Reduction in Other Activities; Continuance.
Exercise Salience Scale (ESS)	Kline, Franken, & Rowland, (1994)	74 university students (Men=32, Women=42) enrolled in undergraduate psychology courses (Mage=23.17; SD=6.31).	No clear conceptualisation	Pool of 40 items proposed by Morrow and Harvey (1990) in a popular fitness magazine	40 items (5-point scale) with 2 major factors (Response Omission Anxiety, and Response Persistence) and 4 minor factors (undefined)
Obligatory Exercise Questionnaire (OEQ)	Pasman & Thompson (1988)	90 volunteers, aged 18-60, 15 men and 15 women in each of the three following groups: obligatory runners (Mage women=33.1, Mage men=37.2); obligatory weightlifters (Mage women=27.4, Mage men=26.7); sedentary group (Mage women=29.1; Mage men=32.3).	Problematic exercise as a behaviour to regulate body shape and weight	Items adapted from the Obligatory Running Questionnaire	20 items (4-point scale) with one factor
Obligatory Exercise Questionnaire (OEQ-1)	Steffen & Brehm (1999)	250 high school students (Women=133; Men=117)	Problematic exercise as a behaviour to regulate body shape and weight	Review of the 20-item structure of OEQ	10 items (4-point scale) with 3 factors: Emotional element of exercise; Exercise frequency and intensity; Exercise preoccupation
Obligatory Exercise Questionnaire (OEQ-2)	Ackard et al, (2002)	586 female university students (Mage=20.61; SD=3.09). Actual BMI=22.79; SD=4.51. Ideal BMI=20.31; SD=2.17.	Problematic exercise as a behaviour to regulate body shape and weight	Review of the 20-item structure of OEQ	11 items (4-point scale) with 3 factors: Exercise fixation; Exercise frequency; Exercise commitment
Obligatory Exercise Questionnaire – Revised (OEQ-R)	Duncan et al. (2012)	241 exercisers (Men=143 Mage=29.95 SD=11.12; Women=97, Mage=32.89, SD=12.47; 1 case did not report gender).	Problematic exercise as a behaviour to regulate body shape and weight	Review of the 20-item structure of OEQ	10 items (4-point scale) with 3 factors: Preoccupation with exercise; Exercise behaviour; Exercise emotionally
Problematic Practice of Physical Exercise Scale (PPPE)	Kotbagi et al. (2015)	341 leisure exercisers (Men=232; Women=109) involved in activities such as yoga, cricket, soccer, gymnastics, swimming, tennis and dancing (Mage=28.26; SD=10.83)	No clear conceptualisation	Pool of 50 items that groups the 29 items of the EDQ (Ogden et al., 1997) and the 21 items of the EDS-R (Symons-Downs et al., 2004).	25 items (6-point scale) with 6 factors and 4 subfactors: Lack of control; Stereotypical behaviour (intention, and continuity); Motivation for health (physical health, and psychological health); Withdrawal; Interference with social life; Tolerance

Note: PE = Physical Education; USA = United States of America; UK = United Kingdom; BMI = Body Mass Index; PA = Physical Activity; DSM = Diagnostic and Statistical Manual of Mental Disorder

Problematic exercise as an end of an exercise continuum

Of the 17 instruments, three of them (i.e., Commitment to Physical Activity Scale, CPAS, Corbin et al., 1987; Commitment to Exercise Scale, CES, Davis et al., 1993; Commitment to Physical Activity Scale Revised, CPAS-R, DeBate, Huberty, & Pettee, 2009) used the notion of a strong commitment to activity, or over-exercising, to conceptualise the problematic exercise. This term was adapted from the more specific term 'running commitment' (Carmack & Martens, 1979), which was one of the first labels used by the instruments to examine the speculations that had emerged institutionally and based upon years of personal running experience about the positively addictive nature of this activity (Glasser, 1976).

Out of the three instruments that use the term 'commitment to exercise', two of them were adaptations of the Commitment to Running Scale (CRS; Carmack & Martens, 1979), to the general scope of exercise. More specifically, the CPAS (Corbin et al., 1987) was the first adaptation of the CRS to the general scope of exercise, and maintains the one-dimensional structure of 12 items of the original instrument, only modifying the direction and wording of the items slightly (e.g., replacing the term 'running' with 'physical activity'). The revision of the CPAS (CPAS-R) by DeBate et al. (2009) maintains the original 12 items, only slightly altering the wording of the items in order to adapt them to school-age adolescents. However, instead of maintaining the original one-dimensional structure, DeBate et al. proposed a three-factor structure (i.e., value, attitudes, and motivation towards physical activity), although they did not offer a definition of each of these factors.

Unlike the CPA and CPA-R, the Commitment to Exercise Scale (CES; Davis et al., 1993) consists of eight items that were developed from the examination of a number of published case studies that collected the testimonies of men and women with clear pathological or excessive exercise habits (e.g., Morgan, 1979; Yates, 1991; Yates et al., 1983). Therefore, the CES moves even further away from the idea of exercise as a positive addiction, and takes the concept of problematic exercise a little closer to the end of a continuum, where excessive or over-exercising would be found to have negative consequences for the individual. The instrument was designed with the idea of evaluating the degree to which feelings of wellbeing are influenced by exercising, the degree to which exercise is performed despite the presence of adverse conditions to continue it, and the extent to which the exercise interferes with the individual's social commitments. As with the aforementioned two instruments, the instruments that conceptualise problematic exercise based on the exerciser's level of commitment focus on questioning the original concept of positive addiction suggested by Glasser (1976). However, apart from this general objective, the instruments within this group suffer from the absence of a conceptual basis and, in this sense, lack an organized and systematic representation of this construct.

Problematic exercise as a means of regulating body size and weight

The instruments grouped in this conceptualisation adopt different names to refer to problematic exercise, although they often use the terms compulsory, excessive, and compulsive exercise interchangeably. This group includes the Obligatory Exercise Questionnaire (OEQ, Pasman & Thompson, 1988), and its subsequent revisions (Ackard, Brehm, & Steffen, 2002; Duncan et al., 2012; Steffen & Brehm, 1999), the Excessive Exercise Scale (EES, McCabe & Vincent, 2002), and the Compulsive Exercise Test (CET, Taranis et al., 2011). In all of these instruments, there is a shared idea that the problematic exercise is associated with the phenomenon of body image disturbance. Therefore, it is considered that problematic exercise may be associated with elevated dissatisfaction with appearance and, consequently, engage in an excessive exercise and dieting in order to modify their figure. Thus, the instruments are mainly oriented to assess common elements between problematic exercise and chronic dieters. In fact, in the development of each instrument, along with the items that assess the problematic character of the exercise, are included measures that assess constructs related to body image and eating disorders (e.g., eating disorders, drive for thinness, drive for bulimia, body satisfaction). A brief summary of the development of these instruments is outlined below.

Obligatory Exercise Questionnaire. The original version of the OEQ (Pasman & Thompson, 1988) is a modification of the Obligatory Running Questionnaire (ORQ, Blumenthal, Toole, & Jonathan, 1984), which was developed in response to the suggestion that compulsive runners share psychological and behavioural dispositions to patients with anorexia nervosa (Yates et al., 1983). Since the original instrument by Pasman and Thompson (1988) there have been three modifications to the OEQ, all of which have proposed reduced versions of the instrument (Ackard et al., 2002; Duncan et al., 2012; Steffen & Brehm, 1999).

Excessive Exercise Scale. McCabe and Vicent (2002) consider that exercise, together with dieting, are two of the most common ways of modifying body size and shape. However, they understand that excessive exercise should not only be studied in its relationship to eating disorders, but also to other disorders associated with modifying body size and shape. Therefore, whereas dieting appears to be the most common way for females to lose weight, exercise is the most common strategy for males to achieve their ideal body type. The authors modified, through two studies, items contained in the EES, developed by Long, Smith, Midgley, and Cassidy (1993), to adapt it to adolescent populations. It should be noted that the ESS is an instrument developed to examine exercise behaviour, attitudes, and motivation to exercise among anorexic and normal samples, and is basically an adaptation of three standardized scales existing at that time. Therefore, as in the case of the OEQ, the EES by McCabe and Vicent (2002) is an adaptation of another existing instrument, so beyond identifying with the general idea that problematic exercise is a means of modifying the weight and body shape, there is no theoretical development on the components that define the construct. To our knowledge, there have been no further revisions or new developments of this instrument.

Compulsive Exercise Test. The CET is based on a cognitive behavioural conceptualisation of excessive exercise (Meyer et al., 2011) and was designed to assess the core maintaining factors for excessive exercise. Similar to the other instruments included in this group, the conceptualisation underlying the CET is that excessive exercise is a primarily a weight control behaviour maintained by weight and shape concerns (Taranis et al., 2011). This measure was specifically designed for use within the eating disorders domain. However, while weight and shape concerns remain an essential component of excessive exercise, it considers other key factors, such as negative affect and compulsivity. Consequently, the CET is based on a multidimensional construct that involves "an association with weight and shape concerns, and persistent continuation in order to: (a) mitigate the experience of extreme guilt and/or negative affect when unable to exercise; and (b) avoid the perceived negative consequences of stopping" (Meyer et al., 2011, p. 184). Although it is recognized that negative affect regulation involving withdrawal effects is a recurrent element in other conceptual frameworks, such as those that conceptualise the problematic exercise as a dependence or addiction, Meyer et al. consider that it is unlikely that a primary exercise dependence exists, that is, problematic exercise does not exist in the absence of eating disorders. Therefore, for these authors, withdrawal symptoms are more likely a component of compulsivity, such that it constitutes a primary maintenance factor for exercise.

Unlike the OEQ and EES, for the development of the CET, Taranis et al. (2011) developed a pool of 31 items that were generated through interviews with eating disorder patients, review of literature on eating disorder and exercise, existing scales, and analysis of the construct validity of these scales (see Meyer et al., 2011). With this pool of items, the authors expected to assess the hypothesized maintenance factors for excessive exercise: (i) compulsivity (e.g., rigid adherence to a strict and repetitive exercise routine, continuing to exercise despite illness or injury, lack of exercise enjoyment, extreme guilt when unable to exercise, making up for missed exercise sessions), (ii) affect regulation (e.g., the positive and negative reinforcement properties of exercise) and, (iii) weight control exercise (e.g., compensatory exercise). The functioning of the items was examined through three empirical studies with independent samples of women, proposing a final model of 24 items grouped into five factors.

Problematic exercise as a primary dependence/addiction

Of the 17 instruments accounted for in this review, six instruments were oriented towards assessing primary problematic exercise (i.e., problematic exercise regardless of whether other disorders co-occur). Of these six instruments, in the development of the Exercise Beliefs Questionnaire (EBQ, Loumidis & Wells, 1998), the terms 'addiction' and 'dependence' are used interchangeably, in the development of the Exercise Dependence Questionnaire (EDQ, Ogden, Veale, & Summers, 1997), the Exercise Dependence Scale (EDS, Hausenblas & Symons-Downs, 2002b), and the Exercise Dependence Scale – Revised (EDS-R, Symons-Downs, Hausenblas, & Nigg, 2004), problematic exercise is conceptualised based on substance dependence criteria (American Psychiatric Association, 2000), while in the Exercise Addiction Inventory (EAI, Terry et al., 2004) and in the Exercise Addiction Inventory–Revised (EAI-R, Szabo et al., 2019) the components model for behavioural additions (Griffiths, 2005) is used to define and operationalize problematic exercise. The following is a brief summary of each of these six instruments.

***General use of dependence/addiction*.** In developing the Exercise Beliefs Questionnaire (EBQ), Loumidis and Wells (1998) conceptualised problematic exercise in terms of a maladaptive behaviour associated with both physical and psychological risk, which was not secondary to eating disorder. Although they mostly use the term 'exercise dependence', they associated it with the term 'addiction', without establishing a differentiation with the latter. In the attempt to develop an instrument to assess primary exercise dependence, the authors relied on the Beck's schema theory (Beck, 1978) of emotional disorder as a basic framework to develop a cognitive conceptualisation of exercise dependence. In this sense, the instrument attempts to assess beliefs and attitudes that predispose to, and maintain, exercise dependence. Using an imagery technique, beliefs elicited from exercisers associated with being unable to exercise were used to construct a pool of 28 items grouped in four dimensions. Through different empirical studies the factor structure of the instrument was examined and the items were reduced to 21 in the final version of the instrument, although the four-factor structure was maintained.

Assessment instruments based on substance dependence criteria. Three instruments conceptualised problematic exercise in terms of dependence – the Exercise Dependence Questionnaire (EDQ), the Exercise Dependence Scale (EDS), and the revised Exercise Dependence Scale (EDS-R). These are partially or totally based on the clinical criteria for substance dependence listed in the DSM-IV (American Psychiatric Association, 2000). Both instruments assess primary exercise dependence (Veale, 1987, 1995). However, as the authors recognize, the instrument should be used alongside other measures that assess mental disorders that may be associated (e.g., eating disorders), and therefore rule out secondary dependence (i.e., the concern with exercise is not better accounted for by other disorders).

The EDQ (Ogden et al., 1997) adopts a conceptualisation of problematic exercise based on some of the criteria for substance dependence included in the DSM-IV, but also includes other factors based on motivational dimensions (e.g., motivation for physical and psychological health). More specifically, Ogden et al. conceptualise exercise dependence as a combination of problematic elements of exercise (e.g., withdrawal, tolerance, repetitive behaviour, excess), but also incorporate a psychosocial perspective that recognizes psychological consequences and effects on interpersonal relationships. For the development of the EDQ, Ogden et al.'s items are based on unstructured self-report questionnaires that were completed by 131 participants who considered themselves to be addicted to exercise. On basis of their statements and the commitment themes emerged, a pool of 86 items were developed. After exploratory factor analysis the final EDQ comprised 29 items and eight factors (as described in Table 1.1).

Unlike the EDQ, the EDS (Hausenblas & Symons-Downs, 2002b) presents a multidimensional conceptualisation of exercise dependence that is based entirely on the seven symptoms for substance dependence listed in the DSM-IV. By operationalizing exercise dependence according to all the criteria established in the DSM-IV, it adopts a conceptual structure that reinforces the rationality of the measure. Consequently, the EDS provides information on the average of each of the symptoms or the average of the total score. Considering the first option, the EDS allows for differentiating individuals into three groups: (i) at-risk for exercise dependence, (ii) symptomatic, and (iii) asymptomatic. Since its inception, the factorial structure of EDS has been represented by the seven diagnostic criteria established for substance dependence in the DSM-IV. The number and sensitivity of items that comprise the instrument has varied throughout different studies that have been published in two papers. The revised version of the EDS (EDS-R, Symons-Downs et al., 2004) proposes a total of 21 items (three items per factor).

Assessment instruments based on behavioural addiction components. Both the EAI (Terry et al., 2004) and its subsequent revision (EAI-R, Szabo et al., 2019) are instruments that assessed the risk of exercise addiction and utilize the components model for behavioural addictions as its theoretical framework (Griffiths, 2005, 2019). Both instruments represent a one-dimensional latent measure (i.e., exercise addiction) that comprises six items. Each of the six items of the instrument theoretically reflects one of the six criteria that are claimed to be present in all behavioural addictions (i.e., salience, mood modification, tolerance, withdrawal, conflict, and relapse).

No clear conceptualisation

There are two instruments, the Problematic Practice of Physical Exercise Scale (PPPE, Kotbagi et al., 2015), and the Exercise Salience Scale (ESS, Kline et al., 1994) that did not describe any clear operational definition of problematic exercise. Both instruments review previously existing measures without informing the readers how the items already created fit into their own conceptualisation of this construct.

In the PPPE, Kotbagi et al. (2015) started from a pool of items formed by the combination of the 21 items of the EDS-R (Symons-Downs et al., 2004) and the 29 items of the EDQ (Ogden et al., 1997). Although the two instruments used by the authors include partially or totally the criteria established in the DSM-IV for substance dependence (American Psychiatric Association, 2000), the selection that the authors made to group these two instruments lacks any theoretical foundation and, as they themselves recognized, the selection was made because (i) they were instruments applicable to any individual doing exercise, because they are not directed toward one particular physical activity; (ii) they had satisfactory psychometric properties; (iii) they were multidimensional; and (iv) they were widely used internationally, which makes cross-cultural comparisons possible (Kotbagi et al., 2015).

The development of the ESS (Kline et al., 1994) reflected the examination of the factor structure of 40 items from the Exercise Involvement Questionnaire (EIQ, Morrow & Harvey, 1990). Morrow and Harvey's (1990) work, which was excluded from the present review because it was published in a magazine that does not meet the criteria of being published in a peer-reviewed journal, does not detail the process of how its items were generated. In addition to modifying the name of the instrument (from 'Exercise Involvement Questionnaire' to 'Exercise Salience Scale'), Kline et al. modified the response range from a three-point scale to a five-point Likert scale without presenting any reason for the change. Through an exploratory factor analysis (EFA), the authors found that many of the 40 items were loaded with factors that were difficult to identify and only two factors were defined: (i) response omission anxiety, which reflects expecting negative consequences if the exercise routine is broken; and (ii) response persistence, which reflects a determination to exercise, even when there is adversity.

Discussion

The aim of the present study was to conduct a systematic review of psychometric instruments that assess problematic exercise in order to identify and compare the theoretical conceptualisations on which these instruments are based. Seventeen self-reported psychometric instruments assessing symptoms of problematic exercise were reviewed. Overall, the instruments reviewed show in their development different theoretical conceptualisations about problematic exercise, which highlights the absence of a clear consensus at the time of operationalizing the measure of problematic exercise. The results also show that the course of different conceptualisations has finally resulted in a strong dichotomy concerning the primary or secondary character of problematic exercise that might limit the capacity of the instruments to capture the complete multidimensionality of this construct, as well as the complexity of its process. We address these issues below, and suggest possible alternatives to the way existing instruments conceptualise and assess problematic exercise.

Competing conceptualisations of problematic exercise and the resulting dichotomy

The results of the analysis of the instruments reviewed suggest that, with the exception of two instruments that did not present a clear conceptualisation (i.e., the EES and the PPPE), the remaining 15 instruments fit into three different groups that conceptualised problematic exercise as either (i) the end of an exercise continuum; (ii) a behaviour to modify weight and/or body shape; or (iii) an addiction/dependence that implies a disorder in its own right.

The first group of instruments, conceptualising problematic exercise as the end of an exercise continuum, is clearly associated with the debate initiated in the 1970s that attempted to determine whether apparently healthy behaviour, such as exercise, may cause problems for the individual when it is carried out to an excessive degree (Adams, 2009; Estok & Rudy, 1986; Glasser, 1976). In this way, when these instruments use the term ‘excessive exercise’ is similar to ‘over-exercising’, that is, the point where exercise begins to lose its healthy character and shows damage not only physically, but in other spheres of the individual's life (Davis et al., 1993). However, even though the use of the term ‘over-exercising’ can be found in the literature that develop these scales (i.e., CES, CPAS, and CPAS-R), the preferred term they adopt in their instrument’s title is ‘commitment’. This term was precisely the one coined by Carmack and Martens (1979) in the development of the Commitment to Running Scale, instead of the traditional term used in the 1970s of ‘positive addiction’ (Glasser, 1976). As Carmack and Martens recognized, with this term they tried to move away from the idea of a positive addiction, and to examine the assumption that running, developed with a strong commitment, might also have symptoms of a negative addiction. Therefore, the three instruments gathered in this group extend the debate on the possibility that the exercise may reflect symptoms of negative addiction and, in this sense, develop instruments that allow this construct to be assessed in the more global scope of exercise.

Unlike the instruments listed in the first group, the instruments included in the other two groups are identified with the debate generated in the 1980s as to whether the problems caused by problematic exercise are due to the exercise behaviour itself or to other associated disorders (Veale, 1987, 1995; Yates et al., 1983). This debate is partly the result of the debate that began a decade earlier, so that, assuming the problematic nature that exercise may have, the question of debate advanced to determine the problematic nature of this activity. However, the debate generated in the 1980s produced a strong dichotomy in the conceptualisation of problematic exercise on which the assessment instruments are based. This dichotomy becomes evident in view of the similar effort that appears to be made in the development of instruments under each of the theoretical positions identified.

Six of the 17 instruments included in the present review conceptualise problematic exercise as a behaviour that individuals use to modify weight and/or body shape and, in this sense, understand problematic exercise as a possible disorder associated with other types of primary disorders, such as eating disorder or body distortion. Although in the literature where these instruments are developed reference can be found to the term 'excessive exercise', unlike the instruments included in the first group, here the term is assimilated to the use that the main clinical manuals make to describe the exercise associated with feeding and eating disorders (i.e., anorexia and bulimia nervosa) (American Psychiatric Association, 2013; World Health Organization, 2018). Within this conceptualisation, the instruments contain the terms 'obligatory' (OEQ, OEQ-1, OEQ-2, and OEQ-R), 'excessive' (EES) and 'compulsive' (CET) in the names of their scales. Although the term 'excessive' is somewhat more generic and has also been used to develop instruments under the first conceptualisation (Davis et al., 1993), the terms 'obligatory' and 'compulsive' are specific to this conceptualisation, and refer to the forced nature and, generally, the lack of attraction that the individual feels for exercising. As acknowledged by Yates (1991), 'obligatory runners' was the term chosen by a group of researchers after interviews with hundreds of long-distance runners. As Yates recognizes, with this term, the researchers wanted to highlight the inability of runners to stop exercising. In turn, the term 'obligatory' was associated with the term 'compulsive', since the extreme form of exercise of the runners was assimilated to the compulsive character that many women with eating disorders presented (Yates et al., 1983).

In a similar number to the previous conceptualisation group, six instruments have been developed utilizing a problematic exercise conceptualisation in terms of dependence/addiction. The authors who developed this group of instruments consider that a problematic exercise by itself, without being associated with another type of disorder, can occur. Three of the instruments included in this group (i.e., EDQ, EDS, and EDS-R) base their items on the criteria of substance dependence established in the DSM-IV (American Psychiatric Association, 2000) and, consequently, use the term 'dependence' in the name of their scale. In contrast, two instruments (i.e., EAI, EAI-R) developed their items based on the addiction components model for behavioural addictions (Griffiths, 2005), and use the term 'addition' in the name of their scales.

Some authors assimilated the use of ‘dependence’ and ‘addiction’ during the development of their scales (Loumidis & Wells, 1998). However, the confusion and undifferentiated use that has existed in recent decades between dependence and addiction appears to lean towards the use of the latter term, at least in the latest edition of the DSM (American Psychiatric Association, 2013). In the DSM-5, the categories of substance abuse and substance dependence were eliminated and replaced by a new category named substance-related and addictive disorders. The grouping of behavioural addictions together with substance-related disorders appears to be based on the idea that an excessively performed behaviour can produce, as with specific substances, the general direct activation of the brain's reward system, which is involved in behavioural reinforcement and memory production (American Psychiatric Association, 2013). Therefore, problematic or pathological behaviours appear to activate the reward systems in a similar way to psychoactive drugs of abuse, and produce behavioural symptoms similar to those of substance use disorders (e.g., family conflicts, work conflicts, etc.). In this way, the working group in charge of this section of the DSM-5 highlights the similarities between repetitive behaviours, among which exercise is cited, and substance use disorders in clinical expression, aetiology, comorbidities, physiology and treatment (Petry et al., 2014). From the new category of DSM-5, authors are likely to begin using the term ‘addiction’ more frequently. In any case, the research used to develop this group of instruments, even though they were developed prior to the DSM-5 proposal, do not devote space to the task of differentiating the terms ‘dependence’ and ‘addiction’, but rather to the common task of developing an instrument that is sensitive to the assessment of a problematic exercise by itself (i.e., independently of other possible associated disorders).

Despite the efforts to look for similarities between substances and addictive behaviours, the strong conceptual dichotomy existing around the primary or secondary character of problematic exercise is striking, which has affected the development of the instruments to assess this construct. From this dichotomous position it is assumed that either the origin of the problem in the exercise behaviour lies in the specific properties of the behaviour itself or, conversely, the problem must be sought in the properties associated with another disorder (e.g., eating disorder). Therefore, although today there is a consensus concerning the multidimensional character of problematic exercise, each perspective attempts to define its specific components (Griffiths, 2005; Hausenblas & Symons-Downs, 2002b; Taranis et al., 2011). However, the strong dichotomy in the conceptualisation of problematic exercise shown by the development of assessment instruments may bring about some drawbacks that should be pointed out.

Limitations associated with a dichotomous conceptualisation of problematic exercise

A dichotomous view of the problematic exercise encourages those in the field to treat problematic exercise behaviour differently according to its possible aetiology and, in this way, accentuates the differences more than its potential similarities. In the same way that a debate is beginning in defence of a broader perspective of behavioural addictions, which considers that in addictions and dependence similarities should be given precedence over the differences (Griffiths, 2017; Petry et al., 2014), conceptualisations could also be thought of that are far from the dichotomization that defines the problematic exercise based on the existence or not of an associated disorder. In other words, a broad perspective of problematic exercise would not discard the possibility that so-called ‘excessive exercise’, referenced in the major mental disorder manuals to refer to exercise associated with eating disorders (e.g., anorexia and bulimia nervosa) (American Psychiatric Association, 2013; World Health Organization, 2018), might actually be an expression of an underlying addiction syndrome. There is some evidence in the literature that would support such a perspective (Chamberlain & Grant, 2020; Davis et al., 1993; Klein et al., 2004; Oberle, Watkins, & Burkot, 2018; Scharmer, Gorrell, Schaumberg, & Anderson, 2020).

For instance, Klein et al. (Klein et al., 2004) adapted the Substance Dependence Severity Scale (SDSS), an instrument that assesses the severity of substance use disorders according to the DSM-IV (American Psychiatric Association, 2000) and ICD-10 (World Health Organization, 1993), in order to assess symptoms of exercise dependence in a group of women with anorexia nervosa. The results of the Klein et al.’s study showed that 48% of the women assessed in the study endorsed symptoms consistent with exercise dependence during the past month. In the same vein as the Klein et al.’s study, Scharmer et al. (2020) showed that eating disorder pathology was associated with qualities of pathological exercise measured using both the CET and the EDS. Chamberlain and Grant (2020), using the EAI measure, found that individuals with eating disorder traits shared defined symptoms for behavioural addictions (Griffiths, 2005). Finally, Oberle et al. (2018) showed that university students with high scores in orthorexia symptomatology (i.e., obsessive fixation on eating healthy that includes compulsive behaviour and concern with restrictive eating practices), had higher problematic exercise scores assessed with both the EAI and CET. In part, findings of the aforementioned studies appear to have been corroborated in a recent meta-analysis by Alcaraz et al. (2020), which evaluated the relationship between self-reported symptoms of problematic exercise as assessed by different instruments (i.e., CES, CET, EAI, EDS-

R, and OEQ) and eating disorders. The results of this meta-analysis showed medium-sized relationships between eating disorders and problematic exercise assessed by all instruments, although larger effect sizes were observed with problematic exercise assessed using the CET. All these studies suggest that exercise performed by individuals with eating disorder symptoms and compulsive-obsessive behaviour traits would maintain defined properties in instruments under a different theoretical conceptualisation, including instruments that conceptualise problematic exercise under models of addiction/dependence.

On the other hand, a dichotomous approach to problematic exercise may be limited in capturing the idea that the different components or symptoms that define the problematic exercise may actually emerge in a wide and varied combination of components. Therefore, each approach usually describes the emergence of problematic exercise as a process, understanding the phenomenon as a unit or global construct (Freimuth et al., 2011; Meyer et al., 2011). Most of the research on problematic exercise may have been driven by the orientation of the instruments used, so that, within each perspective, studies often report the value of each symptom in isolation or the aggregated or mean scores of the whole set of symptoms (Griffiths et al., 2015; Mónok et al., 2012; Terry et al., 2004). However, scholars have also suggested that the different symptoms caused by problematic exercise may not necessarily emerge simultaneously and symptoms may not be equally relevant in terms of their contribution to explaining the problematic exercise (Blaydon, Lindner, & Kerr, 2004; Magee, Buchanan, & Barrie, 2016; Paradis, Cooke, Martin, & Hall, 2013; Szabo et al., 2018).

Little research has so far examined clusters of individuals based on their problematic exercise symptom profiles (Blaydon & Lindner, 2002; Blaydon et al., 2004; Magee et al., 2016; Maraz et al., 2015; Sicilia, Alcaraz-Ibáñez, Chiminazzo, & Fernandes, 2020). However, the results of these investigations suggest that individuals may present simultaneously high and low levels of the symptoms that form a set of criteria, which appears to challenge the conceptual division that implicitly or explicitly dominates the assessment instruments (i.e. individuals with greater or lesser symptoms of problematic exercise). The results of these studies suggest that the symptoms or components assessed utilizing these instruments not only reflect quantitative differences in problematic exercise, but may indicate qualitative differences depending on how these symptoms or components being assessed are combined in different individuals. In addition, these results show that the associations of problematic exercise with health-related correlates may be better explained by the complex association formed by its components. Despite this evidence, the instruments developed so far are limited in studying a combination of patterns derived from components from different perspectives. Therefore, it is likely that the dichotomy of problematic exercise (i.e., primary and secondary problematic exercise) does not adequately capture the multidimensionality and complex process that underlies problematic exercise.

Outlining comprehensive alternatives and its implications

Some authors suggest that problematic exercise can have different aetiologies (e.g., primary and secondary addiction) (Veale, 1987, 1995). However, research has also shown overlaps between these ways of defining problematic exercise (Klein et al., 2004; Scharmer et al., 2020). Despite evidence of these overlaps, the authors emphasize component differences and there are no alternative proposals to the dichotomous view that dominates instrument development and validation to date. The suggestion pointed out by Shaffer et al. (2004), of considering addiction as a syndrome containing different expressions, may be a useful idea to transfer to the study of problematic exercise, and perhaps may serve as inspiration to develop and test new instruments with a broader conceptualisation. As Shaffer et al. recognize, a syndrome should be seen as a cluster of symptoms, signals, or components related to an abnormal underlying condition. In this way, just as not all symptoms or components will be present in every expression of the syndrome, and some manifestations of a syndrome will have a unique combination of symptoms and components, it is likely that the different symptom of problematic exercise will form a different combination depending on whether the exercise is associated with another type of disorder. The idea of considering problematic exercise as a syndrome provides an alternative way of thinking about this reality and allows for a broader conceptualisation that considers problematic exercise as a broad family of different expressions that are individually distinguished by the specific combination of their factors. Therefore, although different expressions of problematic exercise would have different symptoms (i.e., primary and secondary problematic exercise), these manifestations of problematic exercise could also share common elements.

Based on the findings of the present study, some future lines of research are proposed. Case studies may assist in the identification of common patterns in problematic exercise. However, there have been very few such studies to date compared to studies using psychometric assessment instruments. The few case studies carried out to date indicated that characteristics such as the salience of exercise in the individual's life or unpleasant feeling states when exercise is reduced or stopped appear to be criteria or components present in problematic exercise (Griffiths, 1997; Kotbagi et al., 2014; Morgan, 1979; Veale, 1995; Yates et al., 1983). Further evidence from qualitative studies could corroborate whether these identified criteria hold for problematic exercise among individuals with different backgrounds and aetiology. Along with the proliferation of more qualitative studies, future research could address comparative analyses of the components or criteria covered in the psychometric assessment instruments to examine which components of problematic exercise are shared by instruments with different theoretical conceptualisations and which components differ. Such analyses have recently been conducted on instruments assessing other problematic behaviours, such as gaming and pornography use (Fernandez & Griffiths, 2019; King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013). An identification of common and specific components in psychometric assessment instruments with different conceptualisations of problematic exercise may help to interpret the results when using different instruments. In addition, identifying common and different criteria or components of problematic exercise among instruments with different conceptualisations could serve to further examine how different combinations of components relate to different variables, and to explain qualitative differences among groups or individuals.

With better assessment instruments under broader conceptualisations of problematic exercise, clinicians could advance a diagnostic aetiological classification that would help intervention programs for this problematic behaviour, in addition to treating other associated disorders. Therefore, conceptualising problematic exercise as a syndrome may have implications for treatment. Individuals who are treated for eating disorders are sometimes neglected from problematic exercise because it is thought that this problem will disappear when the primary disorder (e.g., eating disorder) is resolved. This type of treatment focuses on the specific secondary character of the problematic exercise and does not take into account the addictive component that may co-occur with the primary disorder. From a syndrome perspective, effective treatment would encompass a multimodal approach that includes both treatment specific to the primary disorder (e.g., eating disorder) and more general treatment of the addictive nature of the associated exercise. This conceptualisation requires clinicians to develop multidimensional treatment plans and to repeatedly assess the impact of these relationships. This aetiological strategy is different from the current multidimensional consensus approach that tends to identify the common elements of primary and secondary problematic exercise, and, within each, tends to give equal weight to the diagnostic criteria that have been defined. In addition, a multimodal perspective might contemplate components that are shared, but also characteristic of other forms of problematic exercise associated with disorders other than eating disorders (e.g., body dysmorphic disorder) (Foster, Shorter, & Griffiths, 2015).

Limitations

The present systematic review had strict selection criteria and only covered self-report scales that assess some type of problematic exercise, without considering instruments developed for a specific exercise (e.g., running) or sport contexts (e.g., bodybuilders). Therefore, instruments developed to assess problematic exercise in specific exercise were not evaluated in the present review. Second, the electronic databases used for the search and the languages selected (i.e., English and Spanish) may not have identified studies published in other languages. Third, to the best of our knowledge, the lack of criteria to assess the risk of bias in conceptual reviews prevented the evaluation in terms of methodological quality of the studies in which such definitions are presented. Finally, the fact that we were unable to assess the risk of bias in studies that could have been of very low quality led us to opt for not including the grey literature (e.g., dissertations, conference abstracts). It is therefore possible that some other existing instruments would not have been included in the review.

Conclusion

The results of the present systematic review show different theoretical conceptualisations in the assessment instruments that evidence a lack of consensus on the definition of problematic exercise, resulting in a strong dichotomy around the primary or secondary character of the problematic exercise. The existing dichotomous conceptualisation may limit the possibility of adequately capturing the complex process that underlies this potential disorder. Given the interest in investigating the problematic exercise in all its forms, it is critical for future research to develop a comprehensive definition of problematic exercise that enables advances to the study and assessment of the multidimensionality and complexity of this construct.

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Estudio 2

A Review of the Components of Problematic Exercise in Psychometric Assessment Instruments

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A Review of the Components of Problematic Exercise in Psychometric Assessment Instruments

Abstract

Backgrounds: The range of theoretical conceptualizations of problematic exercise in psychometric assessment instruments makes it difficult to identify the components that define this phenomenon. A better understanding of the underlying components of problematic exercise may contribute to progress towards providing scientific evidence that allows for deciding whether problematic exercise should be considered a substantive mental health disorder. The objective of the present review was to examine and compare, through a content analysis of their items, the components of problematic exercise in psychometric assessment instruments identified in a recent systematic review. *Method*: A total of 33 components of problematic exercise were identified in the 17 assessment instruments included in the present review. *Results*: The results show that, despite the lack of consensus in the operational definition of their factors and the variety of ways of wording their items, the instruments reflect some common components that might indicate core criteria (i.e., salience, withdrawal, and mood modification) or candidate components (i.e., conflict, and continuance despite problems) of problematic exercise. However, other components of different nature were shown to be specific to some of the problematic exercise conceptualizations on which the assessment instruments are based. *Conclusion*: In the interest of reaching a consensus that allows to advance in this research field, further studies are needed to resolve which components are inherently problematic.

Keywords: exercise addiction, exercise dependence, compulsive exercise, commitment to exercise, excessive exercise, obligatory exercise, morbid exercise

Introduction

Problematic exercise broadly refers to exercising in a way that the individual loses control over the behavior, so that it begins to have negative physical, psychological, and social consequences (Szabo, Demetrovics, & Griffiths, 2018). Despite the possible negative effects that problematic exercise can have (Fernandez, Kuss, & Griffiths, 2020), this behavior has not been recognized to date as a mental health disorder in leading clinical manuals (American Psychiatric Association, 2013; World Health Organization, 2018). One of the main causes behind this lack of recognition is the insufficient scientific evidence to establish the diagnostic criteria and course descriptions needed to identify this behavior as mental health disorder (American Psychiatric Association, 2013).

Most survey research examining problematic exercise has been conducted using psychometric assessment instruments (Szabo, Griffiths, de La Vega, Mervó, & Demetrovics, 2015). However, the fact that the instruments for problematic exercise utilize different terminology and theoretical conceptualizations (Sicilia, Alcaraz-Ibáñez, Paterna, & Griffiths, 2021) makes it difficult to identify the essential components that should define this phenomenon. Without a clear consensus on the components that should define problematic exercise, it is difficult to compare the results of the studies and, therefore, to show scientific evidence that helps to establish the diagnostic criteria and course description need to identify problematic exercise as a disorder (American Psychiatric Association, 2013). Determining core components that define problematic exercise is a central task for its description as a disorder, but also for its subsequent prevention and treatment. In addition, psychometric assessment instruments form the basis of evidence reported in prevalence studies of problematic exercise, so when these instruments vary in their definitions and operational components it becomes difficult to understand the nature of this phenomenon (Colledge, Buchner, Schmidt, & Walter, 2019). Examination of the components of problematic exercise in the assessment instruments would allow comparisons to be made between them and a future consensus to be established on the definition of problematic exercise.

Colledge et al. (2019) conducted a brief review of the assessment instruments for problematic exercise currently in use, showing the existence of a variety of instruments with different theoretical conceptualizations. The three most widely used instruments were the Exercise Dependence Scale (EDS; Hausenblas & Symons-Downs, 2002), which defines the problematic exercise based on criteria for substance dependence provided by the DSM-IV (American Psychiatric Association, 2000), the Exercise Addiction Inventory (EAI; Terry, Szabo, & Griffiths, 2004), that operationalizes the problematic exercise based on the components for behavioral addictions (Griffiths, 2005), and the Compulsive Exercise Test (CET; Taranis, Touyz, & Meyer, 2011), where problematic exercise is defined as a means of regulating body size and weight based on a cognitive behavioral conceptualization (Meyer, Taranis, Goodwin, & Haycraft, 2011).

Recently, Sicilia et al. (2021) conducted a systematic review to examine the theoretical conceptualizations of problematic exercise in psychometric assessment instruments. The findings from this study also showed a variety of theoretical conceptualizations of problematic exercise and demonstrated a lack of consensus concerning its definition. The authors classified the instruments according to their conceptualization into five groups: (i) problematic exercise as an end of an exercise continuum, (ii) problematic exercise as a behavioral addiction, (iii) problematic exercise as a dependence, (iv) problematic exercise as a means of regulating body size and weight, and (v) no clear conceptualization. However, the authors highlighted a strong dichotomy in relation to the primary nature (i.e., a problematic exercise irrespective of whether other disorders may occur) or secondary nature (i.e., the concern with exercise is not better accounted for by other disorders) of problematic exercise, which could limit the ability of the instruments to adequately capture the dimensionality of this construct. Therefore, although it has been suggested that problematic exercise may have different etiologies (Veale, 1987, 1995), research has also shown overlaps between these ways of defining problematic exercise (Klein et al., 2004; Scharmer, Gorrell, Schaumberg, & Anderson, 2020). Consequently, Sicilia et al. (2021) recommended that, in addition to qualitative studies, future research should undertake comparative analyses of the components or criteria covered in the psychometric assessment instruments of problematic exercise, such as has been carried out on other potentially problematic behaviors, such as gaming and pornography use (Fernandez & Griffiths, 2019; King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013).

An examination of the items included in the instruments assessing problematic exercise would provide greater insight on the nature of the components proposed for such deleterious behavior. Furthermore, the identification of common and specific components in instruments with different theoretical conceptualizations would help to interpret the results derived from different instruments. Therefore, taking up the recommendation made in the systematic review by Sicilia et al. (2021), the present study significantly extends that review and, using content analysis, aims to identify, examine, and compare the components of problematic exercise proposed in the psychometric assessment instruments identified in that review. The present study assumes the generic term 'problematic exercise' in the form used by Sicilia et al. (2021), in such a way that the authors do not intend to position themselves a priori on any of the perspectives or theoretical models on which the instruments are based, but rather to examine and compare, in an exploratory manner, the components assessed by those instruments.

Method

In the present study, we examined the items included in the 17 instruments assessing problematic exercise identified in a recent systematic review conducted by the present authors (for more detail see Sicilia et al., 2021). The first and third authors coded the data on the characteristics of the studies identified by Sicilia et al. (2021) using a coding sheet (see Appendix A in supplementary material). Disagreements in the data coding procedure were resolved by discussion between the two authors. Data from the studies were classified into the following categories: (i) instrument; (ii) author(s); (iii) sample characteristics; (iv) conceptualization; (v) instrument structure; and (vi) factors and definition (see Appendix B in supplementary material).

Second, based on similar methodology to that used by King et al. (2013) and Fernández and Griffiths (2020), the psychometric instruments included in the study selection were compared on their ability to assess different components utilizing a coding procedure of their items (Gibbs, 2018; Sparkes & Smith, 2014). This analysis entailed moving from the text included in the items to their common thematic elements. This procedure was developed through different phases. In the first phase, the items of the assessment instruments for problematic exercise were collected and a previous immersion with repeated reading of the items was performed. Subsequently, the research team proceeded to search for, identify, and label the components according to the thematic content represented in each of the items (Gibbs, 2018). This was achieved by combining two methods: deductively considering criteria from the already established theory or manual, and inductively observing the components that emerged in the items in those cases that their wording expressed a concept that did not match with any established criteria in literature. In the latter case, the theme that emerged from the analysis of the item's content was observed and a new component or element was proposed. Enough items were coded by first and second authors until the emerging components of problematic exercise instruments were agreed and defined (see Appendix C in supplementary material). Following this, the first and second authors coded all items of the instruments according to the components established previously by agreement using an Excel spreadsheet. Likewise, some items were coded on more than one addiction component when it appeared to be assessing more than one component. Disagreements in the content analysis of items were resolved by discussion between the first two authors. In addition, all items were independently coded by the fourth author. Discrepancies were reconciled by revisiting the wording of items and reaching a consensus among authors. Finally, the results were ordered in the form of a table (see Table 2.1), designed to show the problematic exercise components that emerged in each of the assessment instruments considered in the present review.

Results

The assessed components, definitions and example of item are shown in Appendix C. The comparison of instruments utilizing the same definition to each component provides a consistent base on which to examine similarities and differences between the instruments in terms of their assessed components. A comparison of the components assessed in the three instruments most frequently used in the recent literature (Colledge et al., 2019; Marques et al., 2019) is shown in Table 2.1.

As shown in Table 2.2, a total of 33 different components of problematic exercise were identified from the 17 assessment instruments considered in the present study. Fifteen of 33 components were defined based on the six components of addiction (i.e., salience, mood modification, withdrawal, conflict, tolerance, and relapse) proposed by Griffiths (2005). Nevertheless, in the present study the salience, mood modification, and withdrawal components were further broken across three domains, while the conflict component was further broken down across four domains.

Table 2.1

Comparison of components assessed by the EDS, EAI and CET

	EDS		EAI		CET	
Assessed component/s	Instrument factor	Item example/s	Instrument factor	Item example/s	Instrument factor	Item example/s
Withdrawal: Psychological	Withdrawal	*I feel stressed if I cannot exercise*	Withdrawal symptoms	*If I have to miss an exercise session, I feel moody and irritable*	Avoidance and rule-driven behavior	*If I cannot exercise, I feel low or depressed*
Mood modification (negative state, general, positive state)	Withdrawal	*I exercise to avoid feeling irritable*	Mood Modification	*I use exercise as a way of changing my mood (e.g., to get a buzz, to escape etc.)*	Mood improvement	*I feel happier and/or more positive after I exercise*
Conflict (Interpersonal, other activities)	Reduction in other activities	*My exercise interferes with family responsibilities / My exercise interferes with work/school responsibilities*	Conflict	*Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do*	-	-
Salience: Cognitive	Reduction in other activities	*I am consumed with thoughts of exercise at home, work, or school*	-	-	-	-
Salience: General & Behavior	Time	*I organize my life around exercise / I spend a great deal of time in exercise related activities*	Salience		-	-
Tolerance	Tolerance	*I continually increase my exercise duration to achieve the desire effects/benefits*	Tolerance	*Over time I have increased the amount of exercise I do in a day*	-	-
Continuance despite problems	Continuance	*I exercise despite persistent physical problems*	-	-	Avoidance and rule-drive behavior	*I usually continue to exercise despite injury or illness, unless I am very ill or too injured*
Impaired control	Lack of control	*I am unable to reduce how often I exercise*	-	-	-	-
Impaired control	Intention effects	*I often exercise longer than I intend*	-	-	-	-
Relapse	-	-	Relapse	*If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before*	-	-

Catching up on missed exercise	-	-	-	-	Avoidance and rule-driven behavior	*If I miss an exercise session, I will try and make up for it when I next exercise*
Reason: Body image	-	-	-	-	Weight and control exercise	*I exercise to burn calories and lose weight*
Withdrawal: Body image	-	-	-	-	Weight and control exercise	*If I cannot exercise, I worry that I will gain weight*
Exercise as a compensatory behavior	-	-	-	-	Weight and control exercise	*If I feel I have eaten too much, I will do more exercise*
Lack of enjoyment	-	-	-	-	Lack of exercise enjoyment	*I do not enjoy exercising*
Rigid exercise pattern	-	-	-	-	Exercise rigidity	*My weekly pattern of exercise is repetitive*

Note: EDS=Exercise Dependence Scale; EAI=Exercise Addiction Inventory; CET=Compulsive Exercise Test.

Table 2.2

Components assessed by psychometric instruments

Instrument	Body image comparison	Catching up on missed exercise	Conflict: General	Conflict: Interpersonal	Conflict: Intrapersonal	Conflict: Other activities	Continuance despite problems	Craving	Cross tolerance	Exercise as a compensatory behav.	Exercise characteristic.: Duration	Exercise characteristic: Frequency	Exercise characteristic: Type	Exercise characteristic: Time	Exercise reason: Affiliation	Exercise reason: Body image	Exercise reason: Health	Impaired control	Lack of enjoyment	Mood modification.: Unspecified	Mood modification: Neg. state	Mood modification: Pos. state	Relapse	Rigid exercise pattern	Salience: Behavior	Salience: Cognitive	Salience: General	Social norms	Striving for control	Tolerance	Withdrawal: Physical	Withdrawal: Psychological	Withdrawal: Body image	**N° Components assessed by the instruments**
CES (Davis et al., 1993)	○	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	●	○	○	○	○	○	○	○	●	○	6
CPA (Corbin et al., 1987)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	●	○	○	○	○	○	○	4
CPA-R (DeBate et al., 2009)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	●	●	●	○	○	○	○	○	○	5
CET (Taranis et al., 2011)	○	●	○	○	○	○	●	○	○	●	○	○	○	○	○	●	○	○	●	○	○	●	○	●	○	○	○	○	○	○	○	●	●	9
EES (McCabe & Vicent, 2002)	○	○	○	○	○	○	●	●	○	●	●	●	○	○	○	○	○	○	○	○	○	○	○	●	○	●	●	○	○	○	○	●	○	9
EAI (Terry et al., 2004)	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	●	○	○	●	○	●	○	6
EAI-R (Szabo et al., 2019)	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	●	○	○	●	○	●	○	7
EBQ (Loumidis & Wells, 1998)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	3
EDQ (Ogden et al., 1997)	○	○	●	●	●	●	○	○	○	○	○	○	○	○	●	●	●	●	○	○	●	●	○	●	○	○	●	○	○	○	○	●	○	13
EDS (Hausenblas & Symons-Downs, 2001)	○	○	○	●	○	●	●	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	●	●	●	○	○	●	○	●	○	10
EDS-R (Symons-Downs et al., 2004)	○	○	○	●	○	●	●	○	○	○	○	○	○	●	○	○	○	●	○	○	●	○	○	○	○	●	○	○	○	●	○	○	○	8
ESS (Kline et al., 1994)	●	○	○	●	○	●	●	○	○	○	○	●	○	○	○	●	○	○	○	○	●	●	○	●	○	●	○	○	○	●	●	●	●	14
OEQ (Passman & Thompson, 1988)	○	●	○	○	○	●	●	●	●	●	○	●	●	○	○	○	○	○	●	○	○	●	○	○	●	●	○	●	●	○	○	●	●	16
OEQ-1 (Steffen & Brehm, 1999)	○	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	●	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	6
OEQ-2 (Ackard et al., 2002)	○	○	○	○	○	●	○	○	○	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	6
OEQ-R (Duncan et al., 2012)	○	○	○	○	○	○	○	○	●	○	○	●	●	○	○	●	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	○	6
PPPE (Kotbagi et al., 2015)	○	○	●	●	●	●	●	○	○	○	○	○	○	●	○	○	○	●	○	○	●	●	○	○	○	○	○	○	○	●	○	○	○	10
Number of instruments assessing the component	1	3	2	7	2	8	8	2	2	5	1	6	2	2	1	4	1	5	4	3	5	6	2	5	4	10	7	1	1	6	2	13	6	

Note: CES=Commitment to Exercise Scale; CPA=Commitment Physical Activity; CPA-R=Commitment to Physical Activity Scale Revised; CET=Compulsive Exercise Test; EES=Excessive Exercise Scale; EAI=Exercise Addiction Inventory; EAI-R=Exercise Addiction Inventory Revised; EBQ=Exercise Beliefs Questionnaire; EDQ=Exercise Dependence Questionnaire; EDS=Exercise Dependence Scale; EDS-R=Exercise Dependence Scale Revised; ESS=Exercise Salience Scale; OEQ=Obligatory Exercise Questionnaire; OEQ-R=Obligatory Exercise Questionnaire Revised; PPPES=Problematic Practice of Physical Exercise Scale

● assessed; ○ not assessed.

Other core components of addiction such as impaired control, craving, and cross-tolerance, not explicitly covered by Griffiths' model (2005), but referred in other works for behavioral addictions (American Psychiatric Association, 2013; Fernandez & Griffiths, 2019; Griffiths, 1997; King et al., 2013), were also identified. Traditional criteria such as the modality or type of exercise, duration of exercise, and frequency of exercise emerged and were grouped together with time to identify the characteristics of exercise that the instruments outlined. In addition, along with time, continuance despite problems was another component identified primarily in the instruments that were based on substance dependence criteria to define problematic exercise. In addition to body-image-related withdrawal, there were five components (i.e., catching up on missed exercise, exercise as a compensatory behavior, body image-related exercise reasons, lack of enjoyment, and rigid exercise pattern) that were mostly identified from instruments which conceptualized exercise as a means to modify weight and body shape. Nevertheless, body image reasons were grouped together with other less frequent components that appeared from items assessing reasons or motives for exercise, such as social relatedness reasons (e.g., "I exercise to meet other people") or health reasons (e.g., "I exercise to be healthy, feel fit, or prevent heart disease and other illness"). Finally, other components that also had a very low frequency were body image comparison, social norms, and striving for control.

In terms of breadth of coverage, the instruments varied from three to 16 of the 33 identified components (see Table 2.2). The component most frequently assessed across the instruments in the present review was psychological withdrawal, being more assessed than any other two domains of this component considered in this study: body image-related withdrawal and physical withdrawal. The second most assessed component across the instruments was cognitive salience, which showed a higher presence than general salience, and behavioral salience. The mood modification component, in any of its types, was assessed across 11 instruments. Conflict, in any of its types, was assessed in 10 instruments, although conflict with other activities and interpersonal conflict were assessed more than intrapersonal conflict and general conflict. Among the components common to other behavioral addictions, tolerance, impaired control, overall craving, cross-tolerance, and relapse, were assessed less frequently than any of the aforementioned addiction component groups.

Within the traditional components assessing exercise characteristics, exercise frequency was more assessed in the instruments than exercise time, exercise type, and exercise duration components. However, the continuance despite problems component was more assessed than time within the criteria that were based on substance dependence. There were six components which were presented to a greater or lesser extent in instruments highlighting an obligatory or compulsive character of exercise, being in descending order: body image-related withdrawal, exercise as compensatory behavior, rigid exercise pattern, body image reasons, lack of enjoyment, and catching up on missed exercise. Considered as a whole, 10 of the 17 instruments in the present review assessed one or more of the six aforementioned components. Of these 10 instruments, only the CET (Taranis et al., 2011) assessed all these six components.

Discussion

Utilizing content analysis, the objective of the present study was to identify, examine, and compare the components of problematic exercise in psychometric instruments assessing problematic exercise identified in a recent systematic review (Sicilia et al., 2021). This is the first study to date that identified and compared the components of problematic exercise in assessment instruments. Despite the different theoretical conceptualization, the divergence in the operational definition of their factors, and the variety of ways of wording their items, the instruments reflected some common components that might indicate core criteria when defining and operationalizing problematic exercise.

Establishing an operational definition that allows the comparison of instruments under the same and between different theoretical perspectives

Seventeen self-reported psychometric instruments assessing at least some potential aspect of problematic exercise were reviewed. Prior to the comparison between instruments in terms of their assessed components, a coding and interpretation task was required by the researchers to identify and define the components assessed through the items collected in the instruments. This task did not (in most cases) involve a direct identification of the exercise components, since there are instruments, such as the Commitment to Physical Activity Questionnaire (CPA, Corbin, Nielsen, Borsdorf, & Laurie, 1987) and the Obligatory Exercise Questionnaire (OEQ, Pasman & Thompson, 1988) that contain a large number of items with diverse content but are encompassed in a one-dimensional structure not defined in the study description (see Appendix B in the supplementary material). In other instruments, such as the Commitment to Physical Activity Scale Revised (CPA-R, DeBate, Huberty, & Pettee, 2009), the Excessive Exercise Scale (EES, McCabe & Vincent, 2002), the Exercise Dependence Questionnaire (EDQ, Ogden, Veale, & Summers, 1997), and the OEQ-revised (OEQ-R, Duncan et al., 2012), the items are grouped into factors, but these are also not defined anywhere in the study description. Finally, in the rest of the instruments, where the items are grouped into factors defined in the study description, inconsistencies were shown between the operational definition of the factors and the wording of the items that assesses the construct in question.

Looking at the comparison between the EDS, EAI, and CET (see Table 2.1), with a few exceptions (for example, the tolerance component), inconsistencies can be observed between the definition of the factors and the wording of the items intended to assess them. On the one hand, there are factors that in different instruments use the same term, but on further inspection their items assess different components. For example, the EDS and EAI contain a factor assessing withdrawal which, however, show variation in its operational definition (see Appendix B). Thus, some of the items contained in the EDS for withdrawal (i.e., “I feel stressed if I cannot exercise”) reflect the same component defined in the EAI. However, the wording of other items of the EDS included in withdrawal (i.e., “I exercise to avoid feeling irritable”) would reflect the mood modification component defined for the EAI. On the other hand, some factors that are named in the instruments with different terms, actually assess the same component. For example, the time factor in the EDS is defined in a similar way to the salience factor in the EAI. Both factors refer to the dominant role that the exercise plays in the individual’s life. These inconsistencies show that instruments that assess problematic exercise utilizing different theoretical conceptualizations, also maintain a lack of consensus when denominating and operationalizing the components of problematic exercise. Therefore, a clear contribution of the present study is to identify the components that assess the items of the instruments, in order to be able to compare the different instruments under the same operational definition of components. In addition, the components and their definitions in the Appendix C represent a code necessary to reproduce or replicate the results of this study.

Core components of problematic exercise in the psychometric assessment instruments

The components that were most frequently assessed across the items of the instruments reviewed were some of the identified forms of withdrawal (i.e., physical, psychological, and body image), salience (behavioral, cognitive, and general), and mood modification (unspecified, negative state, and positive state). Although no component was assessed by all of the instruments reviewed, this reduced set of components were present in all instrument groups according to the theoretical conceptualization of problematic exercise on which they are based. Despite the use of different terms, there appears to be consensus around these three major components. Therefore, based on the instruments reviewed, it appears that these three components reflect the “core” criteria for problematic exercise. This fact is not surprising because these components are core features of addiction models (Griffiths, 2005; Terry et al., 2004) and have been defined, although sometimes with variations in their terminology, in instruments based on the criteria for substance dependence (Hausenblas & Symons-Downs, 2002), and in instruments that conceptualize problematic exercise as a means to modify weight and/or body shape (Meyer et al., 2011; Taranis et al., 2011).

Regarding the withdrawal component, most instruments (*n* = 13) assess the psychological effects of withdrawal, and only two instruments (EES and the Exercise Beliefs Questionnaire [EBQ]) additionally assess the physical effects of exercise cessation. Not surprisingly, psychological withdrawal appears as a core component in problematic exercise instruments, since research has shown that this component is present in other clinically recognized behavioral addictions (i.e., gambling, video gaming) (Griffiths, 2010; Griffiths & Smeaton, 2002; Kaptsis, King, Delfabbro, & Gradisar, 2016). However, the low frequency of the physical withdrawal component could be viewed as surprising, especially because (i) some instruments are based on substance dependence criteria, where the physical effects of withdrawal is a defined component, and (ii) literature has previously indicated physical withdrawal effects (e.g., fatigue, heart rate, pain) for potential behavioral addictions, including exercise addiction (Fernandez et al., 2020). However, it should be noted that while research has shown the existence of some psychological effects, such as depression or anxiety, resulting from exercise withdrawal (Weinstein, Koehmstedt, & Kop, 2017), the physical effects of withdrawal in the context of exercise have been less studied and is an avenue for future research. On the other hand, body image-related withdrawal symptoms had a higher frequency in these particular instruments than physical withdrawal, and was assessed primarily in instruments that conceptualized exercise as a means of modifying body shape and weight. Therefore, even though the withdrawal symptoms associated with body image also reflect exercising to avoid negative affect and could reflect this feature as psychological withdrawal, it might well be a common element with others mental disorders (e.g., eating disorders). Consequently, it would be interesting to incorporate its assessment in instruments that in a comprehensive way evaluate different forms of problematic exercise. In this regard, a differentiation of this type of withdrawal could help to identify exercise according to the combination of their symptoms or components (Shaffer et al., 2004).

Cognitive salience was the second most assessed component by the problematic exercise instruments (n = 10). Some of them in addition to assessing the cognitive aspect, assess the behavioral aspect of this component, while a few instruments, grouped under a conceptualization of addiction/dependence, assess this component only in a general way (i.e., EAI, EAI-R, and EDQ). In any case, it should be noted that overall salience, referring to strong presence of exercise in the individual's life, was assessed by a number of instruments similar to the withdrawal component (n = 13). However, one of the few instruments that does not assess any type of salience is the CET, despite the fact that other instruments grouped under a conceptualization of problematic exercise as a means of modifying the weight and/or body shape assess this component. Future research should examine the role that salience may have in problematic exercise associated with eating and body image disorders.

With respect to the mood modification component, 11 instruments assessed one of the three mood modification forms that emerged, which highlights different definitions of this component. More specifically, instruments that define problematic exercise in terms of behavioral addiction (i.e., EAI and EAI-R) assess this component without going into detail regarding the positive or negative character of the changes in the emotional states experienced as a consequence of exercising. Instruments conceptualizing problematic exercise based on substance dependence criteria (i.e., EDQ, EDS, and EDS-R) assess mood modification in terms of getting relief from a negative emotional state. Finally, instruments conceptualizing problematic exercise as a means of modifying body weight and/or shape (i.e., CET and OEQ) tend to reflect the positive subjective experience in the mood modification component. Based on these results, future research should examine under what circumstances mood modification should be considered a component of problematic exercise. For example, in circumstances where exercise contributes to the relief of a negative state without major significance to individual, it might not be problematic, since the problem would be more what produces the negative subjective experience in individual. However, in those circumstances where exercise behavior is adopted as an almost unique and disproportionate way of dealing with these negative states, this might clearly indicate a problem because this behavior may lead to the exacerbation of other symptoms, such as social isolation or withdrawal. Therefore, future research should determine whether it is valuable to discern between these three components when assessing them in a problematic exercise instrument.

Candidate components of problematic exercise

Two components, conflict (in some of its forms) and continuance despite problems had a high presence of assessment in the instruments reviewed. However, unlike the three aforementioned core components, these do not appear to be core criteria in the problematic exercise instruments because they are absent in some of the developed instruments according to their conceptualization of problematic exercise.

The conflict component (in its different forms) was assessed in 10 of the 17 instruments reviewed, and was the fourth most frequently assessed component. However, it cannot be considered a “core component” of the instruments because it was absent from assessment instruments that conceptualized problematic exercise as a means of modifying body shape and/or weight (i.e., CET, EES, OEQ and some of the OEQ modifications). In the development of these specific instruments, no form of conflict (i.e., interpersonal, intrapersonal, with other activities) is mentioned as a component of the problematic exercise. Not even in the work that theoretically underpins and develops the CET, the instrument within this conceptualization group that presents a clearer theoretical foundation, can any reference to conflict be found (Meyer et al., 2011; Taranis et al., 2011).

However, it is surprising that conflict is not assessed in this group of instruments, since recent research suggests the need to consider this component, given that conflict appears to be associated to a greater extent than other components with unhealthy variables associated with eating disorders. For example, Chamberlain and Grant (2020) analyzed the symptoms of problematic exercise among individuals with eating disorder traits. Overall, the results of the study showed that the EAI showed a positive association with disordered eating. However, conflict assessed by EAI was the only component associated with emotional dysregulation and obsessive-compulsive personality disorder traits, characteristics that have been attributed to problematic exercise associated with eating disorders (American Psychiatric Association, 2013; Meyer et al., 2011).

Similarly, Sicilia et al. (2020) identified profiles of adolescent exercisers based on exercise addition symptoms assessed with the EAI and examined differences in several health-related variables across these profiles. The results of the Sicilia et al.'s study suggest that conflict may somehow play a key role in differentiating problematic exercise profiles associated with eating disorders (e.g., an eating disorder associated with an emotional state generated by depression or derived from excessive concern for body image). Future research should investigate the role that the conflict component may have in understanding problematic exercise associated with eating disorders.

Continuance despite problems is a relatively frequently assessed component in problematic exercise instruments based on substance dependence criteria (EDQ, EDS, EDS-R) and models that define problematic exercise as a means to modify body shape and/or weight (CET, EES, OEQ).

However, this component is not assessed in instruments based on addiction components (e.g., EAI and EAI-R). The continuance despite problems component refers to when an individual continues engaging in exercise despite drawbacks or contraindications to do it, and was highlighted as a consequence of problematic exercise in a case study applying a behavioral addition conceptualization (Griffiths, 1997). Therefore, along with the conflict component, future studies should analyze the role of continuance despite problems as a possible core symptom of problematic exercise.

Components differentiating the psychometric assessment instruments

Except for the three global core components (i.e., withdrawal, salience, and mood modification) and the two candidate components (i.e., conflict, and continuance despite problems), the remaining components had a lesser presence in the assessment instruments reviewed. Tolerance and relapse were two components within the component model for behavioral addictions (Griffiths, 2005) that had the least presence in the instruments assessing problematic exercise. However, items assessing tolerance were greater than for those assessing relapse, which could be explained by the fact that while tolerance is a component that has been defined both in models of behavioral addictions (Griffiths, 2005) and substance dependence (American Psychiatric Association, 2013; Hausenblas & Symons-Downs, 2002), relapse has only been defined within the first model. In fact, the relapse component was only assessed in the EAI and EAI-R. Both components relate to the body's capacity to adapt to exercise (e.g., need to increase the amount of exercise), so it has been indicated that they may not necessarily reflect a real problem in exercise-specific behavior, especially for elite athletes (Paradis, Cooke, Martin, & Hall, 2013; Szabo et al., 2018).

Apart from the six core components defined by Griffiths (2005) for behavioral addictions, other common addiction components had some inclusion in the instruments (i.e., impaired control, craving, and cross-tolerance). The lower frequency of these components is surprising given that they have all been observed in case study accounts and considered as possible components of behavioral addictions (Griffiths, 1997), but they have also been considered as criteria for substance dependence in the latest (fifth) edition of the DSM (DSM-5; American Psychiatric Association, 2013). Therefore, it is surprising that impaired control, although assessed in the instruments based on criteria of substance dependence, is not assessed by the EAI and EAI-R, which is limited only to the six core components of behavioral addictions defined by Griffiths (2005). However, Griffiths (2005) also argued that impaired control was subsumed in the 'conflict' component. Even scarcer is the assessment of craving and cross-tolerance which is not assessed in any of the problematic exercise instruments based on either behavioral addiction or substance dependence.

The results show that a relatively small group of instruments assess components that are related to the characteristics of exercise (i.e., types, duration, frequency, time). Among these components, exercise frequency is the most assessed by the instruments, with a greater presence than the duration and time components. The presence of these components is noteworthy, given that literature has repeatedly indicated that the amount of time spent or the form of exercise itself is not a distinctive feature of problematic exercise (Freimuth, Moniz, & Kim, 2011; Szabo et al., 2018). Therefore, the assessment of these components appears to reflect the initial influence that physical components (i.e., form and mode of exercise) had on the definition of problematic exercise. In fact, the instruments that include the assessment of these components (e.g., time, duration, frequency, etc.) are either instruments based on conceptualizations developed several decades ago (Pasman & Thompson, 1988) or studies that build on the instruments originally proposed in those decades (Kline et al., 1994; McCabe & Vincent, 2002) where, along with the assessment of psychological factors, the behavioral components that describe the activity itself are maintained.

However, it is noteworthy that an instrument with a conceptualization of problematic exercise such as the EDS-R includes a time component, restricted to the amount of time the individual spends exercising. This is explained by the fact that the wording of the time component items in the EDS-R do not really capture the operational definition of the construct. More specifically, Hausenblas and Symons-Downs (2002) in developing the EDS defined the time factor in line with the criteria defined in the DSM-IV for substance dependence, that is, as “great deal of time is spent in activities necessary to obtain exercise”. In this sense, time is operationalized in the EDS similar to a type of salience (e.g., “I organize my life around exercise”), as defined by the components of behavioral addictions (Griffiths, 2005; Terry et al., 2004). However, the wording of the items in the EDS-R for this factor was changed from the original version (EDS, Hausenblas & Symons-Downs, 2002), so that the latter wording, far from capturing the operational definition of the component, reflectsmore the time that the individual spends on exercise itself (e.g., “I spend a lot of time exercising”).

The DSM considers the criterion of time for substance use disorders, referring to the great deal of time that the individual may spend in obtaining the substance, using the substance, or recovering from its effects (American Psychiatric Association, 2000, 2013). Therefore, an adaptation of this criterion, as specified for substance use disorders, to the context of the problematic exercise should be operationalized in relation to the large amount of time per day that the individual spends around exercise (i.e., before, during, and after exercise), and not focus exclusively on the time of exercise performance. A definition in this line is more like a type of behavioral salience than a characteristic of the exercise itself. In fact, exercise time, assessed through frequency or duration, is more concerned with exercise involvement than problematic exercise (Freimuth et al., 2011).

In addition to exercise characteristics, reasons or motives for exercise (i.e., social relatedness, body image, and health) are also assessed in some instruments for problematic exercise. The EDQ is the only instrument that assesses these three exercise reasons. As has been indicated for exercise characteristics (i.e., frequency, intensity, type or modality of exercise), research needs to examine whether the motives may themselves reflect characteristics of problematic exercise (Freimuth et al., 2011). For example, the motive of exercising for body image reasons was evaluated more frequently than the other two motives, because it was also considered in the instruments that conceptualized problematic exercise as a means of modifying body weight and/or size (i.e., CET, OEQ, OEQ-R). As indicated above, although this group of instruments share components of problematic exercise (i.e., withdrawal, salience, mood modification, continuance despite problems) with other groups of instruments, they nevertheless show clear differences in the assessment of some components. More specifically, catching up on missed exercise, rigid exercise pattern, and lack of enjoyment are components defined in the instruments with a problematic exercise conceptualization as a means to modify body weight and size but has a low frequency of assessment in other instruments with different conceptualization. Moreover, there are clear components (i.e., withdrawal: body image, exercise as a compensatory behavior) that were only present in the instruments that conceptualize problematic exercise associated with body image.

Instruments that conceptualize problematic exercise as a means of modifying body shape and/or weight capture the assessment of components related to concern about body weight and appearance (e.g., withdrawal: body appearance, exercise reason: body image). In addition, these components are absent in the other groups of instruments with different theoretical conceptualizations. Therefore, it is logical to expect that the size of the effect of the relationship found between problematic exercise and eating disorders is larger when it is assessed with instruments that conceptualize problematic exercise as a means to modify the weight and body shape, such as CET, than with instruments under other theoretical conceptualizations (e.g., EAI, EDS), as recent research has found (Alcaraz-Ibáñez, Paterna, Sicilia, & Griffiths, 2020; Scharmer et al., 2020). Nevertheless, the assessment instruments for problematic exercise, regardless of their conceptualization of problematic exercise, share assessed components with each other (i.e., withdrawal, salience, mood modification), so it is not surprising to find addictive components present in individuals with eating disorders (Chamberlain & Grant, 2020; Klein et al., 2004).

Implications for a future consensus on problematic exercise components

The results of the present study reveal a lack of consensus in the operational definition of the components of problematic exercise and a variety of ways of wording their items. This variety of ways of defining problematic exercise makes it difficult to compare results from different assessment instruments. Therefore, a consensus on the components of problematic exercise appears necessary for the advancement of research. The present study contributes, as a first step, in this direction, since the results identify some common components, despite the wide variety of components identified in the instruments. However, although the degree of presence of specific components in the assessment instruments may help to move toward a greater consensus on the operational components of problematic exercise, this should not be the only criterion to be considered. There are several issues that should be taken into account in the future.

First, there is a need for specific criteria, based on empirical and/or clinical research (e.g., medical case studies), to support the components to be evaluated through the items in psychometric assessment instruments. The development of some of the instruments reviewed in the present study show no clear theoretical conceptualization, while other instruments have proposed components of problematic exercise considering features in other behavioral addictions and substance use disorders, but also in other disorders that could be associated with problematic exercise (Sicilia et al., 2021). However, it should be noted that the screening of problematic exercise through psychometric assessment instruments is limited without the definition of diagnostic criteria.

Second, those components that showed lower frequencies in the assessment instruments reviewed in the present study should not be classified a priori as peripheral components of problematic exercise. It should be noted that some of them may well reflect the variety of conceptualizations used in the instruments. On the other hand, it must be assumed that problematic exercise is a complex phenomenon, because it may involve various forms of expression and can occur in individuals who exercise in different ways and for different reasons. This diversity could be approached from different theoretical perspectives. Therefore, an approach that highlights the differences will be directed to the development of instruments that assess a specific manifestation of problematic exercise. An approach that highlights the similarities between the different manifestations of problematic exercise will focus on assessing only the core components of this phenomenon (see for example the model of common components to behavioral addictions proposed by Griffiths, 2005, 2019). Far from somewhat antagonistic proposals, a third possibility would be to propose comprehensive conceptualizations that contemplate the development of instruments that include both core components of the various manifestations of problematic exercise and some of its differentiated components. Along these lines, Sicilia et al. (2021), based on the proposal of Shaffer et al. (2004), suggested a broader conceptualization that considers problematic exercise as a broad family of different expressions that are individually distinguished by the specific contribution of their factors. Although none of these three approaches should be considered as better than the others, nevertheless, each of them illuminates the development of problematic exercise instruments and the components that should be included.

Third, there is a wide consensus that a behavior becomes problematic when it is harmful or has negative consequences for individual (Charlton & Danforth, 2007; Hausenblas & Symons-

Downs, 2002; Sicilia et al., 2021; Szabo et al., 2018). Therefore, taking into account the aforementioned considerations, a key issue in selecting the components that should define problematic exercise is that they should reflect the pathological nature of the behavior, and therefore include components that are necessarily negative (Billieux, Flayelle, Rumpf, & Stein, 2019; Griffiths, 2019). A practice that includes a large number of components without sufficient evidence would fall into the risk of overpathologizing exercise behavior. Components that do not express a functional impairment, psychological distress, or a clear separation from normative behavior in context should not be components to be included in instruments of assessment for problematic exercise (Kardefelt-Winther et al., 2017). For example, the time component, referring to the amount of time an individual spends exercising, has been indicated as a characteristic that in the specific exercise behavior probably does not reflect a problem in itself, and produces confusion when differentiating problematic exercise from high exercise involvement (Freimuth et al., 2011).

Finally, in the development of instruments, authors should take special care in the wording of the items in order to capture, as precisely as possible, the operational definition of the problematic exercise component they are trying to assess. Therefore, test developers should prevent the opposite practice described in the previous paragraph whereby components, reflecting some potential damage of the exercise, nevertheless in the wording of the items that assess this component do not capture this quality. As Griffiths (2019) pointed out, some components that he adopted from Brown (1993) for his model of behavioral addictions clearly reflect the negative aspect. However, this aspect may not have been reflected in some of the items used in the assessment instruments for behavioral addictions. For example, as Griffiths points out, the original concept of salience offered by Brown refers to "when the particular activity becomes the most important activity in the person's life and dominates their thinking (preoccupations and cognitive distortions), feeling (cravings) and behavior (deterioration of socialized behavior)...even if the person is not actually engaged in the behavior they will be thinking about the next time they will be" (Griffiths, 2019, p. 180). In this sense, the original concept clearly focuses on the negative aspects of behavior, through experiencing cognitive distortions, and a total cognitive preoccupation, along with a deterioration of the individual's socialization.

However, the content analysis of the items in the instruments that assess this component for problematic exercise, as suggested by Griffiths, does not always reflect a negative element of the behavior for the individual.

Focusing on the instruments analyzed in the present review, we found wording of items such as "I look forward to physical activity" (e.g., CPA, CPA-R), "How often do you think about exercise?" (e.g., EES), "Exercise is the most important thing in my life" (e.g., EAI, EAI-R), "I organize my life around exercise" (e.g., EDS), "Exercise is frequently onmymind" (e.g., ESS), and "I have had daydreams about exercising" (e.g., OEQ, OEQ-1, OEQ-2, OEQ-R). Although all of these items may reflect the salience component, they clearly are not reflecting the negative character that Griffiths (2005, 2019) refers to.

Therefore, a re-evaluation is needed when reviewing the instruments in order to reach consensus on the inclusion of components that should define the problematic exercise in all its different manifestations. On the one hand, based on further empirical and clinical evidence, components that do not reflect the problematic nature of the behavior should be excluded from future instruments by assessing this construct. On the other hand, the items should be written in such a way that they clearly reflect the negative component of this construct, therefore avoiding either the instrument overpathologizing individuals who exercise, or clearly harmful components being omitted by inappropriate wording of the items assessing the components.

Limitations

This review addresses for the first time a compilation and comparison of the components present in the psychometric instruments currently available that assess problematic exercise. Nonetheless, several limitations of the present study should be highlighted. First, following the approach adopted in the systematic review previously conducted by the present authors (Sicilia et al., 2021). instruments assessing problematic exercise in specific exercise or sport contexts (e.g., dance, running, bodybuilders) or adaptations of existing instruments in a new language or culture were not included. Consequently, the possibility exists that some other components specifically proposed for these contexts may not have been captured in the present study. Second, the components emerged from studies that, in some cases, were developed among samples that might have included some proportion of non-exercising individuals (e.g., university students, secondary school students). Finally, the review of instruments was limited to studies written in languages spoken by the authors of the present study (i.e., English and Spanish).

Conclusions

Despite the disparity of operational definitions and instruments proposed for the assessment of problematic exercise, components such as withdrawal, salience, and mood modification appear to be present in all the groups of instruments considered. Consequently, these might well form the "core" group of components of problematic exercise. Despite being present in many of the instruments, components such as conflict and continuance despite problems are clearly absent in one of the groups of instruments That is, conflict is absent in the group of instruments than concern body image, while continuance despite problems is absent in those that are based on addiction criteria. Finally, a wider number of components of differing nature appears to be specific to the variety of conceptualizations used in the currently available instruments. In view of the disparity of potential components of problematic exercise identified in the present study, and in the interest of reaching a consensus that allows to advance in this research field, further studies are needed to resolve which of those components could be considered to be inherently problematic.

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Estudio 3

Examining the reliability of the scores of self-report instruments assessing problematic exercise: A systematic review and meta-analysis

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Examining the reliability of the scores of self-report instruments assessing problematic exercise: A systematic review and meta-analysis

Abstract

Background and aims: Problematic exercise (PE) has mainly been assessed with self-report instruments. However, summarized evidence on the reliability of the scores derived from such instruments has yet to be provided. The present study reports a reliability generalization meta-analysis of six well-known self-report measures of PE (Commitment to Exercise Scale, Compulsive Exercise Test, Exercise Addiction Inventory, Exercise Dependence Questionnaire, Exercise Dependence Scale, and Obligatory Exercise Questionnaire). *Methods:* Pooled effect sizes were computed using a random-effect model employing a restricted maximum likelihood estimation method. Univariable and multivariable meta-regressions analyses were employed for testing moderator variables. *Results:* Data retrieved from 255 studies (741 independent samples, *N*=254,174) identified three main groups of findings: (i) pooled alpha values that, ranging from .768 to .930 for global scores and from .615 to .907 for subscale scores, were found to be sensitive to sociodemographic and methodological characteristics; (ii) reliability induction rates of 47.58%; and (iii) the virtually non-existent testing of the assumptions required for the proper applicability of alpha. Data unavailability prevented the provision of summarized reliability estimates in terms of temporal stability. *Discussion:* These findings highlight the need to improve reliability reporting of the scores of self-reported instruments of PE in primary studies. This implies providing both prior justification for the appropriateness of the index employed and reliability data for all the subpopulation of interest. The values presented could be used as a reference both for comparisons with those obtained in future primary studies and for correcting measurement-related artefacts in quantitative meta-analytic research concerning PE.

Keywords: internal consistency; alpha; psychometric properties; morbid exercise; exercise dependence

Introduction

Promotion of regular physical activity has been proposed as a comprehensive and valid strategy to reduce cardiovascular risk (Ding et al., 2016). One of the domains in which physical activity is more frequently undertaken is leisure time, in particular, throughout recreational participation in sports activities or by engaging in exercise conditioning/training (Bull et al., 2020). However, a small proportion of the population may develop a potentially dysfunctional pattern of exercise behaviour (Marques et al., 2019). This is a complex and multifaceted phenomenon that, irrespective of the different umbrella terms used to refer to it (e.g., problematic exercise; Scharmer et al., 2020; or morbid exercise behaviour; Szabo et al., 2018) implies losing control over exercise behaviour to the point of experiencing harm at a physical level (e.g., injuries or immune problems), psychological level (e.g., altered mood states or inability to concentrate), or social level (e.g., loss of social relationships or job) (Juwono & Szabo, 2020; Szabo et al., 2018).

Existing research on the phenomenon – hereafter referred to as 'problematic exercise' (PE) – has been mainly approached using quantitative techniques and, more specifically, self-report instruments (Marques et al., 2019; Szabo et al., 2015). To date, much research has been devoted to examining the psychometric properties of scores obtained from translations of the original English versions of such instruments in non-English speaking countries from Europe (Mónok et al., 2012; Sauchelli et al., 2016; Sicilia et al., 2013; Zeeck et al., 2017), South America (Alchieri et al., 2015; Sicilia et al., 2017), and Asia (Li et al., 2016; Shin & You, 2015). However, much less effort has been spent on examining the psychometric properties of these PE scores among specific populations (e.g., in terms of their clinical condition [Formby et al., 2014] or the exercise modality practised [Lichtenstein & Jensen, 2016]), as well as whether these properties can be generalized across different countries or languages (Griffiths et al., 2015). This is an important limitation in the case of a psychometric property that, such as reliability (i.e., measurement precision), is highly dependent on both the test application conditions and the characteristics of the sample under consideration (Slaney, 2017). A main practical implication of the extant literature concerns cross-group comparisons, because unequal reliability between groups can lead to wrong conclusions when comparing their respective scores (Graham & Unterschute, 2015). This is a matter of relevance in PE research because sample characteristics (e.g., exercise modality practised or being at-risk of an eating disorder) are frequently used for comparison purposes (Di Lodovico et al., 2019; Trott et al., 2020). Having a comprehensive understanding of the effect of the sample and application characteristics on the score reliability of self-report instruments assessing PE is likely to contribute to advancing the science in this field. For example, this knowledge may assist practitioners and researchers in choosing an assessment tool capable of producing reliable scores across a range of circumstances. However, there is no summarized evidence on the reliability of scores derived from self-report instruments assessing PE across populations and application conditions.

Reliability Generalization (RG) meta-analysis provides cumulative evidence on elements contributing to the variability of test score reliability across studies (Vacha-Haase et al., 2000, 2002). Despite many reliability indices being available (Cho, 2016), it is often the case that RG meta-analysis only presents information concerning Cronbach´s alpha coefficients (e.g., Graham & Unterschute, 2015; Vicent et al., 2019). This is due to an overwhelming use of alpha in primary studies (Hoekstra et al., 2019). However, it has been suggested that this prevalent use of alpha is more due to compliance reasons such as it being perceived as a common and required practice (Hoekstra et al., 2019) rather than to its superiority over other reliability indexes or, as it would be methodologically sound, its adequacy according to the nature of the data (Cho, 2016). Indeed, the fact that alpha functions as an unbiased reliability estimator is dependent on the fulfilment of three main assumptions: (i) the unidimensionality of the test, (ii) the equality of the factor loadings of the items (i.e., tau-equivalence; if not met, alpha will underestimate reliability), and (iii) the independency of the error terms of the items (if not met, alpha will overestimate reliability) (Cho & Kim, 2015).

Based on these considerations, it follows that providing evidence on whether reported alpha values have been obtained after testing the assumptions required for the unbiased use of such a coefficient may be of interest from the perspective of RG meta-analysis. Similar ways of proceeding are common in RG meta-analysis (e.g., Graham & Unterschute, 2015; Vicent et al., 2019) with regard to another questionable reporting practice that may also influence the scope of the results, namely, *reliability induction* (i.e., the fact of not reporting reliability estimates for the data at hand; Vacha-Haase et al., 2000). Moreover, almost no attention has been paid to date in RG meta-analysis to alpha reporting practices in terms of their application assumptions (Vacha-Haase & Thompson, 2011). In view of these considerations, it is reasonable to suggest that examining both the rate of reliability induction and the extent to which the assumptions underlying the unbiased performance of alpha may lead to a more accurate and comprehensive interpretation of the results provided in RG meta-analysis.

Within this context, the present RG meta-analysis addresses three objectives concerning several widely used instruments proposed in the self-reported assessment of PE. More specifically, these are to (i) estimate the average reliability of the test scores under consideration; (ii) examine the sociodemographic and methodological characteristics that may affect the reliability estimates of the test scores of interest; and (iii) examine the reliability reporting practices of studies employing these instruments. The latter will be done (a) by examining the reliability induction rates; and (b) in view of the very likely possibility that alpha will be the most frequently reported index (Cho, 2016), by examining the extent to which the assumptions for unbiased estimates of such coefficient are tested and met.

Method

The systematic review and meta-analysis was conducted in accordance with the checklist from Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) (Moher et al., 2009) and was registered on PROSPERO (CRD42021237100) (see Appendix A).

Locating studies

Electronic bibliographic databases MEDLINE, PsycINFO, Web of Science, Current Contents Connect, SciELO, and Dissertations & Theses Global were searched for eligible studies from inception to January 30, 2020 (see Appendix B for the full search strategy). No geographical or cultural restrictions were applied. Reference lists of all retrieved studies were hand-searched to identify further potentially eligible studies.

The references of the retrieved studies were managed in EndnoteX9. Studies were independently selected by two of the authors in two stages by examining (a) their titles and abstracts, and (b) their full-texts. Disagreements were discussed and resolved on a consensual basis with the assistance of a third author if needed.

Eligibility criteria

The review collated data from studies employing the most widely used self-report instruments for the assessment of symptoms of PE (i.e., exercising to the point of losing the control over such a behaviour, so that it may leads to physical, psychological, or social damage; Szabo et al., 2018). According to the findings from previous reviews conducted in the field of PE (e.g., Alcaraz-Ibáñez et al., 2020, 2021), the following six key instruments were considered eligible: *Commitment to Exercise Scale* (CES), that assesses the extent to which (i) individuals' well-being are influenced by exercising, (ii) adherence to exercise is maintained in the face of adverse conditions, and (iii) exercise regimen interferes with social commitments (Davis et al., 1993); *Compulsive Exercise Test* (CET), which assesses the primary factors operating in the maintenance of excessive exercise within the eating disorders domain (Taranis et al., 2011);

Exercise Addiction Inventory (EAI), which assesses six common criteria proposed for behavioural addictions (Terry et al., 2004); *Exercise Dependence Questionnaire* (EDQ), which assesses elements employed in traditional models of addiction and both psychologically-related and socially-related consequences of exercise behaviour (Ogden et al., 1997); *Exercise Dependence Scale* (EDS-21), which assesses seven criteria adapted from substance abuse defined in the *Diagnostic and Statistical Manual for Mental Disorders* (American Psychiatric Association, 1994) applied to the exercise domain (Downs et al., 2004); and *Obligatory Exercise Questionnaire* (OEQ), which assesses the subjective need to engage in repetitive exercise behaviours (Pasman & Thompson, 1988). The eligibility of these instruments was also supported by the findings derived from a search on *Google Scholar* performed by the present authors for all the 17 measures previously identified within the field (Sicilia et al., 2020). In particular, these instruments were shown to be the ones with the highest number of citations (see Appendix C).

Inclusion criteria

Studies were considered eligible if the following criteria were met: (a) at least one of the following six self-report instrument of PE was used: CES, CET, EAI, EDQ, EDS-21, OEQ; (b) they were written in English, Spanish, French, or Portuguese (the working languages of the review team); and (c) some estimate of reliability was provided (e.g., Cronbach's alpha [α], intra-class correlation index [ICC], or Pearson's correlation index [r]).

Exclusion criteria

Studies were excluded on the basis of the following criteria: (a) only composite scores comprising two or more instruments assessing PE were provided so that individual scores were not available; (b) specific items were excluded when obtaining global scores of PE and sub-domains scores were not available; (c) specific items were excluded when obtaining sub-scale scores of PE; (d) the scores of PE were obtained using a partially/completely altered factorial structure from the one originally proposed for the instrument; and (e) studies with less than 30 participants. The first four exclusion criteria were implemented with the aim of fulfilling one of the main assumptions of meta-analytic research (i.e., the application of a similar statistical configuration) (Lipsey & Wilson, 2001). The final exclusion criterion was implemented on the basis of the increased sampling error and variations in the assessment of heterogeneity likely introduced by studies with small sample sizes (Lin, 2018).

Coding procedure

A coding frame was developed taking into account the common features of the studies retrieved in a preliminary search. After being pilot-tested, the coding sheet was used by two of the present authors when extracting the relevant data from the retrieved studies (see Appendix D). Disagreements between the reviewers were discussed and resolved on a consensual basis with the assistance of a third author if necessary. The following coding categories were considered: (i) citation and year of publication; (ii) sample size; (iii) exercise modality; (iv) eating disorders (EDs); (v) report of leisure time exercise; (vi) regular exercisers; (vii) region (geographic location); (viii) test version; (ix) type of survey; (x) publication status; (xi) study design; (xii) mean and standard deviation (*SD*) of test scores; (xiii) mean and *SD* of age; (xiv) % of Whites; (xv) % of females; and (xvi) PE measure. These coded features were considered for descriptive purposes and – where appropriate – as potential moderator variables (Rosenthal, 1995).

Statistical analysis

Effect size calculations

Cronbach´s alpha (α) was employed as the effect size index. In order to normalize their distributions and stabilize their variances, the reliability coefficients were (α)-to-($\bar{\alpha}$) transformed by applying the formula proposed by Bonett (2002) before conducting the statistical analyses. In the interest of facilitating interpretation of the results, effect sizes and their 95% confidence intervals (CIs) were subsequently ($\bar{\alpha}$)-to-(α) transformed (Sánchez-Meca et al., 2013).

Due to the expected heterogeneity between studies in terms of participants' characteristics, and assuming that variations in the distribution and sampling errors of effect sizes may contribute to explain differences between them, the pooled effect sizes were computed using a random-effect model using an estimation method robust to the normality (i.e., restricted maximum likelihood, REML) (Pigott, 2012). The I^2 statistic was used to assess statistical heterogeneity, with values of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively (Higgins, Thompson, Deeks, & Altman, 2003). The robustness of the summarized estimates was examined through sensitivity analyses (i.e., by conducting systematic reanalysis while removing studies one at a time). Results from sensitivity analyses (see Appendix E) were considered meaningful when corrected estimates were beyond the 95% CI of the original ones.

Consistent with previous RG meta-analyses (Rubio-Aparicio, Badenes-Ribera, Sánchez-Meca, Fabris, & Longobardi, 2020), moderator analyses for categorical and continuous variables were conducted provided that at least 15 effect sizes were available. Meta-regression analyses employed for testing moderator variables were conducted in two stages. Firstly, by employing univariable models (i.e., considering each potential moderator in isolation). Secondly, by employing multivariable models in which all significant moderators identified in the first stage were simultaneously introduced. For a better control of Type I error rate, meta-regressions were conducted using the method proposed by Knapp and Hartung (2003). Given constraints due to available sample size, non-significant categorical predictors were sequentially dropped from the full starting multivariable models in order to obtain the most parsimonious and accurate representation of the data. The tenability of the reduced vs. the full model was judged through a likelihood ratio test (LRT). Explained variance by the moderators was quantified as a percentage and expressed by R^2. Provided that at least 10 effect sizes were available (Page et al., 2019), publication bias was examined by visual inspection of funnel plot symmetry, Egger´s test, and the 'trim and fill' procedure (See Appendix F). The tatistical analyses described in this section were conducted in R using the *metafor* package.

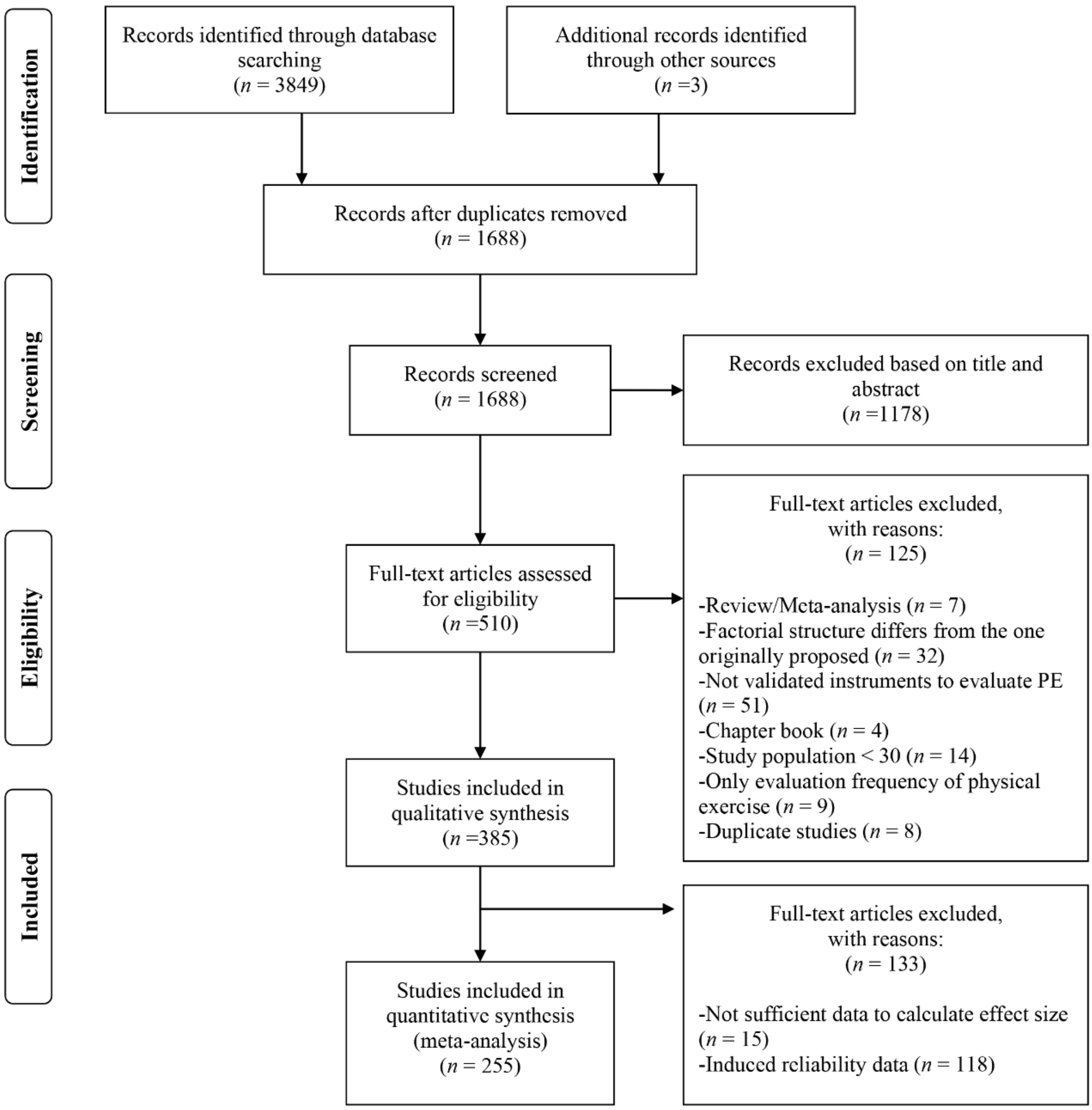

Figure 3.1. PRISMA-based flow diagram of study selection

Results

Selection of studies

A total of 3852 studies were identified from multiple database searches. The study selection procedure was conducted in two stages. Firstly, the eligibility criteria were applied to the studies considered for full text assessment (see Figure 3.1). Secondly, the report of reliability indices was examined. Despite the intention of including data on temporal stability (e.g., Pearson's correlation), the number of studies reporting this information was too low to meta-analytical techniques to be applied (i.e., EAI, Griffiths et al., 2005; Li et al., 2016; EDQ, Kern & Baudin, 2011; EDS-21, Downs et al., 2004; Kern, 2007). As a result of this process, 255 studies that reported reliability in terms of alpha coefficient were included in the RG meta-analysis. The study characteristics and their corresponding effect sizes were grouped according to PE measures. Consequently, 741 effect sizes from 255 studies (*N*= 254,174) were examined in 27 different meta-analyses (see Table 3.1).

Table 3.1
Alpha estimates for the scores of instruments assessing problematic exercise

Measure (Subscale)	Items	Range	Original α	Meta-analysis report					
				k	$\bar{\alpha}$	95% CI		Q	I^2
						Lo	Up		
CES-Likert	8	1-10	N.R.	10	.872	.853	.889	47.856	81.29
CES-VAS	8	0-155	.770	30	.842	.816	.864	401.834	93.60
CET	24	0-5	.850, .830	48	.880	.868	.891	450.903	92.99
CET (Avoidance)	8	0-5	.880, .880	27	.907	.888	.923	601.459	95.98
CET (Weight control)	5	0-5	.860, .850	21	.817	.787	.842	175.464	90.72
CET (Mood improvement)	5	0-5	.750, .720	20	.801	.779	.836	187.271	90.71
CET (Lack of enjoyment)	3	0-5	.840, .820	18	.777	.739	.810	155.376	88.08
CET (Rigidity)	3	0-5	.730, .820	23	.771	.748	.793	92.048	76.36
EAI	6	1-5	.840	42	.768	.739	.794	2258.405	97.27
EDQ	29	1-7	.843	12	.862	.842	.879	70.101	84.26
EDQ (Interference)	5	1-7	.814	7	.743	.676	.795	49.772	86.57
EDQ (Positive reward)	4	1-7	.795	6	.789	.688	.857	75.291	94.89
EDQ (Withdrawal)	4	1-7	.799	7	.772	.719	.815	35.498	82.67
EDQ (Weight control)	4	1-7	.781	6	.721	.670	.764	18.925	71.44
EDQ (Insight into problem)	4	1-7	.756	6	.690	.625	.744	24.952	78.19
EDQ (Social reasons)	3	1-7	.755	6	.615	.489	.710	53.587	88.86
EDQ (Health reasons)	3	1-7	.701	6	.774	.692	.834	56.772	90.64
EDQ (Stereotyped behaviour)	2	1-7	.516	6	.670	.561	.736	25.358	81.63
EDS-21	21	1-6	N.R.	90	.930	.923	.937	3906.857	97.76
EDS-21 (Tolerance)	3	1-6	.780, .780	43	.857	.840	.872	673.810	93.94
EDS-21 (Withdrawal)	3	1-6	.930, .900	42	.828	.809	.845	603.767	92.86
EDS-21 (Intention effects)	3	1-6	.920, .890	43	.881	.865	.895	906.013	95.48
EDS-21 (Lack of control)	3	1-6	.820, .820	44	.823	.803	.841	691.373	93.80
EDS-21 (Time)	3	1-6	.880, .860	43	.848	.833	.862	549.977	91.82
EDS-21 (Reduction in other activities)	3	1-6	.670, .750	53	.704	.675	.730	692.150	92.53
EDS-21 (Continuance)	3	1-6	.890, .900	43	.834	.816	.851	611.499	93.26
OEQ 20	20	1-4	.960	38	.870	.853	.885	556.527	94.43

Note. α = alpha value(s) reported in the original validation studies; $\bar{\alpha}$ = Estimated effect size (corrected coefficient alpha); CI= Confidence interval; Lo= Lower; Up= Upper; N.R. = non-reported; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire

Commitment to Exercise Scale

Two different response procedures were employed in the retrieved studies using the CES (i.e., Likert scales or visual analogue scales [VAS]). Given that the homogeneity of statistical configuration across studies is one of the main underlying assumptions of meta-analysis (Lipsey & Wilson, 2001), the scores of the CES (Likert) and CES (VAS) were examined independently.

Commitment to Exercise Scale using Likert scales. The analysis examining alpha estimates for the global score on the CES-Likert (see Forest plot in Appendix G) included 10 effect sizes from nine studies involving a total (N_{total}) of 2,891 participants. Results from the random effects model showed a pooled alpha estimate of .872 (p<.001; 95%CI=.853 to .889, I^2=81.29). Since the number of effect sizes retrieved was <15, moderation analyses were not conducted.

Commitment to Exercise Scale using visual analogue scales. The analysis examining alpha estimates for the global score on the CES-VAS (see Forest plot in Appendix G) included 30 effect sizes from 23 studies (N_{total} = 6,529). Results from the random effects model showed a pooled alpha estimate of .842 (p<.001; 95%CI=.816 to .864, I^2=93.60). Results from the univariate meta-regression analysis for categorical variables (see Table 3.2) identified the following significant moderators: (a) eating disorders (omnibus-test [2, 27]=7.451; p=.003; R^2=33.59); (b) report of leisure time exercise (omnibus-test [1, 28]=6.096; p=.020; R^2=16.93); (c) region (omnibus-test [4, 25]=3.850; p=.014; R^2=28.21); (d) test version (omnibus-test [1, 28]=5.621; p=.025; R^2=13.48); and (e) type of survey (omnibus-test [3, 26]=3.990; p=.018; R^2=25.87). Results from the univariate meta-regression analysis for continuous variables (see Table 3.3) did not identify any significant moderator. Results from the multivariate meta-regression analysis showed that eating disorders, report of leisure time exercise, test version, and type of survey explained together 68.73% of variance in pooled alpha estimate (see Table 3.4).

Compulsive Exercise Test

The analysis examining the alpha estimates for the global score on the CET (see Forest plot in Appendix G) included 48 effect sizes from 42 studies (N_{total}=14,675). Results from the random effects model showed a pooled alpha estimate of .880 (p<.001; 95%CI=.868 to .891, I^2=92.99). Results from the univariate meta-regression analysis for continuous categorical variables (see Table 3.2) identified the following significant moderators: (a) eating disorders (omnibus-test [4, 43]=8.737; p<.001; R^2=43.48); (b) regular exercisers (omnibus-test [1, 46] =6.482; p=.014; R^2=11.63); and (c) study design (omnibus-test [1, 46]=4.723; p=.035; R^2=7.47). Results from the univariate meta-regression analysis for continuous variables (see Table 3.3) did not identify any significant moderators. Results from the multivariate meta-regression analysis showed that eating disorders and regular exercisers together explained 57.55% of variance in pooled alpha estimate (see Table 3.4).

Compulsive Exercise Test subscales. The analysis examining the alpha estimates for the subscale scores on the CET (see Forest plot in Appendix G) included 109 effect sizes. Considering the different subscales, the effect sizes available ranged from 18 (lack of exercise enjoyment, N_{total}=4,302) to 27 (avoidance, N_{total}=6,888). Findings from the random effects model showed pooled alpha estimates ranging from .771 (exercise rigidity; p<.001; 95%CI=.748 to .793, I^2=76.36) to .907 (avoidance; p<.001; 95%CI=.888 to .923, I^2=95.98). Results from the univariate meta-regression analysis for categorical variables (see Table 3.5) identified the following significant moderators: (a) avoidance: exercise modality (omnibus-test [3, 23] =3.222, p=.041, R^2=20.10), eating disorders (omnibus-test [2, 24]=33.606, $p<.001$, R^2=75.04), report of leisure time exercise (omnibus-test [1, 25]=5.833, p=.023, R^2=16.40), regular exercisers (omnibus-test [1, 25]=5.429, p=.028, R^2=14.24), and test version (omnibus-test [1, 25]=5.455, p=.028, R^2=16.21); (b) weight control: (type of survey, omnibus-test [2, 18]=5.322, p=.015, R^2=35.20); and (c) exercise rigidity: region (omnibus-test [4, 18]=4.535, p=.010, R^2=41.51), and study design (omnibus-test [1, 21]=5.334, p=.031, R^2=17.36). The results of the univariate meta-regression analysis for continuous variables (see Table 3.6) identified the following significant moderators: (a) mean of test score (avoidance and mood improvement); (b) age (avoidance); (c) *SD* of age (avoidance and mood improvement); (d) year of publication (avoidance and weight control; and percentage of females (weight control and exercise rigidity). However, the results of the multivariate meta-regression analysis (see Table 3.7) supported the moderating role of the variables under examination just for the following cases: (a) eating disorders and *SD* of test score (avoidance); (b) percentage of females and year of publication (weight control); (c) *SD* of test score and *SD* of age (mood improvement); and (d) region and percentage of females (exercise rigidity). The amount of variance in pooled alpha estimates explained by the retained models in the multivariate meta-regression analyses ranged from 63.26% (weight control) to 86.08% (avoidance).

Exercise Addiction Inventory

The retrieved studies included multiple versions of the EAI. Since only one study reported alpha scores for the EAI-R (Szabo et al., 2019) (α=.90), this was excluded from the analyses. The analysis examining the alpha estimates for the global score on the EAI (see Forest plot in Appendix G) included 42 effect sizes from 40 studies (N_{total}=26,565). Results from the random effects model showed a pooled alpha estimate of .768 (p<.001; 95%CI=.739 to .810, I^2=97.27). Results from the univariate meta-regression analysis for categorical variables (see Table 3.2) identified the following significant moderators: (a) region (omnibus-test [5, 36]=5.182; p=.001; R^2=35.78); (b) test version (omnibus-test [1, 40]=4.264; p=.046; R^2=7.46); and (c) publication status (omnibus-test [1, 40]=4.720; p=.036; R^2=8.50). Results from the univariate meta-regression analysis for continuous variables (see Table 3.3) identified the mean of test score as a significant moderator. Results from the multivariate meta-regression analysis (see Table 3.4) showed that region, test version, and mean of test score together explained 59.22% of variance in pooled alpha estimate.

Exercise Dependence Questionnaire

The analysis examining the alpha estimates for the global score on the EDQ (see Forest plot in Appendix G) included 12 effect sizes from 11 studies (N_{total}=2,961). Results from the random effects model showed a pooled alpha estimate of .862 (p<.001; 95%CI=.842 to .879, I^2=84.26). Since the number of effect sizes available was <15, moderation analyses were not performed.

Exercise Dependence Questionnaire subscales. The analyses examining the alpha estimates for the subscale scores on the EDQ (see Forest plot in Appendix G) included 50 single alpha scores. The effect sizes available ranged from six (positive reward, N_{total}=1,405) to seven (interference, N_{total}=1,498). Findings from the random effects model showed pooled alpha estimates ranging from .615 (social reasons; p<.001; 95%CI=.489 to .710, I^2=88.86) to .789 (positive reward; p<.001; 95%CI=.688 to .857, I^2=94.89). Since the number of effect sizes available was <15, moderation analyses were not performed.

Exercise Dependence Scale-21

The analysis examining the reliability estimates for the global score on the EDS-21 (see Forest plot in Appendix G) included 90 effect sizes from 84 studies (N_{total} = 35,918). Results from the random effects model showed a pooled alpha estimate of .930 (p<.001; 95% CI=.923 to .937, I^2=97.96). Results from the univariate meta-regression analysis for categorical variables (see Table 3.2) identified both exercise modality (omnibus-test [6, 83]= 4.100; p=.001; R^2=18.00) and test version (omnibus-test [1, 88]=5.930; p=.017; R^2=5.24) as significant moderators. Results from the univariate meta-regression analysis for continuous variables (see Table 3.3) identified both mean test score and *SD* of test score as significant moderators. Results from the multivariate meta-regression analysis showed that exercise modality, test version, and mean test score and *SD* of these scores together explained 38.02% of variance in pooled alpha estimates (see Table 3.4).

Exercise Dependence Scale-21 subscales. The analyses examining the reliability estimates for the subscale scores on the EDS-21 (see Forest plot in Appendix G) included a total of 311 effect sizes. The effect sizes available ranged from 42 (withdrawal, N_{total}=15,457) to 53 (reduction in other activities, N_{total}=18,755). Findings from the random effects model showed pooled alpha estimates ranging from .704 (reduction in other activities; p<.001; 95%CI=.675 to .730, I^2=92.53) to .881 (intention effects; p<.001; 95%CI=.865 to .895, I^2=95.48). Results from the univariate meta-regression analysis for categorical variables (see Table 3.8) identified the following significant moderators: (a) tolerance: region (omnibus-test [5, 37]=4.528, p=.003, R^2=31.52), test version (omnibus-test [1, 41]=6.763, p=.013, R^2=13.49), and publication status (omnibus-test [1, 41] =4.440, p=.041, R^2=8.69); (b) withdrawal: region (omnibus-test [5, 36]=10.317, p<.001, R^2=61.22), and test version (omnibus-test [1, 40]=18.992, p<.001, R^2=34.95); (c) intention: report of leisure time (omnibus-test [1, 41]=4.465, p=.041, R^2 = 7.92), regular exercisers (omnibus-test [1, 41]=5.434, p=.025, R^2=10.36), region (omnibus-test [5, 37] =10.661, p<.001, R^2=55.86), test version (omnibus-test [1, 41]=28.574, p<.001, R^2=42.29), and publication status (omnibus-test [1, 41]=8.651, p=.005, R^2=16.05); (d) lack of control: region (omnibus-test [5, 37]=10.661, p<.001, R^2=54.87), test version (omnibus-test [1, 42] =28.574, p<.001, R^2=42.99), publication status (omnibus-test [1, 42]=4.475, p=.040, R^2=8.40), and study design (omnibus-test [1, 42]=5.792, p=.021, R^2=9.99); (e) time: region (omnibus-test [5, 37]=5.849, p<.001, R^2=41.55), and test version (omnibus-test [1, 41]=7.396, p=.010, R^2=15.06); (f) continuance: region (omnibus-test [5, 37]=6.759, p<.001, R^2=45.41), and test version (omnibus-test [1, 41]=7.716, p=.008, R^2=15.95). The results of the univariate meta-regression analysis for continuous variables (see

Table 3.9) identified of the following significant moderators: (a) test mean score (lack of control); (b) *SD* of test score (tolerance); and (c) percentage of females (tolerance, intention effects, lack of control, time, and continuance). The results of the multivariate meta-regression analysis (see Table 3.10) supported the moderating role of the following variables: (a) *SD* of test scores and percentage of females, (tolerance); (b) region and percentage of females (intention effects); (c) region and percentage of females (lack of control); (d) test version and percentage of females (Time); and (e) region, test version, and percentage of females (continuance). The amount of variance in pooled alpha estimates explained by the retained models the multivariate meta-regression analyses ranged from 27.97% (tolerance) to 67.73% (intention effects).

Obligatory Exercise Questionnaire

The analysis examining the reliability estimates for the global score on the OEQ (see Forest plot in Appendix G) included 38 effect sizes from 33 primary studies (N_{total}=10,548). Results from the random effects model showed a pooled alpha estimate of .870 (p<.001; 95%CI=.853 to .885, I^2=84.43). Results from the univariate meta-regression analysis for categorical variables (see Table 3.2) identified both exercise modality (omnibus test [3, 34] =9.568; p<.001; R^2=43.48) and (b) regular exercisers (omnibus-test [1, 36]=10.087; p=.003; R^2=22.55) as significant moderators. Results from the univariate meta-regression analysis for continuous variables (see Table 3.3) did not identify any significant moderators. Results from the multivariate meta-regression analysis showed that exercise modality and regular exercisers together explained 68.55% of variance in pooled alpha estimates (see Table 3.4).

Reliability reporting practices

A total of 118 studies reported induced reliability (e.g., based on other studies), eleven studies reported unusable reliability indices (i.e., reliability ranges), and eight studies did not report alpha or Pearson's correlation but other reliability indices (i.e., ω, Meule et al., 2020; ρ, Alcaraz-Ibáñez et al., 2018; Sicilia et al., 2018; *ave*, Egan et al., 2017; or *ICC*, Parastatidou et al., 2012; Sicilia et al., 2013, 2017; Sicilia & González-Cutre, 2011). A global reliability induction rate of 47.58% was found. This ranged from 18.64% to 57.14% in the case of the global scores and from 14.93% to 66.67% in the case of subscale scores (see Table 3.11).

Concerning the assumptions required for the unbiased performance of alpha, the first one (i.e., the unidimensionality of the test) was in no case used as an argument to justify the employment of alpha against other reliability indices. Despite the theoretically multidimensional nature of three of the instruments under consideration (CET, EDQ, EDS-21), alpha was frequently used as the reliability index of their global scores (see Table 3.1). The second assumption (the equality of the factor loadings of the items) was not examined in any of the retrieved studies. The third assumption (i.e., the independency of the error terms), was found to be tested just in the context of improving model fit (e.g.; Zeeck et al., 2017) but in no case to justify the use of alpha or to comment on the implications of using it in such circumstances.

Table 3.2

Results of univariable meta-regression analyses for categorical variables (global scores)

Subgroups	CES-VAS					CET					EAI					EDS-21					OEQ				
			95% CI					95% CI					95% CI					95% CI					95% CI		
	K	$\bar{\alpha}$	Lo	Up	I^2	*K*	$\bar{\alpha}$	Lo	Up	I^2	*K*	$\bar{\alpha}$	Lo	Up	I^2	*K*	$\bar{\alpha}$	Lo	Up	I^2	*K*	$\bar{\alpha}$	Lo	Up	I^2
Exercise modality																									
Unknown (RC)	19	.843	.805	.874	95.23	38	.887	.876	.897	92.07	16	.783	.740	.819	97.46	39	.946	.937	.953	96.57	25	.867	.849	.883	90.02
Unclear	2	.800	.746	.842	71.77	8	.843	.790	.883	90.36	8	.769	.710	.815	94.69	18	.920	.896	.939	98.60	6	.863	.829	.890	89.39
Power disciplines	-	-	-	-	-	-	-	-	-	-	2	.733	.705	.759	0.00	3	.918	.889	.939	76.70	-	-	-	-	-
Non-endurance	1	.770	.642	.852	-	1	.850	.805	.885	-	2	.708	.523	.821	85.27	4	.917	.838	.957	98.09	-	-	-	-	-
Multiple sports	7	.871	.860	.855	13.50	-	-	-	-	-	6	.796	.647	.882	98.49	9	.925	.903	.941	95.89	2	.954	.943	.962	34.26
Fitness and health	1	.770	.726	.807	-	-	-	-	-	-	4	.720	.661	.770	92.09	7	.924	.903	.942	95.89	-	-	-	-	-
Endurance	-	-	-	-	-	1	.850	.822	.874	-	4	.764	.581	.867	96.99	10	.913	.899	.925	93.52	5	.837	.805	.864	89.47
Eating disorders																									
Unknown (RC)	23	.824	.799	.846	90.69	32	.863	.850	.875	91.31	39	.770	.739	.798	97.35	69	.930	.921	.938	.97.90	37	.869	.852	.884	94.61
At-risk	-	-	-	-	-	2	.874	.801	.921	91.04	-	-	-	-	-	4	.963	.945	.974	78.37	-	-	-	-	-
Not at-risk	-	-	-	-	-	1	.900	.861	.928	-	-	-	-	-	-	5	.917	.894	.934	84.06	-	-	-	-	-
Mixed	6	.857	.827	.911	90.33	3	.902	.853	.934	84.62	3	.745	.695	.785	80.49	11	.922	.896	.942	98.00	1	.900	.863	.927	-
Clinical	1	.950	.930	.964	-	10	.927	.920	.934	0.01	-	-	-	-	-	1	.930	.913	.944	-	-	-	-	-	-
Report of LTE																									
No (RC)	13	.808	.766	.842	92.11	31	.887	.875	.899	92.81	20	.786	.740	.824	98.06	42	.931	.920	.941	98.30	23	.868	.849	.884	90.84
Yes	17	.864	.836	.887	92.50	17	.864	.839	.885	90.77	22	.751	.714	.782	95.19	48	.929	.919	.939	96.95	15	.873	.839	.900	96.96
Regular exercisers																									
Unknown (RC)	21	.838	.803	.867	95.06	40	.886	.874	.896	92.08	28	.784	.751	.813	97.57	55	.934	.925	.942	97.93	10	.883	.866	.898	93.10
Yes	9	.851	.821	.877	83.40	8	.842	.792	.881	89.36	13	.729	.673	.775	94.91	34	.922	.909	.934	97.24	28	.827	.800	.850	88.61
Region																									
Unknown (RC)	2	.815	.719	.878	88.12	7	.905	.872	.929	92.18	8	.790	.756	.819	90.96	16	.941	.928	.951	94.85	13	.891	.863	.914	94.59
South America	18	.820	.789	.847	91.29	-	-	-	-	-	2	.640	.527	.726	82.69	4	.880	.856	.900	75.04	-	-	-	-	-
Oceania	-	-	-	-	-	7	.890	.861	.913	84.45	2	.704	.649	.750	0.00	1	.930	.911	.945	-	7	.854	.804	.892	94.19
North America	7	.875	.832	.907	90.63	12	.864	.841	.884	87.56	5	.837	.795	.871	87.39	29	.938	.927	.947	97.52	15	.858	.833	.879	93.31
Mixed	1	.950	.930	.964	-	4	.890	.795	.941	93.92	-	-	-	-	-	4	.938	.889	.965	98.47	-	-	-	-	-
Europe	2	.834	.803	.862	67.28	18	.875	.861	.887	89.97	24	.745	.706	.779	96.82	34	.920	.905	.932	97.69	3	.855	.787	.901	85.50
Asia	-	-	-	-	-	-	-	-	-	-	1	.920	.914	.926	-	2	.942	.525	.993	99.67	-	-	-	-	-

Test version																									
Original (RC)	11	.874	.834	.904	93.81	44	.877	.865	.888	92.89	21	.795	.765	.821	95.19	58	.936	.928	.944	97.38	38	.870	.853	.855	94.43
Linguistically adapted	19	.820	.791	.846	81.28	4	.905	.857	.937	85.16	21	.739	.687	.782	97.73	32	.918	.902	.930	97.96	-	-	-	-	-
Type of survey																									
Unknown (RC)	15	.871	.844	.893	91.89	36	.884	.871	.896	92.54	25	.786	.751	.816	97.45	46	.929	.919	.938	97.18	24	.863	.848	.878	90.19
Paper-pencil	2	.708	.592	.791	55.12	9	.878	.859	.895	54.25	5	.727	.634	.796	96.08	26	.928	.914	.940	97.66	8	.867	.822	.901	94.57
On-line	12	.820	.780	.852	91.66	3	.861	.822	.893	94.61	11	.748	.676	.803	96.12	16	.930	.905	.948	98.26	4	.881	.788	.933	96.45
Both	1	.770	.714	.815	-	-	-	-	-	-	1	.710	.669	.746	-	2	.968	.923	.987	97.81	2	.920	.687	.979	98.31
Publication status																									
Published (RC)	24	.830	.800	.855	93.76	41	.881	.868	.893	94.10	38	.759	.728	.785	97.25	79	.931	.923	.938	97.95	30	.870	.849	.888	95.59
Unpublished	6	.882	.846	.910	85.65	7	.870	.849	.899	70.78	4	.843	.795	.879	89.55	11	.920	.896	939	94.01	8	.870	.848	.889	80.17
Study design																									
Psychometric (RC)	5	.859	.767	.914	96.57	8	.848	.797	.887	93.70	12	.784	.714	.837	97.74	9	.933	.902	.954	98.69	6	.878	.805	.924	96.13
Applied	25	.838	.811	.861	92.81	40	.885	.873	.895	91.62	30	.761	.730	.789	96.68	81	.930	.922	.937	97.60	32	.868	.852	.883	93.68

Note. $\bar{\alpha}$ = Corrected coefficient alpha; CI= Confidence interval; Lo= Lower; Up= Upper; RC= Reference category; LTE = Leisure time exercise; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire.

Table 3.3

Results of univariable meta-regression analyses for continuous variables (global scores)

Moderators	CES-VAS					CET					EAI					EDS-21					OEQ				
	K	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2
Mean of test score	29	.000	0.001	.971	0.00	40	-.025	0.998	.324	0.36	31	**-.250**	4.993	.033	13.08	68	**-.243**	4.895	.030	6.37	33	-.047	0.150	.701	0.00
SD of test score	29	-.001	0.004	.948	0.00	39	-.301	2.690	.109	5.34	31	.398	1.304	.263	2.18	66	**.618**	5.836	.019	6.88	33	-.166	0.402	.531	0.00
Mean age	26	.011	1.396	.249	1.41	43	-.008	0.785	.381	0.00	40	-.003	0.076	.785	0.00	78	-.001	0.012	.913	0.00	32	-.005	0.233	.633	0.00
SD age	26	.029	0.734	.400	0.00	42	.008	0.270	.606	0.00	37	.000	0.001	.982	0.00	76	-.007	0.189	.666	0.00	31	.004	0.034	.855	0.00
% of Whites	14	.001	0.138	.717	0.00	17	-.003	0.133	.720	0.00	7*	-.003	0.279	.620	0.00	38	-.003	2.379	.132	4.50	18	.003	0.155	.699	0.00
% of Females	30	.001	0.273	.605	0.00	47	.002	0.948	.336	0.00	40	.001	0.167	.685	0.00	89	.002	1.544	.217	0.44	34	-.001	0.156	.695	0.00
Year of publication	30	.002	0.040	.843	0.00	48	.027	3.821	.057	5.95	42	-.005	0.091	.765	0.00	90	.008	0.442	.508	0.00	38	-.012	1.688	.202	1.40

Note. β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test; RC = Reference category; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire. Statistically-significant effects ($p < .05$) appear highlighted in bold.

* Correspond to $K < 10$ and should therefore not be interpreted (Fu et al., 2011).

Table 3.4

Results of multivariable meta-regression analyses (global scores)

Moderators	K	β_0	β_1	SE	F	p	R^2
CES-VAS	30				51.844	<.001	68.73
		1.779	-	.117			
Eating disorders (Mixed)			**.281**	.133			
Eating disorders (Clinical)			**.931**	.298			
Report of LTE (Yes)			**.286**	.117			
Test version (linguistically adapted)			**-.268**	.125			
Type of survey (Paper-pencil)			**-.476**	.222			
Type of survey (Online)			.110	.142			
Type of survey (Both)			**-.595**	.267			
CET	48				49.917	<.001	57.55
		2.039	-	.043			
Eating disorders (At risk)			.041	.163			
Eating disorders (Not at risk)			.263	.264			
Eating disorders (Mixed)			.255	.147			
Eating disorders (Clinical)			**.564**	.093			
Regular exercisers (Yes)			**-.257**	.094			
EAI	31				38.281	<.001	59.22
		2.251	-	.282			
Region (South America)			**-.334**	.168			
Region (Oceania)			**-.337**	.166			
Region (North America)			.023	.145			
Region (Europe)			-.139	.102			
Test version (linguistically adapted)			**-.248**	.091			
Mean total score*			**-.223**	.094			
EDS-21	66				37.410	<.001	38.02
		2.938	-	.323			
Exercise modality (Unclear)			**-.380**	.137			
Exercise modality (Power disciplines)			-.437	.287			
Exercise modality (Non-endurance)			**-.684**	.247			
Exercise modality (Multiple sports)			**-.382**	.169			
Exercise modality (Fitness and health)			**-.645**	.214			
Exercise modality (Endurance)			**-.488**	.159			
Mean total score*			-.078	.106			
SD total score*			.203	.228			
OEQ	38				64.660	<.001	68.55
		2.096	-	.050			
Exercise modality (Unclear)			.156	.114			
Exercise modality (Multiple sports)			**.997**	.174			
Exercise modality (Endurance)			.295	.160			
Regular exercisers (Yes)			**-.463**	.124			
Publication status (Unpublished)			**-.197**	.093			

Note. β_0 = intercept/mean effect size; β_1 = estimated regression coefficient; R^2 = Explained variance; F = Omnibus test of moderators; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire; LTE = Leisure time exercise. The reference categories were: Unknown (Eating disorders, Exercise modality, and Region), Original version (Test version), and Published (Publication status). Statistically-significant effects (p < .05) appear highlighted in bold.

* Continuous moderator.

Table 3.5

Results of univariable meta-regression analyses for categorical variables (subscale scores of the Compulsive Exercise Test)

Subgroups	Avoidance					Weight control					Mood improvement					Lack of enjoyment					Exercise rigidity				
	K	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2
Exercise modality																									
Unknown (RC)	18	.922	.901	.938	96.19	12	.797	.748	.836	92.92	11	.830	.793	.860	91.25	11	.787	.727	.833	93.27	16	.764	.736	.789	77.44
Unclear	6	.857	.827	.880	68.90	6	.864	.846	.879	22.90	6	.796	.728	.846	85.18	6	.758	.731	.783	0.01	6	.800	.756	.836	62.75
Power disciplines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-endurance	1	.870	.831	.900	-	1	.750	.670	.810	-	1	.770	.697	.826	-	1	.770	.689	.830	-	1	.720	.621	.793	-
Multiple sports	2	.890	.843	.924	88.14	2	.818	.798	.936	0.00	2	.736	.670	.789	67.36	-	-	-	-	-	-	-	-	-	-
Fitness and health	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eating disorders																									
Unknown (RC)	15	.876	.856	.893	90.17	12	.818	.778	.851	92.22	12	.806	.775	.832	84.76	12	.770	.726	.807	88.23	15	.764	.732	.791	82.02
At risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not at risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed	4	.893	.864	.918	79.73	4	.808	.780	.833	36.92	3	.744	.695	.784	55.30	1	.770	.689	.830	-	1	.720	.621	.793	-
Clinical	8	.953	.947	.959	44.96	5	.828	.730	.890	91.46	5	.849	.769	.901	90.32	5	.800	.698	.867	87.42	7	.798	.767	.825	34.89
Report of LTE																									
No (RC)	16	.921	.900	.939	96.07	10	.809	.761	.847	91.37	9	.823	.770	.865	93.77	8	.781	.730	.838	88.71	13	.768	.739	.793	70.21
Yes	11	.880	.852	.903	91.86	11	.824	.784	.856	89.97	11	.796	.761	.826	83.04	10	.766	.714	.809	87.17	10	.778	.734	.814	82.07
Regular exercisers																									
Unknown (RC)	19	.919	.898	.935	96.59	13	.804	.769	.834	89.48	12	.822	.782	.855	93.01	11	.797	.747	.837	90.97	16	.766	.740	.790	74.34
Yes	8	.873	.844	.897	83.62	8	.834	.783	.873	89.44	8	.788	.738	.829	82.36	7	.741	.689	.785	69.09	7	.783	.730	.826	76.72
Region																									
Unknown (RC)	6	.935	.914	.951	88.06	3	.789	.734	.833	76.58	3	.827	.763	.874	87.53	3	.764	.596	.862	94.83	6	.755	.707	.795	64.68
South America	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oceania	5	.904	.864	.932	87.25	5	.869	.832	.898	66.02	5	.777	.723	.820	54.50	4	.776	.725	.817	15.30	4	.825	.788	.855	0.00
North America	2	.896	.819	.940	92.29	2	.774	.619	.866	85.93	1	.850	.816	.878	-	1	.770	.713	.816	-	1	.800	.750	.840	-
Mixed	2	.932	.879	.962	88.46	2	.858	.790	.904	76.18	2	.860	.838	.879	0.00	2	.785	.689	.851	68.86	2	.842	.814	.865	0.00
Europe	12	.887	.847	.917	97.50	9	.791	.743	.831	91.92	9	.800	.739	.847	95.18	8	.800	.708	.834	93.13	10	.746	.713	.777	75.82
Asia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test version																									

Original (RC)	23	.899	.878	.916	95.75	21	.817	.787	.842	90.72	20	.809	.779	.836	90.71	18	.777	.739	.810	88.08	19	.776	.750	.800	79.31
Linguistically adapted	4	.943	.920	.960	86.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	.748	.691	.795	49.57
Type of survey																									
Unknown (RC)	17	.914	.889	.934	97.04	17	.832	.807	.853	84.49	13	.809	.774	.840	87.15	11	.778	.727	.820	89.17	18	.769	.744	.791	68.54
Paper-pencil	5	.895	.840	.931	93.83	1	.620	.536	.689	-	3	.854	.728	.922	96.73	4	.770	.644	.852	94.86	3	.746	.593	.842	91.87
On-line	5	.892	.857	.918	85.85	3	.767	.678	.831	90.90	4	.778	.754	.800	17.01	3	.783	.735	.823	-	2	.807	.776	.834	19.73
Both	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Publication status																									
Published (RC)	23	.912	.891	.928	96.45	17	.816	.781	.846	92.43	16	.821	.787	.849	91.73	14	.766	.719	.805	89.12	19	.776	.750	.798	76.70
Unpublished	4	.873	.842	.898	69.71	4	.819	.766	.859	75.08	4	.761	.714	.800	50.14	4	.815	758	.859	74.17	4	.752	.673	.812	74.92
Study design																									
Psychometric (RC)	11	.904	.866	.931	97.23	10	.828	.791	.857	89.21	10	.817	.763	.858	94.15	8	.780	.726	.823	85.34	8	.802	.769	.831	70.24
Applied	16	.909	.887	.927	94.64	11	.806	.757	.846	91.20	10	.805	.770	.831	81.90	10	.775	.717	.822	89.44	15	.753	.724	.780	72.36

Note: $\bar{\alpha}$ = Corrected coefficient alpha. CI= Confidence interval; Lo= Lower; Up= Upper; RC = Reference category. LTE = Leisure time exercise.

Table 3.6

Results of univariable meta-regression analyses for continuous variables (subscale scores of the Compulsive Exercise Test)

Moderators	Avoidance					Weight control					Mood improvement					Lack of enjoyment					Exercise rigidity				
	K	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2
Mean total scores	20	.314	2.627	.122	8.29	18	-.200	3.473	.080	17.27	17	-.159	0.696	.417	0.00	15	-.118	1.345	.267	1.84	17	-.087	0.840	.374	0.00
SD total scores	20	**1.383**	41.712	<.001	70.92	18	-.454	0.739	.403	0.00	17	**1.912**	30.996	<.001	71.45	15	-.072	0.057	.814	0.00	17	.371	1.675	.215	2.51
Mean age	27	**.038**	4.748	.039	14.91	21	-.024	0.013	.081	8.75	20	.026	4.357	.051	14.75	18	.021	2.182	.159	7.12	23	.007	0.330	.572	0.00
SD age	27	**.071**	9.548	.005	27.69	21	-.029	1.851	.190	3.14	20	**.045**	4.916	.040	17.60	18	.033	1.930	.184	4.68	23	.006	0.140	.712	0.00
% of Whites	7*	-.002	0.062	.813	0.00	7*	.013	2.477	.176	23.21	6*	-.006	2.714	.175	32.78	6*	.002	0.078	.794	0.00	6*	-.006	2.188	.213	61.24
% of Females	27	.003	1.049	.316	0.12	21	**.006**	8.154	.010	29.83	20	.003	1.202	.287	2.56	18	.001	0.150	.703	0.00	23	**.004**	8.807	.007	38.16
Year of publication	27	**.071**	10.694	.003	28.75	21	**-.046**	6.218	.022	27.52	20	.026	1.599	.222	3.60	18	.001	0.001	.971	0.00	23	-.011	0.654	.428	0.00

Note. β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; Statistically-significant effects ($p< .05$) appear highlighted in bold.

* Correspond to *K*< 10 and should therefore not be interpreted (Fu et al., 2011).

Table 3.7

Results of multivariable meta-regression analyses (subscale scores of the Compulsive Exercise Test)

Moderators	K	β_0	β_1	SE	F	p	R^2
Avoidance	27				26.516	<.001	86.08
		1.300	-	.263			
Eating disorders (Mixed)			-.020	.132			
Eating disorders (Clinical)			**.615**	.182			
SD total score*			**.806**	.245			
Weight control	21				9.335	.002	63.26
		2.418	-	.436			
% of Females*			**.005**	.002			
Year of publication*			**-.042**	.015			
Mood improvement	20				20.014	<.001	81.45
		-.325	-	.340			
SD total score*			**1.777**	.321			
SD age*			.0264	.013			
Exercise rigidity	23				5.427	.004	73.70
		1.144	-	.132			
Region (Oceania)			**.289**	.135			
Region (North America)			.228	.172			
Region (Mixed)			**.407**	.139			
Region (Europe)			.030	.090			
% of Females*			**.003**	.001			

Note. β_0 = intercept/mean effect size; β_1 = estimated regression coefficient; R^2 = Explained variance; F = Omnibus test of moderators. Unknown was considered as the reference category both for Eating disorders and Region. Statistically-significant effects ($p < .05$) appear highlighted in bold.

* Continuous moderator.

Table 3.8

Results of univariable meta-regression analyses for categorical variables (subscale scores of the Exercise Dependence Scale-21)

Subgroups	Tolerance					Withdrawal					Intention effects					Lack of control					Time					Reduction in other activities					Continuance				
	K	*ā*	95% CI Lo	95% CI Up	I^2	*K*	*ā*	95% CI Lo	95% CI Up	I^2	*K*	*ā*	95% CI Lo	95% CI Up	I^2	*K*	*ā*	95% CI Lo	95% CI Up	I^2	*K*	*ā*	95% CI Lo	95% CI Up	I^2	*K*	*ā*	95% CI Lo	95% CI Up	I^2	*K*	*ā*	95% CI Lo	95% CI Up	I^2
Exercise modality																																			
Unknown (RC)	8	.892	.859	.917	91.34	8	.838	.793	.874	90.27	9	.909	.877	.933	94.42	9	.829	.762	.878	95.85	8	.849	.811	.800	88.67	13	.720	.639	.782	93.67	9	.811	.748	.858	94.43
Unclear	18	.849	.823	.870	93.48	17	.805	.776	.829	90.77	17	.872	.845	.894	95.32	17	.824	.789	.853	94.99	18	.854	.825	.878	95.41	18	.707	.667	.741	90.22	17	.838	.807	.863	94.42
Power disciplines	2	.784	.690	.849	69.70	2	.835	.799	.865	0.00	1	.890	.854	.817	-	2	.765	.714	.807	0.00	2	.805	.763	.840	0.00	3	.762	.718	.799	7.61	2	.844	.693	.921	91.47
Non-endurance	2	.822	.791	.848	0.00	2	.803	.760	.838	34.28	2	.808	.775	.836	0.00	2	.839	.755	.895	85.74	2	.834	.806	.859	0.00	2	.606	.496	.692	58.10	2	.790	.754	.821	0.00
Multiple sports	6	.853	.798	.892	94.86	6	.830	.779	.869	92.59	6	.881	.833	.915	95.56	6	.811	.750	.857	.93.41	6	.844	.805	.875	89.79	6	.749	.646	.822	95.75	6	.843	.817	.865	76.98
Fitness and health	4	.836	.751	.892	96.38	4	.869	.764	.927	98.17	4	.884	.843	.915	93.26	4	.836	.802	.864	81.93	3	.868	.838	.893	83.71	5	.703	.617	.769	88.71	4	.876	.830	.909	93.58
Endurance	3	.891	.859	.915	73.57	3	.865	.830	.892	67.62	4	.871	.774	.926	97.30	4	.813	.761	.855	85.39	4	.825	.806	.843	23.85	6	.614	.551	.667	77.38	3	.806	.740	.855	80.53
Eating disorders																																			
Unknown (RC)	41	.858	.841	.874	94.13	40	.831	.811	.848	93.02	40	.882	.865	.897	95.43	42	.823	.802	.842	94.11	41	.849	.834	.863	92.11	48	.706	.676	.734	92.79	41	.837	.819	.854	93.14
At risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not at risk	1	.820	.788	.847	-	1	.770	.729	.805	-	1	.850	.823	.873	-	1	.840	.811	.864	-	1	.800	.764	.831	-	1	.680	.622	.729	-	1	.720	.700	.763	-
Mixed	1	.810	.759	.851	-	1	.780	.721	.827	-	2	.871	.668	.950	97.92	1	.800	.746	.843	-	1	.840	.797	.874	-	2	.643	.451	.768	89.98	1	.790	.733	.835	-
Clinical	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Report of LTE																																			
No (RC)	12	.874	.842	.900	96.27	11	.845	.816	.869	92.42	12	.903	.870	.928	97.62	13	.841	.799	.874	96.77	13	.863	.841	.883	92.28	19	.701	.636	.754	95.87	12	.829	.792	.860	94.96
Yes	31	.849	.829	.866	91.93	31	.822	.797	.843	92.45	31	.871	.854	.886	92.65	31	.814	.792	.834	90.68	30	.840	.821	.858	90.79	34	.705	.674	.733	88.82	31	.836	.814	.855	92.36
Regular exercisers																																			
Unknown (RC)	16	.873	.847	.895	95.26	15	.840	.815	.861	90.91	17	.900	.875	.920	96.73	17	.839	.806	.866	95.40	17	.864	.846	.880	89.72	25	7.02	.650	.746	95.13	16	.831	.802	.855	93.08
Yes	27	.846	.824	.865	92.15	27	.821	.794	.845	93.22	26	.866	.847	.884	92.68	27	.812	.786	.834	91.82	26	.836	.813	.856	91.64	28	.706	.673	.736	88.11	27	.836	.811	.858	93.27
Region																																			
Unknown (RC)	6	.881	.846	.907	87.45	6	.854	.824	.879	76.96	7	.909	.880	.931	91.16	8	.847	.807	.879	91.41	7	.866	.838	.889	83.77	13	.726	.634	.795	95.56	7	.865	.839	.886	79.85
South America	4	.780	.737	.816	67.21	4	.748	.646	.820	90.94	3	.838	.790	.875	82.54	4	.754	.712	.791	59.47	4	.779	.721	.824	79.95	5	.743	.639	.817	91.94	4	.834	.772	.878	89.22
Oceania	1	.920	.903	.934	-	1	.890	.866	.910	-	1	.930	.915	.943	-	1	.920	.903	.934	-	1	.940	.927	.951	-	1	.760	.708	.803	-	1	.930	.915	.943	-
North America	8	.891	.854	.918	95.52	8	.885	.860	.906	90.08	9	.924	.912	.935	85.80	8	.862	.832	.887	90.28	8	.870	.845	.891	87.76	10	.674	.625	.717	84.51	8	.871	.847	.892	86.75
Mixed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Europe	22	.847	.827	.864	90.65	21	.809	.795	.823	72.08	9	.845	.823	.864	91.68	21	.797	.766	.823	92.74	22	.838	.820	.854	87.73	22	.688	.648	.723	90.90	21	.796	.770	.819	90.36
Asia	2	.807	.752	.850	60.93	2	.749	.707	.786	0.00	2	.886	.866	.902	0.00	2	.832	.762	.882	79.59	1	.840	.802	.871	-	2	.741	.697	.779	0.00	2	.841	.814	.864	0.00
Test version																																			
Original (RC)	18	.878	.853	.899	94.05	18	.863	.840	.882	90.84	19	.912	.896	.926	93.34	20	.849	.824	.871	92.59	19	.868	.847	.885	90.64	25	.712	.669	.749	92.59	19	.858	.830	.881	93.73
Linguistically adapted	25	.839	.819	.857	91.33	24	.798	.777	.816	86.27	24	.849	.830	.866	91.18	24	.797	.769	.821	92.47	24	.831	.811	.849	90.09	28	.697	.656	.732	92.43	24	.812	.791	.831	88.98
Type of survey																																			

Unknown (RC)	18	.859	.831	.882	95.00	24	.836	.809	.859	94.41	12	.896	.866	.919	95.59	18	.807	.769	.839	94.61	22	.838	.817	.856	91.16	32	.702	.658	.740	93.58	22	.851	.831	.869	91.33
Paper-pencil	15	.863	.835	.886	93.46	9	.807	.764	.842	90.27	17	.886	.862	.905	95.44	11	.830	.788	.864	94.33	11	.856	.828	.880	90.06	9	.690	.616	.749	93.50	8	.808	.751	.852	94.16
On-line	7	.813	.775	.845	86.20	8	.823	.784	.855	86.25	12	.862	.822	.893	95.65	12	.823	.801	.842	77.67	9	.858	.816	.890	93.50	11	.707	.676	.735	69.15	11	.819	.771	.857	94.49
Both	3	.896	.863	.921	70.05	1	.850	.809	.882	-	2	.842	.795	.877	0.00	3	.878	.779	.933	94.35	1	.900	.859	.929	-	1	.840	.796	.875	-	2	.818	.704	.888	81.46
Publication status																																			
Published (RC)	40	.852	.835	.868	93.56	39	.825	.804	.843	93.02	39	.874	.857	.889	94.93	41	.817	.797	.836	93.13	40	.849	.833	.863	92.03	49	.707	.676	.734	92.83	40	.833	.813	.850	93.57
Unpublished	3	.906	.863	.936	88.89	3	.876	.854	.894	38.59	4	.931	.913	.946	83.59	3	.882	.801	.931	94.26	3	.837	.751	.893	91.07	4	.669	.578	.741	84.99	3	.855	.798	.895	84.94
Study design																																			
Psychometric (RC)	15	.843	.812	.869	95.02	15	.815	.771	.852	96.66	16	.873	.846	.894	95.73	15	.789	.748	.824	95.04	15	.838	.810	.863	94.11	16	.712	.664	.754	93.49	15	.832	.797	.860	95.34
Applied	28	.864	.843	.882	92.78	27	.835	.816	.852	86.96	27	.886	.864	.903	95.07	29	.838	.817	.857	91.50	28	.853	.835	.869	89.90	37	.700	.663	.733	91.87	28	.835	.812	.855	91.60

Note. $\bar{\alpha}$ = Corrected coefficient alpha. CI= Confidence interval; Lo= Lower; Up= Upper; RC = Reference category. LTE = Leisure time exercise.

Table 3.9

Results of univariable meta-regression analyses for continuous variables (subscale scores of the Exercise Dependence Scale-21)

Moderators	Tolerance					Withdrawal					Intention effects					Lack of control					Time					Reduction in other activities					Continuance				
	K	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2
Mean total scores	36	-.183	3.573	.067	8.02	36	-.035	0.312	.580	9.59	37	-.170	1.266	.268	1.19	38	**-.294**	8.745	.006	19.17	36	-.129	2.629	.114	5.44	41	-.096	0.748	.393	0.00	37	.060	0.256	.616	0.00
SD total scores	36	**.623**	4.524	.041	9.22	36	-.060	0.054	.818	9.58	37	.082	0.041	.840	0.00	38	-.075	0.097	.758	0.00	36	.210	0.539	.468	0.00	41	-.008	0.002	.967	0.00	37	-.458	2.319	.137	4.02
Mean age	41	-.001	0.003	.957	0.00	40	-.003	0.179	.675	14.64	40	-.004	0.134	.716	0.00	42	.003	0.140	.710	0.00	41	-.003	0.198	.659	0.00	49	.006	0.519	.475	0.00	41	-.011	2.253	.141	3.84
SD age	40	-.010	0.430	.516	0.00	39	-.019	1.616	.212	14.32	39	-.001	0.002	.966	0.00	41	-.004	0.055	.815	0.00	40	-.001	0.009	.927	0.00	48	.022	2.342	.133	2.34	40	-.014	0.986	.327	0.87
% of Whites	8*	.010	2.638	.156	19.41	8*	.008	3.708	.103	9.21	10	.003	0.401	.544	0.00	9*	.001	0.044	.841	0.00	7*	-.007	0.494	.513	0.00	12	.002	0.117	.740	0.00	9*	.001	0.112	.748	0.00
% of Females	40	**.005**	4.256	.046	8.58	39	.003	2.242	.143	13.88	40	**.006**	5.420	.025	11.17	41	**.007**	12.342	.001	24.97	40	**.008**	17.577	<.001	32.19	50	.002	0.646	.426	0.00	40	**.005**	6.018	.019	12.29
Year of publication	43	.005	0.126	.725	0.00	42	-.022	2.740	.106	12.99	43	-.012	0.559	.459	0.00	44	-.004	0.065	.800	0.00	43	-.003	0.041	.842	0.00	53	-.001	0.012	.913	0.00	43	-.007	0.258	.614	0.00

Note. β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; Statistically-significant effects (p< .05) appear highlighted in bold.

Table 3.10

Results of multivariable meta-regression analyses (subscale scores of the Exercise Dependence Scale-21)

Moderators	*K*	β_0	β_1	*SE*	*F*	*p*	R^2
Tolerance	43				5.591	.008	27.97
		.825	**-**	.387			
SD total scores*			**.697**	.277			
% of Females*			**.006**	.002			
Withdrawal	42				10.550	<.001	67.73
		1.925	**-**	.099			
Region (South America)			**-.569**	.154			
Region (Oceania)			.283	.251			
Region (North America)			.243	.128			
Region (Europe)			**-.270**	.111			
Region (Asia)			**-.539**	.196			
Intention effects	43				9.240	<.001	69.91
		2.596	**-**	.188			
Report of LTE (Yes)			**-.306**	.107			
Region (South America)			-.339	.217			
Region (Oceania)			.414	.322			
Region (North America)			.216	.139			
Region (Europe)			**-.482**	.123			
Region (Asia)			-.090	.241			
% of Females*			-.000	.002			
Lack of control	44				4.592	.002	47.07
		1.661	**-**	.146			
Region (South America)			**-.440**	.205			
Region (Oceania)			.375	.337			
Region (North America)			.032	.152			
Region (Europe)			**-.263**	.126			
Region (Asia)			-.264	.250			
% of Females*			**.005**	.002			
Time	43				14.198	<.001	47.48
		1.683	**-**	.100			
Test version (Linguistically adapted)			**-.218**	.078			
% of Females*			**.007**	.002			
Continuance	43				6.847	<.001	65.81
		2.004	**-**	.148			
Region (South America)			**-.567**	.257			
Region (Oceania)			**.665**	.290			
Region (North America)			.057	.133			
Region (Europe)			**-.955**	.248			
Region (Asia)			**-.770**	.292			
Test version (Linguistically adapted)			**.600**	.226			
% of Females*			-.000	.002			

Note. β_0 = intercept/mean effect size; β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; LTE = Leisure time exercise. The reference categories were: No (Report of LTE), Unknown (Region), and Original version (Test version). Statistically-significant effects ($p < .05$) appear highlighted in bold.

* Continuous moderator.

Table 3.11

Reliability reporting practices of in studies using self-report instruments assessing problematic exercise

Measure (Subscale)	Induced reliability				Reported reliability	
	By omission	Vague report	Precise report	Induction rate	Unusable	Usable
	K (%)	*K* (%)	*K* (%)	%	*K* (%)	*K* (%)
CES-Likert	5 (31.25)	-	-	31.25	1 (6.25)	10 (62.50)
CES-VAS	14 (27.45)	2 (3.92)	5 (9.80)	41.18	-	30 (58.82)
CET	7 (11.86)	3 (5.08)	1 (1.69)	18.64	-	48 (81.36)
CET (Avoidance)	5 (13.16)	4 (10.53)	1 (2.63)	26.32	1 (2.63)	27 (71.05)
CET (Weight control)	5 (16.13)	4 (12.90)	-	29.03	1 (3.23)	21 (67.74)
CET (Mood improvement)	5 (16.67)	4 (13.33)	-	30.00	1 (3.33)	20 (66.67)
CET (Lack of enjoyment)	5 (18.52)	4 (14.81)	-	33.33	-	18 (66.67)
CET (Rigidity)	5 (15.15)	4 (12.12)	1 (3.03)	30.30	-	23 (69.70)
EAI	26 (26.80)	9 (9.28)	17 (17.53)	53.61	2 (2.06)	43 (44.33)
EDQ	3 (10.71)	5 (17.86)	8 (28.57)	57.14	-	12 (42.86)
EDQ (Interference)	1 (5.56)	5 (27.78)	5 (27.78)	61.11	-	7 (38.89)
EDQ (Positive reward)	1 (5.88)	5 (29.41)	5 (29.41)	64.71	-	6 (35.29)
EDQ (Withdrawal)	1 (5.56)	5 (27.78)	5 (27.78)	61.11	-	7 (38.89)
EDQ (Weight control)	2 (11.11)	5 (27.78)	5 (27.78)	66.67	-	6 (33.33)
EDQ (Insight into problem)	1 (5.88)	5 (29.41)	5 (29.41)	64.71		6 (35.29)
EDQ (Social reasons)	2 (11.11)	5 (27.78)	5 (27.78)	66.67	-	6 (33.33)
EDQ (Health reasons)	2 (11.11)	5 (27.78)	5 (27.78)	66.67	-	6 (33.33)
EDQ (Stereotyped behaviour)	1 (5.88)	5 (29.41)	5 (29.41)	64.71	-	6 (35.29)
EDS-21	8 (6.30)	15 (11.81)	6 (4.72)	22.83	8 (6.30)	90 (70.87)
EDS-21 (Tolerance)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
EDS-21 (Withdrawal)	1 (1.79)	9 (16.07)	-	17.86	4 (7.14)	42 (75.00)
EDS-21 (Intention effects)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
EDS-21 (Lack of control)	1 (1.72)	9 (15.52)	-	17.24	4 (6.90)	44 (75.86)
EDS-21 (Time)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
EDS-21 (Reduction in other activities)	1 (1.49)	9 (13.43)	-	14.93	4 (5.97)	53 (79.10)
EDS-21 (Continuance)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
OEQ	7 (10.00)	5 (7.14)	19 (27.14)	44.29	1 (1.43)	38 (54.29)
Total	113 (9.77)	162 (14.00)	98 (8.47)	47.58	43 (3.72)	741 (64.04)

Note. CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire; Induced reliability= No reliability values for the data at hand are provided; By omission= No reference to reliability is made; Vague= Some reference to reliability is made, but information concerning the source of such information is missing; Precise report= Reported reliability values correspond to those provided in another studies; Unusable= Reliability values for the data at hand is provided employing indices different to alpha; Usable= Data that were effectively included in the meta-analysis.

Discussion

The present RG meta-analysis provides summarized evidence on the reliability scores in terms of coefficient alpha of six of the most commonly used self-report instruments assessing PE. Data retrieved from 255 studies (741 independent samples) showed alpha values that ranged from .768 to .930 for global scores and from .615 to .907 for subscale scores. The alpha estimates of both global and subscales test scores were affected by several sociodemographic and methodological characteristics. The main implications of these findings are discussed in detail below.

Alpha estimates for total and subscale scores

Interpretation of alpha values has generally been carried out adopting a *more is better* and cut-off-based approach. This implies that the level of reliability of the scores of a given instrument in terms of alpha would dictate the use for which it may be recommended (Cicchetti, 1994; Nunnally & Bernstein, 1994). According to this approach, the alpha estimates found for the global scores of the instruments under consideration may lead to judging them as suitable for (a) exploratory research (EAI), (b) basic research purposes (CES, CET, EDQ, and OEQ), and (c) applied research and clinical practice (EDS-21). In the case of the subscale scores, applying this same criterion implies considering them as (a) unacceptable for research purposes (insight into problem, social reasons, and stereotyped subscales of the EDQ), (b) acceptable for exploratory research (lack of control and rigidity subscales of the CET; interference, positive reward, withdrawal, weight control, and health reasons subscales of the EDQ; and reduction in other activities subscale of the EDS), (c) suitable for basic research purposes (weight control and mood subscales of the CET; and tolerance, withdrawal, intention effects, lack of control, time, and continuance subscales of the EDS-21), and (d) suitable for applied research and clinical practice (avoidance subscale of the CET). However, the automatic application of cut-off points inherent to this purely quantitative approach of interpreting alpha has been strongly criticised by arguing that they do not emerge as a result of empirical evidence but from researchers' intuition (Cho & Kim, 2015; Hoekstra et al., 2019; Panayides, 2013). Alternatively, it has been suggested that alpha values should be interpreted also taking into account both instrument length and complexity of the construct being assessed (Cho & Kim, 2015). The implications derived from the latter are discussed separately below for the scores with particularly high or low alpha values.

The fact that high alpha values were obtained for some of the scores under consideration (i.e., those near to .90 and above) may not necessarily indicate that these are highly reliable. Indeed, high alpha values may also be due to redundancy in the content of the items, particularly, the greater the number of items used (Cho & Kim, 2015). This redundancy is nevertheless undesirable since it could compromise coverage of the construct being assessed. Moreover, the greater its theoretical complexity, the more potentially relevant content is excluded (Hoekstra et al., 2019; Panayides, 2013). Such redundancy may also imply leaving a considerable proportion of individuals' estimates outside the items targeting range, which could result in a decreased reliability (Cho & Kim, 2015; Panayides, 2013). Furthermore, it is worth noting that the instruments whose scores were found to have particularly high alpha values do not appear to have been developed with particular attention to their content validity (e.g., almost none of those studies reported that content validity had been evaluated by a panel of experts). Indeed, it was only in the case of a preliminary version of the EDS-21 that the latter was somewhat indicated, although just in terms of "appropriateness" and providing no other further details on the procedure being followed (Hausenblas & Downs, 2002). Additionally, none of the validation studies reported having examined an aspect of content validity, such as comprehensiveness (i.e., no key aspects of the construct are missed), that is particularly relevant in avoiding content redundancy (Mokkink et al., 2010). Consequently, further research is needed that provide evidence on whether the particularly high alpha values obtained in the present study are due to the true high reliability scores or content validity-related shortcomings.

A second important consideration regarding scores that showed the highest levels of alpha concerns the CET, EDS, and EDQ. More specifically, none of these three scales were proposed as being either unidimensional or higher-order instruments (i.e., including a number of first-order factors and one second-order factor). Indeed, evidence exists supporting the multidimensional versus the unidimensional nature of these instruments (Formby et al., 2014; Sicilia & González-Cutre, 2011). It is therefore surprising to find these instrument scores (and their reliability in terms of alpha) have more often been computed on an aggregate basis than a factor-by-factor basis. This is particularly concerning considering that, in instruments with correlated factors, the use of alpha should be limited to such subscale scores, so that in no case should it be used for the overall test score (Cho, 2016; Cho & Kim, 2015). This leads to a suggestion that, should the overall score of any of the instruments under examination be defensible from a theoretical perspective, reliability should be estimated by adopting methodologically sounder alternatives than alpha (see Cho, 2016; Cho & Kim, 2015; Gignac, 2014).

A first point to note with regard to the instruments whose scores showed the lowest alpha estimates concerns the one whose global score showed the lowest alpha estimate among those examined (i.e., the EAI). One explanation for this finding may be that this instrument was developed on six specific theoretical components of behavioural addictions, therefore just one item per component were proposed (Terry et al., 2004). However, the complex nature of some of these components may not be totally represented by a single item without resorting to the use of complex or double-barrelled items (e.g., the item alluding to the conflicts arising between individuals and their "family and/or partner" because of the amount of exercise being engaged in). Such items may be subject to heterogeneous interpretation and, by extension, to contribute to a lesser extent that those more clearly conceptualizing the underlying latent construct (Hayes & Coutts, 2020; Kyriazos & Stalikas, 2018). The latter implies not fulfilling the tau-equivalence assumption for unbiased estimations of alpha, so that this coefficient no longer reflects the true actual reliability of the score but rather its lower bound (Hayes & Coutts, 2020). Consequently, the possibility exists that the EAI's reliability score was above the one calculated by the analysis in the present study. However, the lack of formal testing of the tau-equivalence assumption of the EAI's items detected in the retrieved studies prevents us from providing empirical evidence that support this possibility, the collection of which should be subject of future research.

A second point to be noted is that with regard to the instruments whose scores showed the lowest alpha estimates concerns the three subscale scores of the EDQ showing alpha values below the minimum .70 cut-off traditionally employed for discouraging the employment of a given score (i.e., insight into problem, social reasons, and stereotyped behaviour). These findings are not entirely surprising considering the difficulty of achieving high alpha values using only a few items in the subscales (i.e., from two to four) (Greco et al., 2018). However, it is worth noting that, despite using a similarly small number of items, the scores on some of the other subscales examined (e.g., those of the EDS-21) showed higher levels of alpha than the three aforementioned EDQ subscales. The explanation for these differences is probably due to the way in which the content of the two instruments were developed. That is, on the basis of the theoretical definition of the seven constructs being assessed (in the EDS-21), or by assigning the statements provided by exercisers concerning their exercise-related feelings and cognitions to the factors emerging from statistical analyses (in the EDQ). Therefore, the fact that the items included in these three subscales of the EDQ with particularly low alpha values did not derive from a predetermined theoretical approach could have meant grouping indicators that do not reflect an unequivocal underlying factor, leading to decreased measurement reliability. This is important because low reliability tends to attenuate the strength of the relationship being examined (Graham & Unterschute, 2015). Consequently, these findings raise the need to review the content and number of items included in these subscales in order to improve their reliability.

Moderators of the reliability scores of self-report instruments of PE

Evidence supported the relationship between some of the characteristics of the studies evaluated and the variability in alpha estimates. For example, higher alpha values were found for the global scores of the CES-VAS and the avoidance and rule-driven behaviour subscale of the CET among clinical populations in terms of eating disorders. These findings are relatively unsurprising given that both instruments include content of particular relevance to individuals with eating disorders such as the negative consequences of being unable to exercise, especially feelings of guilt (Davis et al., 1993; Scharmer et al., 2020; Taranis et al., 2011; Zeeck et al., 2017). It follows that comparing scores derived from these two instruments involving individuals with and without a clinical eating disorder diagnosis may be susceptible to bias.

Findings also suggested that the alpha values of the global scores of the CET and the OEQ may be lower among populations comprising regular exercisers. Moreover, it should be noted that the CET was developed with a particular focus on excessive exercise within the eating disorders domain. Therefore, the possibility exists that some of the content included in the instrument (e.g., exercising due to weight/appearance reasons or to the lack of enjoyment when exercising; Taranis et al., 2011) may not be equally relevant for non-clinical populations in terms of eating disorders (Alcaraz-Ibáñez et al., 2019). Additionally, the lower alpha values obtained for OEQ scores among regular exercisers may be due to the low potential variability of some of the instrument's items among those featuring very low levels of exercise. Clear examples are items referring to exercise frequency (e.g., exercising on a daily basis) or specific exercise-related habits (e.g., keeping a record of exercise performance) (Pasman & Thompson, 1988). Taken together, these results reinforce the notion that differences in the interpretation of the content of self-report instruments assessing PE may exist among individuals with unequal levels of exercise involvement (Szabo et al., 2015).

Exercise modality is another exercise-related feature that support the likely relationship in alpha estimate variability (i.e., the global scores of the EDS-21). In particular, results suggested that alpha values were lower in studies reporting very precise exercise modalities compared to those that did not. However, the fact that the instrument scores under consideration were found to be similarly reliable in terms of alpha values suggests that comparisons across modalities could be reasonably made. This is important given that this kind of comparison has been a matter of research interest (Di Lodovico et al., 2019).

Findings also suggested that the alpha estimates of the linguistically adapted versions may be lower than original versions in the case of CES-VAT and EAI global scores, and several EDS-21 subscale scores. These findings suggest the existence of possible weaknesses in the linguistic adaptation processes. However, it should be noted that cross-cultural and cross-linguistic research in this field is scarce (Griffiths et al., 2015). Consequently, further research is needed that examines the extent to which the psychometric properties of the scores of the self-report instruments assessing PE are equivalent across their different linguistic adaptations.

There was no conclusive evidence found linking the proportion of females included in the samples with the alpha estimates of the global scores of the instruments under consideration. This suggest that the reliability of such scores does not greatly differ between males and females. However, this was not the case for some of the subscale scores (i.e., weight control and exercise rigidity subscales of the CET; and tolerance, lack of control, and time subscales of the EDS-21). Indeed, evidence suggested that the higher the number of females in the sample, the higher the reliability alpha estimates of these subscale scores. Therefore, the reliability of these scores may be lower for males than for females. These findings are relevant considering that gender has been proposed as a potential risk factor for several potentially addictive behaviours and, particularly, PE (Bueno-Antequera et al., 2020; Cunningham et al., 2016). The existence of gender differences in reliability scores may have led to biased estimates in comparisons involving these two population groups.

A last notable group of findings emerging from moderator analyses concerns continuous variables. The fact that no evidence was obtained relating alpha values to mean scores on the scales suggests that the reliability of the scores examined is likely to be similar among individuals with very different levels of self-reported PE. An exception to this general trend was the negative relationship observed between the mean scores and the associated reliability values in the case of the EAI. This is important because it suggests that the reliability of the EAI scores may decrease among individuals scoring high on this instrument. This might be explained by evidence suggesting that individuals with similarly high levels of PE on the EAI may differ markedly on the score for the item reflecting conflict (Chamberlain & Grant, 2020; Sicilia, Alcaraz-Ibáñez, et al., 2020). This may imply a decreased level of inter-correlations among items and, by extension, a decrease in alpha values (Greco et al., 2018).

Finally, it worth noting that the variance of scores under consideration were found to be positively related to alpha estimates in just in three cases (i.e., the avoidance and mood modification subscales of the CET, and the tolerance subscale of the EDS-21). These findings are somewhat unexpected considering that psychometric theory points to score variance as one of the main components of reliability estimation (Nunnally & Bernstein, 1994). From this, it follows that the population characteristics already discussed here may help explain the variability of alpha to a greater extent than the standard deviation of the scores. On balance, findings from the moderator analyses underscore the need to examine reliability in each of the groups involved in cross-groups comparisons on self-reported PE symptoms.

Reliability reporting practices in studies using self-report assessment of problematic exercise

The global induction rate found in the present study (i.e., 47.58%) appears to be slightly higher than the one reported for exercise psychology research more generally (i.e., 41.20%; Wilson et al., 2011). It is worth noting that induction rates above the mean were found for the instruments whose scores showed the lowest values of alpha at the global level (i.e., EAI) and subscale level (i.e., EDQ). This suggests that information concerning reliability in this field may be more likely to be omitted for those scores with lower values of alpha. In the case of the EAI, one explanation for these findings may be that this instrument has been used not only for providing a continuous score representing the construct of interest but also as a screening instrument for the purpose of distinguishing individuals at-risk from those having some or no symptoms of exercise addiction. Therefore, the possibility exists that the focus on classifying individuals on the basis of a fixed cut-off point may have led some authors to overlook the issue of examining the reliability of the instrument's global score.

A particularly worrying issue in view of the highly prevalent use of alpha is the almost non-existent testing of the assumptions required for its unbiased employment. Researchers in this field may opt instead to use the reliability index that is most appropriate to the data (Cho & Kim, 2015). A misconception that may deter researchers from approaching this task is the alleged difficulty of both testing the assumptions of alpha and using the alternative methods required when its assumptions are violated (Cho, 2016; Hayes & Coutts, 2020). However, it should be noted that convenient practical guidelines for addressing these tasks have been provided, with some involving relatively non-complex tools (e.g., spreadsheet-based solutions; Cho, 2016) or software that is familiar to large numbers of researchers (e.g., SPSS; Hayes & Coutts, 2020).

Limitations

Despite the many strengths of the present review, there are a number of limitations. A first group of limitations concerns the limited data available on the population characteristics being examined as potential moderators. For example, the small number of studies reporting reliability estimates in some populations meant that, in many cases, only a small number of primary estimates were available. This prevented providing a higher level of evidence for some of the moderation analyses conducted or even, in some cases, from carrying them out at all. The latter was the case for the EDQ, for which it was impossible to examine the variables that may contribute to the variability of the alpha estimates of its global and subscale scores. Also related to the limited availability of data were the characteristics of the study participants. For example, there were more studies that omitted information on exercise modalities or minimum exercise levels of the participants than those that provided such information. These omissions are particularly relevant in view of the limited amount of variance (i.e., < 50%) explained by some of the regression models aimed at exploring the potential sources of variability in the alpha estimates. This is so because these relatively low levels of explained variance point towards the existence of other important moderator variables beyond those considered in the present study. This scarcity of data is also relevant given the results here pointed to some of the variables for which limited data were available (e.g., region or exercise modality) as potential moderators of the alpha estimates under consideration. In view of these limitations, a two suggestions can be made. Firstly, researchers in this field should pay particular attention to reporting the characteristics of study participants. This means providing sociodemographic information that, in view of the findings here, may be of interest due to its likely influence on the reliability levels of the scores in terms of coefficient alpha. Examples of the latter include the type of survey, volume of exercise, and the main exercise modality practised. Moreover, it would be particularly useful to provide specific information for the subgroups identified on the basis of these or other socio-demographic variables, because this would facilitate further meta-analytical research. Secondly, more research is needed that examines the reliability of the scores of self-report instruments assessing PE among populations for which limited evidence is currently available. Depending on the instrument, this would involve regions or linguistic contexts still under represented, as well as clinical populations in terms of eating disorders.

A second important limitation is that the fact that there were virtually no primary studies reporting test-retest reliability. This prevented the providing of summarized evidence on the consistency of instrument scores over time. Therefore, further primary research is needed examining the reliability of the test scores under consideration in terms of temporal stability. Finally, it worth mentioning the lack of testing of the assumptions required for the unbiased function of alpha. This makes it advisable to treat the results presented with caution, particularly in the case of the global scores of instruments with a non-clearly unidimensional character (i.e., EDQ, CET, and EDS-21).

Conclusions and practical implications

First, the alpha estimates of the global and subscale scores of existing self-report instruments assessing PE vary largely not just from one to the other but also across different applications. Indeed, the 95% CI of the summarized alpha estimates obtained in the present study did not contain (in most cases) the alpha values reported in the studies in which the instruments under consideration were originally proposed. Therefore, the possibility exists that the originally-reported alpha values were not the most adequate ones to be compared with those obtained in primary research, nor to correct for measurement-related artefacts in quantitative meta-analytic research. It is therefore suggested that the values provided in the present study should be used for such purposes.

Second, the reliability of test scores of existing self-report instruments assessing PE appears to be particularly sensitive to the characteristics of the study population. Researchers including the self-report PE instruments in their studies are encouraged to report specific reliability estimates for the different population groups of interest. This would provide insight into the potential for cross-group comparisons to be biased by the presence of differences in inter-group reliability. Future research efforts aimed at refining existing instruments or proposing new ones should be conducted including not just one or two convenience samples but, instead, several groups according to the characteristics that were proved to be related with the variability in alpha estimates (e.g., clinical condition in terms of eating disorders, language, and exercise modality). This would allow for examining the extent to which the instrument's scores are acceptable in terms of reliability for a minimum number of target groups of interest, which, if this were not the case, would allow the instrument to be refined at an early stage of development.

Third, existing quantitative research using self-report instruments assessing PE suffers from two main deficiencies in terms of reliability reporting: (i) the frequent omission of reliability estimates for the data at hand; and (ii) the (almost exclusive) employment of alpha without proper testing of the assumptions necessary for its unbiased use or even when the nature of the test to be examined would make its use particularly unsuitable. Researchers, journal editors, and reviewers should be aware of the need to report the reliability of scores derived from instruments assessing PE for the data at hand in all primary research. Therefore, the suitability of reliability index to be used should be justified on the basis of the theoretical nature of the constructs under consideration and the characteristics of the data being examined, for example, in terms of test dimensionality and measurement model.

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Conclusiones/Conclusions

Conclusions

The purpose of the present PhD dissertation was to analyse the range of currently available self-report psychometric instruments proposed for assessing potentially problematic exercise behaviours. To meet this goal, three studies were conducted with the aim of (i) identifying and comparing the theoretical conceptualisations on which the instruments of interest are based, (ii) examining and comparing the specific components covered by each of them, and (iii) providing quantitative summarized evidence on their reliability scores. Systematic review techniques were employed in all the studies, which were supplemented in the third study with meta-analytical techniques. The main findings, implications and directions for future research derived from the evidence obtained in the studies are presented hereafter.

Findings from **Study 1** show that self-report instruments of problematic exercise can be classified into up to five categories depending on their underlying theoretical conceptualizations. Four of them involves conceptualizing this phenomenon as (i) the upper end of an exercise continuum, (ii) a means of regulating body size and weight, (iii) as a form of dependence, and (iv) a behavioural addiction. A fifth category comprised those instruments with no clear conceptualisation. These different conceptualisations imply a strong dichotomy concerning the secondary or primary or secondary character of problematic exercise (i.e., whether or not such a phenomenon occurs simultaneously with another potential disorder). This may limit the ability of the instruments to capture both the full multidimensionality of problematic exercise and the complexity of its underlying processes. Consequently, future research efforts are needed in order to obtain a comprehensive and consensus-based definition of problematic exercise that enables advances to the assessment and study of the aetiology and consequences of this potentially unhealthy form of exercise.

Findings from **Study 2** show a lack of consensus in the operational definition of the range of components included in the currently available self-report psychometric instruments assessing PE. These components can be classified according to their level of presence in the different instruments as core criteria (i.e., salience, withdrawal, and mood modification) or candidate components (i.e., conflict, and continuance despite problems) of PE. However, other components of different nature are shown to be specific to some of the problematic exercise conceptualizations on which the assessment instruments are based. This is the case of tolerance, relapse, impaired control, craving, cross-tolerance, exercise volume (e.g., in terms of time, duration, or frequency), or certain exercise motives (e.g., social relatedness, and health or body image improvement). Further studies are needed to help establish and operationalize the components that allow for distinguishing potentially healthy from unhealthy exercise behaviour patterns. Items proposed in future instruments developed for the purpose of assessing problematic exercise should be written with a focus on capturing the maladaptive nature of the component to be assessed. This would be in the interest of not pathologizing the behaviour of individuals with high levels of harm-free exercise practice.

Findings from **Study 3** show the alpha estimates of both global and subscales test scores of currently available self-report instruments of problematic exercise to vary largely not just from one to the other but also across different applications, as well as being particularly sensitive to the characteristics of the study population. In the light of these findings, three main implications are drawn. Firstly, that the values provided in the **Study 3** should be used for the purpose of being compared with those obtained in primary research or to correct for measurement-related artefacts in quantitative meta-analytic research. Secondly, the need to report specific reliability estimates for the different population groups of interest included in the primary studies. Thirdly, that future research efforts aimed at refining existing instruments or proposing new ones should be conducted including not just a few convenience samples but several groups according to the characteristics that were proved to be related with the variability in alpha estimates (e.g., clinical condition in terms of eating disorders, language, and exercise modality). This would allow for examining whether the instrument's scores are acceptable in terms of reliability for a minimum number of target groups of interest, which, if this were not the case, would allow the instrument to be refined at an early stage of development. A last group of findings concerns the two main emerging deficiencies in terms of reliability reporting: (i) the frequent omission of reliability estimates for the data at hand, and (ii) the (almost exclusive¬) employment of alpha without proper testing of the assumptions necessary for its unbiased use. Researchers, journal editors, and reviewers should be aware of the need to report the reliability of scores derived from instruments assessing problematic exercise for the data at hand in all primary research. The suitability of reliability index to be used should be justified on the basis of the theoretical nature of the constructs under consideration and the characteristics of the data being examined (e.g., in terms of test dimensionality and measurement model).

In sum, the findings of the three studies presented highlight the existence of large disparities between the different instruments available for self-report assessment of problematic exercise in terms of their theoretical design, the specific components included in each of them, and their reliability levels. These instruments do not seem to assess the very same construct but rather different manifestations of an exercise-related behavioural pattern that were considered relevant from the perspectives or theoretical frameworks adopted by their respective developers. As a whole, these findings cast some doubts on the meaningfulness and accuracy of the evidence obtained through the use of these instruments. The knowledge gained from the studies presented here provide the basis for future research aimed at achieving a twofold objective. Firstly, to reach consensus on both a definition and the very precise components underpinning problematic exercise that allows for qualifying certain patterns of exercise behaviour as inherently problematic. Secondly, to provide a strong evidence base for the reliability of the scores derived from the instruments under consideration. While such investigations are being carried out, the recommendations provided may be taken into account for the purpose of improving reliability reporting practices in quantitative primary research within the field of PE.

Apéndices

Apéndices

Estudio 1: Theoretical Conceptualisations of Problematic Exercise in Psychometric Assessment Instruments: A Systematic Review

Appendix A. PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	2
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4-5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5-6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5; Appendix B
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7; Appendix C
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7

Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	NA
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	NA
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	NA
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7; Figure1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	NA
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	7-16
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	7-16; Table 1
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	17-24
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	25-26
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	26
FUNDING			

Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Title page

Appendix B. Search Strategy

WOS Core Collection (n = 574)	ScieLO (n = 34)	PsycINFO (n = 451)	PsycTEST (n = 22)	SCOPUS (n = 456)
1. Morbid exercise/	1. Morbid exercise/	1. Morbid exercise/	1. Morbid exercise/	1. Morbid exercise/
2. Exercise addiction/	2. Exercise addiction/	2. Exercise addiction/	2. Exercise addiction/	2. Exercise addiction/
3. Exercise dependence/	3. Exercise dependence/	3. Exercise dependence/	3. Exercise dependence/	3. Exercise dependence/
4. Compulsive exercise/	4. Compulsive exercise/	4. Compulsive exercise/	4. Compulsive exercise/	4. Compulsive exercise/
5. Compulsive physical activity/	5. Compulsive physical activity/	5. Compulsive physical activity/	5. Compulsive physical activity/	5. Compulsive physical activity/
6. Obligatory exercise/	6. Obligatory exercise/	6. Obligatory exercise/	6. Obligatory exercise/	6. Obligatory exercise/
7. Commitment to exercise/	7. Commitment to exercise/	7. Commitment to exercise/	7. Commitment to exercise/	7. Commitment to exercise/
8. Excessive exercise/	8. Excessive exercise/	8. Excessive exercise/	8. Excessive exercise/	8. Excessive exercise/
9. Problematic exercise	9. Problematic exercise	9. Problematic exercise	9. Problematic exercise	9. Problematic exercise
10. Questionnaire/	10. Questionnaire/	10. Questionnaire/	10. Questionnaire/	10. Questionnaire/
11. Validation/	11. Validation/	11. Validation/	11. Validation/	11. Validation/
12. Validity/	12. Validity/	12. Validity/	12. Validity/	12. Validity/
13. Psychometrics/	13. Psychometrics/	13. Psychometrics/	13. Psychometrics/	13. Psychometrics/
14. Scale*/	14. Scale*/	14. Scale*/	14. Scale*/	14. Scale*/
15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9
16. 10 OR 11 OR 12 OR 13 OR 14	16. 10 OR 11 OR 12 OR 13 OR 14	16. 10 OR 11 OR 12 OR 13 OR 14	16. 10 OR 11 OR 12 OR 13 OR 14	16. 10 OR 11 OR 12 OR 13 OR 14
17. (15 AND 16)	17. (15 AND 16)	17. (15 AND 16)	17. (15 AND 16)	17. (15 AND 16)
18. *Limit 17 to English language and Article	18. *Limit 17 to English language and Article	18. *Limit 17 to English language, Spanish language, Journal and Journal article	18. *Limit 17 to English language, Spanish language	18. *Limit 17 to English language, Spanish language, Article

Note: * Refers to the category limits pre-specified in the search platform

Appendix C. Systematic Review Coding Sheet

Instrument

Insert name measure

Authors

Insert citation and year of study

Sample size

Mean age
Mean BMI
Gender
Characteristics

Conceptualization

Insert emergent categorization

Items Generation

Insert description item generation

Factor structure

Name factor included by authors

Number items and range

Apéndices

Estudio 2: A Review of the Components of Problematic Exercise in Psychometric Assessment Instruments

Appendix A. Review Coding Sheet

Instrument

Insert name measure

Authors

Insert citation and year of study

Sample size

Mean age
Mean BMI
Gender
Characteristics

Conceptualization

1. Problematic exercise as end of a continuum of exercise
2. Problematic exercise as a behaviour to regulate body shape and weight
3. Problematic exercise as a behavioural addiction
4. Problematic exercise as a dependence
5. No clear conceptualization

Instrument Structure

Number items and factors

Components and Definition

Insert name factor
Insert definition factor by authors

Appendix B. Characteristics, structure, and factors in the psychometric instruments assessing problematic exercise

Instrument	Authors	Sample size (characteristics)	Conceptualization	Instrument Structure	Factors and Definition
Commitment to exercise scale (CES)	Davis et al. (1993)	185 Exercisers recruited from recreational facilities at university, health and fitness clubs and associations in Canada Men (*N*=88; mean age=28.93; SD=9.42) Women (*N*=97; mean age=26.71; SD=8.81)	Problematic exercise as end of a continuum of exercise	8 items with 2 factors	1) Obligatory: aspect of exercising whereby psychological well-being is contingent upon assiduous adherence to a regular and structured exercise regimen 2) Pathological: when exercise is continued in the face of adverse circumstances, and when it tends to take precedence over the social component of one's life
Commitment to Physical Activity questionnaire (CPA)	Corbin et al. (1987)	450 College students enrolled in PE classes at an USA University (Men=238; Women=212)	Problematic exercise as end of a continuum of exercise	12 items with unidimensional structure	-------
Commitment to Physical Activity Scale –Revised (CPA-R)	DeBate et al. (2009)	937 Girls, aged 8 to 13, from different locations across USA taking part in an PA intervention program	Problematic exercise as end of a continuum of exercise	12 items with 3 factors	1) Value of PA (Nd) 2) Attitudes toward PA (Nd) 3) Motivation regarding PA (Nd)
Compulsive Exercise Test (CET)	Taranis et al. (2011)	367 young women (Mage=20.76, SD=2.39, range=18-30), recruited from a UK university (68,8%) and Australian university (28,1%) engaged in regular exercise or sport over the last 4 weeks (M=4.27 h/w). BMI=21.86 (SD=2.77; range=16.3-38.2)	Problematic exercise as a behaviour to regulate body shape and weight	24 items with 5 factors: Avoidance and rule-driven behaviour;	1) Avoidance and rule-driven behaviour: reflects rule-driven behaviour (e.g., making up for missed sessions, continued exercise despite injury, experiencing guilt and feelings of having let the self down when unable to exercise) and continued exercise to avoid affective withdrawal symptoms. 2) Weight control exercise: related to exercising for weight and shape reasons and the use of dysfunctional weight control practices. 3) Mood improvement: reflects the positive reinforcement component of exercise in terms of mood. 4) Lack of exercise enjoyment: reflects experiencing exercise as a chore and deriving no enjoyment from it. 5) Exercise rigidity: reflects a rigid behavioural pattern in terms of exercise

Excessive Exercise Scale (EES)	McCabe & Vincent (2002)	413 secondary schools' students (*Boys*=221; Mage=13.76, SD=1.07; Girls=192; Mage=13.81, SD=1.10)	Problematic exercise as a behaviour to regulate body shape and weight	8 items with 2 factors:	1) Need for exercise (Nd) 2) Focus on exercise (Nd)
Exercise Addiction Inventory (EAI)	Terry et al. (2004)	200 university students, (102 sport science students; 98 psychology students), age from 18-40, who reported regular participation in exercise. (Mage=21.24, SD=3.77); Men=111 (Mage=20.82); Women=189 (Mage=21.75)	Problematic exercise as a behavioural addiction	6 items with unidimensional structure. Each item reflects a component	1) Salience: when the particular activity becomes the most important activity in the person's life and dominates their thinking (preoccupations and cognitive distortions), feelings (cravings), and behaviour. 2) Mood modification: subjective experiences that people report as a consequence of engaging in the particular activity and can be seen as a coping strategy. 3) Tolerance: process whereby increasing amounts of the particular activity are required to achieve the former effects. 4) Withdrawal symptoms: unpleasant feeling states and/or physical effects which occur when the particular activity is discontinued or suddenly reduced, e.g., the shakes, moodiness, irritability etc. 5) Conflict: refers to the conflicts between the addict and those around them (interpersonal conflict), conflicts with other activities (job, social life, hobbies and interests) or from within the individual themselves [intrapsychic conflict] which are concerned with the particular activity. 6) Relapse: tendency for repeated reversions to earlier patterns of the particular activity to recur and for even the most extreme patterns typical of the height of the addiction to be quickly restored after many years of abstinence or control.
Exercise Addiction Inventory (EAI-R)	Szabo et al (2019)	277 young and adult individuals (Men=243; Women=34; aged from 22 to 45) recruited on social media and exercised regularly at least three times per week	Problematic exercise as a behavioural addiction	6 items with unidimensional structure. Each item reflects a component	1) Salience (Ada); 2) Mood modification (Ada); 3) Tolerance (Ada); 4) Withdrawal symptoms (Ada); 5) Conflict (Ada); 6) Relapse (Ada).

Exercise Beliefs Questionnaire (EBQ)	Loumidis & Wells (1998)	13 exercisers (Male=7; Female=6; aged from 21 to 40) recruited from a university sports centre and who reported exercised over three times a week.	Problematic exercise as a dependence	21 items with 4 factors	1) Social desirability: people's concerns about becoming socially inadequate, inferior or undesirable if unable to exercise. 2) Physical appearance: maladaptive beliefs about exercise concerned with physical appearance or the fear of becoming physically unattractive if unable to exercise. 3) Mental and emotional functioning: concerns about the effect that exercise cessation could have on mental and emotional functioning. 4) Vulnerability to disease and ageing: concerns about being more vulnerable to disease, growing old early, or one's brain becoming unhealthy.
Exercise Dependence Questionnaire (EDQ)	Ogden et al. (1997)	449 young and adult participants (Male=161; Mage=32.85; Female=288; Mage=31.26) recruited from sports clubs, leisure centres, and ads in magazines, reported exercising more than 4 hours/week.	Problematic exercise as a dependence	29 items with 8 factors	1) Interference with social / family / work life: Nd 2) Positive reward: Nd 3) Withdrawal symptoms: Nd 4) Exercise for weight control: Nd 5) Insight into problem: Nd 6) Exercise for social reasons: Nd 7) Exercise for health reason: Nd 8) Stereotyped behaviour: Nd
Exercise Dependence Scale (EDS)	Hausenblas & Symons-Downs (2002)	266 university students (57,7% men; Mage=21.72, SD=2.89	Problematic exercise as a dependence	31 items with 7 factors	1) Tolerance: need for increased amounts of exercise to achieve the desired effect or diminished effect with continued use of the same amount of exercise. 2) Withdrawal: manifested by either the characteristic withdrawal symptoms for exercise or the same [or closely related] amount of exercise is engaged in to relieve or avoid withdrawal symptoms. 3) Intention effects: exercise is often taken in larger amounts or over a longer period than was intended. 4) Lack of control: there is a persistent desire or unsuccessful effort to cut down or control exercise. 5) Time: a great deal of time is spent in activities necessary to obtain exercise. 6) Reduction in other activities: social, occupational, or recreational activities are given up or reduced because of exercise. 7) Continuance: exercise is continued despite knowledge of having a persistent or recurrent physical or psychological

					problem that is likely to have been caused or exacerbated by the exercise
Exercise Dependence Scale-Revised (EDS-R)	Symons-Downs et al. (2004)	408 university students (65.7% women; Mage = 20.2 years, SD = 2.5) participating in fitness classes at least three times per week	Problematic exercise as a dependence	21 items with 7 factors:	1) Tolerance: Ada 2) Withdrawal: Ada 3) Intention Effects: Ada 4) Lack of Control: Ada 5) Time: Ada 6) Reduction in Other Activities: Ada 7) Continuance: Ada
Exercise Salience Scale (ESS)	Kline, Franken, & Rowland, (1994)	74 university students (Men=32, Women=42) enrolled in undergraduate psychology courses (Mage=23.17; SD=6.31).	No clear conceptualization	40 items with 2 major factors and 4 minor factors undefined	1) Response Omission Anxiety: experiences a dysphoric or anxious mood when unable to exercise. 2) Response Persistence: persists in exercise behaviour in the face of physical consequences, such as bad weather and physical injury.
Obligatory Exercise Questionnaire (OEQ)	Pasman & Thompson (1988)	90 volunteers, aged 18-60, 15 men and 15 women in each of the three following groups: obligatory runners (Mage women=33.1, Mage men=37.2); obligatory weightlifters (Mage women=27.4, Mage men=26.7); sedentary group (Mage women=29.1; Mage men=32.3).	Problematic exercise as a behaviour to regulate body shape and weight	20 items with unidimensional structure	------
Obligatory Exercise Questionnaire (OEQ-1)	Steffen & Brehm (1999)	250 high school students (Women=133; Men=117)	Problematic exercise as a behaviour to regulate body shape and weight	10 items with 3 factors:	1) Emotional element of exercise: items concerning negative emotional consequences of failing to exercise. 2) Exercise frequency and intensity: items concerning one's personal sense of being compelled or driven to exercise 3) Exercise preoccupation: items describing someone who thinks a lot about exercising.

Obligatory Exercise Questionnaire (OEQ-2)	Ackard et al, (2002)	586 female university students (Mage=20.61; SD=3.09). Actual BMI=22.79; SD=4.51. Ideal BMI=20.31; SD=2.17.	Problematic exercise as a behaviour to regulate body shape and weight	11 items with 3 factors	1) Exercise fixation: items describing a preoccupation with exercise, negative affect associated with missed exercise, and the use of exercise to compensate for perceived overeating. 2) Exercise frequency: items describing the frequency and type of exercise episodes. 3) Exercise commitment: items indicative of an individual's sense that routine exercise episodes cannot be missed.
Obligatory Exercise Questionnaire – Revised (OEQ-R)	Duncan et al. (2012)	241 exercisers (Men=143 Mage=29.95 SD=11.12; Women=97,	Problematic exercise as a behaviour to regulate body shape and weight	10 items with 3 factors	1) Preoccupation with exercise: Nd 2) Exercise behaviour: Nd 3) Exercise emotionally: Nd
Problematic Practice of Physical Exercise Scale (PPPE)	Kotbagi et al. (2015)	341 leisure exercisers (Men=232; Women=109) involved in activities such as yoga, cricket, soccer, gymnastics, swimming, tennis and dancing (Mage=28.26; SD=10.83)	No clear conceptualization	25 items (from EDQ and EDS-R) with 6 factors and 4 subfactors	1) Lack of control: reflect the individual's incapacity to decide his exercising habits. 2) Stereotypical behaviour: 2a) intention (determination to act in a certain Way); and 2b) continuity (the fact that the same behaviour is continuous in time, recurring frequently or at times even without interruption). 3) Motivation for health: 3a) physical health (Nd), and 3b) psychological health (Nd). 4) Withdrawal: uncomfortable physical or mental changes that happen when the body is deprived of a substance that it is accustomed to getting. Here, the changes are attributed to the deprivation of exercise. 5) Interference with social life: similar to reduction of other activities in EDS-R. 6) Tolerance: reflects the individual's capacity to challenge himself and endure more hardships while exercising.

Note: PE = Physical Education; USA = United States of America; UK = United Kingdom; BMI = Body Mass Index; PA = Physical Activity; DSM = Diagnostic and Statistical Manual of Mental Disorders; Nd = not defined by the authors; Ada = As defined above

Appendix C. Components, definition and example of item of the components measured by the psychometric instruments

Component	Definition	Example of item
Body image comparison	Refers to when individual confronts their body image to other people	I am aware of my size and shape and a gaze at my refection in mirrors and windows more frequently than most people do
Catching up on missed exercise	Refers to the need to exercise after missing a session or workout	If I miss a planned workout, I attempt to make up for it the next day
Conflict: General	Refers to global negative consequences of exercise that affects the individual's life in a general way, without specifying any particular life's domain	My exercising is ruining my life
Conflict: Interpersonal	Tension/conflict between the individual and those around them (e.g., friends, family, and partner) that occurs, or could occur, as consequence of exercise	I would end a relationship if it prevented me from exercising
Conflict: Intrapersonal	Tension/conflict within individual themselves as consequences of their exercise	I feel guilty about the amount I exercise
Conflict: Other activities	Refers to when individual report actual or possible interferences between exercise and other life's activities (e.g., work/school responsibilities, social invitations)	My level of exercising makes me tired at work
Continuance despite problems	Refers to when individual continues doing exercise despite drawbacks or contraindications to do it	I often exercise despite injury, fatigue or mild illness
Craving	Refers to the subjective experience of intense desire to engage in exercise	Sometimes, I feel a need to exercise twice in one day, even though I may feel a little tired
Cross tolerance	Refers to the need to do other sport modalities if individual cannot do the habitual one	I will engage in other forms of exercise if I am unable to engage in my usual form of exercise
Exercise as compensatory behaviour	Refers to when individual exercise, or intends to, as a mean to compensate other behaviours (e.g., overeating)	If I feel I have eaten too much, I will do more exercise
Exercise characteristic: Duration	Refers to the time spent exercising within a given period of time	On average, how long do you exercise on each occasion?
Exercise characteristic: Frequency	Refers to the number of times the individual exercises within a given period of time	I exercise at least four days every week
Exercise characteristic: Type	Refers to the type (or types) of exercise that is performed	I engage in one/more of the following forms of exercise: walking, jogging/running or weightlifting
Exercise characteristic: Time	Refers to great deal of time that individual spends doing exercise	I spend a lot of time exercising

Exercise reason: Social relatedness	Refers to when individual exercises to make friends or avoid being alone	I exercise to meet other people
Exercise reason: Body image	Refers to when individual exercises to control or modify the body appearance, specially shape and weight	I exercise to look attractive
Exercise reason: Health	Refers to when individual exercises to keep, improves their health or prevents any diseases	I exercise to be healthy
Impaired control	Lack or decreased individual's control over exercise reflected by engaging in the behaviour even when they do not want to, or engaging in more frequency, intensity or longer duration than intended	I am unable to reduce how often I exercise
Lack of enjoyment	Refers to when individual experience exercise as a chore and they do not feel before and/or during the activity as an enjoyable experience.	I do not enjoy exercising
Mood modification: Unspecified	Refers to feeling o mood changes experienced by individual during and/or after exercising without any specification of the either positive or negative character of these experiences	I use exercise as a way of changing my mood (e.g. to get a buzz, to escape etc.)
Mood modification: Negative state	Relief from an unpleasant or negative subjective state is obtained as a consequence of exercising	After an exercise session I feel less anxious
Mood modification: Positive state	Pleasant or positive subjective experience that individual has as a consequence of exercising	I have experienced a feeling of euphoria or a "high" during or after an exercise session
Relapse	Refers to the tendency to repeat the same (or greater) amount of exercise after a certain time without doing the activity or after withdrawal from the activity (e.g., due to injury).	If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before
Rigid exercise pattern	Refers to when individual follow a rigid pattern to exercise (e.g. follow a plan regularly)	I follow a set routine for my exercise sessions e.g. walk or run the same route, particular exercises, same amount of time, and so on
Salience: Behaviour	When exercise becoming the most important thing in the individual's life so that the own behaviour aimed at ensuring a next exercise session	I would arrange or change my schedule participate in physical activity
Salience: Cognitive	Refers to strong presence of exercise in the individual's mind	Sometimes, I find that my mind wanders to thoughts about exercising

Salience: General	Refers more generally to the importance of exercise in the individual's life without no references to a particular thinking or behaviour	Physical activity is the high point in my day
Social norms	Reflects the social influence from other significant (e.g., on what they think or do about exercise) which could affect the individual's exercise behaviour.	My best friend likes to exercise
Striving for control	Individual try to keep a control about their load of training in order to improve their performance	I keep a record of my exercise performance, such as how long I work out, how far or fast I run / I frequently "push myself to the limits"
Tolerance	Refers to the need to increase the amount of exercise to achieve the desired effects or benefits	I continually increase my exercise frequency to achieve the desire effects/benefits
Withdrawal: Physical	Unpleasant physical effects that individual manifests when exercise is suddenly reduced or stopped (e.g., Insomnia, sluggish)	If I miss a day of exercise, I feel as if my muscles have atrophied
Withdrawal: Psychological	Unpleasant feeling states reported by individual when exercise is reduced or stopped (e.g., irritated, anxious, stressed)	If I cannot exercise I feel irritable
Withdrawal: Body image	Unpleasant feeling states by a negative perception of the body's appearance and reported by individual when exercise is reduced or stopped (e.g., outside the socially sanctioned body ideal)	When I miss an exercise session, I feel concerned about my body possibly getting out of shape

Estudio 3: Examining the reliability of the scores of self-report instruments assessing problematic exercise: A systematic review and meta-analysis

Appendix A: PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	1-4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4-5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	5
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-6; Figure1

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5-6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	NA
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6-8
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6-8
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6-8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	6-8 (Appendix C; Appendix D)
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8; Figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8; Tables 2-11
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	NA
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Appendix E
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	8-15; Table 1
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Appendix D
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	8-15; Tables 2-11; Appendix C

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	15-24
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	24-25
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	25-27
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Title page

Appendix B. Search Strategy

WOS Core Collection (n = 1197)	**ScieLO (n = 46)**	**Medline (n = 862)**	**Current Contents Connect (n = 675)**	**PsycINFO (n = 802)**	**Dissertations & Theses Global (n = 267)**
1. Problematic exercise /	1. Problematic exercise /	1. Problematic exercise /	1. Problematic exercise /	1. Problematic exercise /	1. Problematic exercise /
2. Morbid exercise /	2. Morbid exercise /	2. Morbid exercise /	2. Morbid exercise /	2. Morbid exercise /	2. Morbid exercise /
3. Exercise addiction /	3. Exercise addiction /	3. Exercise addiction /	3. Exercise addiction /	3. Exercise addiction /	3. Exercise addiction /
4. Exercise Addiction Inventory /	4. Exercise Addiction Inventory /	4. Exercise Addiction Inventory /	4. Exercise Addiction Inventory /	4. Exercise Addiction Inventory /	4. Exercise Addiction Inventory /
5. Exercise dependence /	5. Exercise dependence /	5. Exercise dependence /	5. Exercise dependence /	5. Exercise dependence /	5. Exercise dependence /
6. Exercise Dependence Scale /	6. Exercise Dependence Scale /	6. Exercise Dependence Scale /	6. Exercise Dependence Scale /	6. Exercise Dependence Scale /	6. Exercise Dependence Scale /
7. Compulsive exercise /	7. Compulsive exercise /	7. Compulsive exercise /	7. Compulsive exercise /	7. Compulsive exercise /	7. Compulsive exercise /
8. Compulsive Exercise Test /	8. Compulsive Exercise Test /	8. Compulsive Exercise Test /	8. Compulsive Exercise Test /	8. Compulsive Exercise Test /	8. Compulsive Exercise Test /
9. Compulsive physical activity /	9. Compulsive physical activity /	9. Compulsive physical activity /	9. Compulsive physical activity /	9. Compulsive physical activity /	9. Compulsive physical activity /
10. Obligatory exercise /	10. Obligatory exercise /	10. Obligatory exercise /	10. Obligatory exercise /	10. Obligatory exercise /	10. Obligatory exercise /
11. Obligatory Exercise Questionnaire /	11. Obligatory Exercise Questionnaire /	11. Obligatory Exercise Questionnaire /	11. Obligatory Exercise Questionnaire /	11. Obligatory Exercise Questionnaire /	11. Obligatory Exercise Questionnaire /
12. Commitment to exercise /	12. Commitment to exercise /	12. Commitment to exercise /	12. Commitment to exercise /	12. Commitment to exercise /	12. Commitment to exercise /
13. Commitment to Exercise Scale /	13. Commitment to Exercise Scale /	13. Commitment to Exercise Scale /	13. Commitment to Exercise Scale /	13. Commitment to Exercise Scale /	13. Commitment to Exercise Scale /
14. Excessive exercise /	14. Excessive exercise /	14. Excessive exercise /	14. Excessive exercise /	14. Excessive exercise /	14. Excessive exercise /
15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14	1. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14	15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14
16. Limit 14 to English language	1. Limit 14 to English language	16. Limit 14 to English language	16. Limit 14 to English language	16. Limit 14 to English language and Spanish language	16. Limit 14 to English language and Spanish language, Title, Abstract, Keywords

Appendix C: Sensitivity analysis by PE

Results from the sensitivity analyses (i.e., by conducting systematic reanalysis while removing studies one at a time) showed that the pooled estimates resulting from the 27 meta-analyses conducted were not significantly modified when specific data were removed one at a time therefore suggesting the robustness of the results.

CES-Likert

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Teixeira et al. (2010)	0.8772	31.9685	0.0000	0.8603	0.8920	39.8706	0.0000	0.0264	76.3444	4.2273
Aruguete et al. (2012)	0.8746	26.2499	0.0000	0.8535	0.8926	44.9499	0.0000	0.0411	82.0344	5.5662
Martin & Racine (2017)	0.8677	27.4288	0.0000	0.8471	0.8855	29.8816	0.0002	0.0334	76.5406	4.2627
Mond e al. (2008)	0.8673	29.4133	0.0000	0.8482	0.8840	37.4617	0.0000	0.0286	76.8184	4.3138
McLaren (2000_female)	0.8709	24.7847	0.0000	0.8482	0.8902	47.2008	0.0000	0.0458	83.4130	6.0288
McLaren (2000_male)	0.8710	25.1442	0.0000	0.8487	0.8901	47.5235	0.0000	0.0450	84.0961	6.2877
Ditmer et al. (2018)	0.8716	26.6761	0.0000	0.8507	0.8896	47.7931	0.0000	0.0418	83.9243	6.2206
Goodwin et al. (2011b)	0.8750	26.2626	0.0000	0.8541	0.8930	31.7410	0.0001	0.0401	77.3719	4.4193
Taranis & Meyer (2011_study2)	0.8740	26.4216	0.0000	0.8530	0.8919	46.7964	0.0000	0.0415	83.3532	6.0072
McLaren et al. (2001)	0.8709	24.8082	0.0000	0.8482	0.8902	47.2368	0.0000	0.0457	83.4957	6.0590

CES-VAS

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Teixeira et al. (2010)	0.8772	31.9685	0.0000	0.8603	0.8920	39.8706	0.0000	0.0264	76.3444	4.2273
Aruguete et al. (2012)	0.8746	26.2499	0.0000	0.8535	0.8926	44.9499	0.0000	0.0411	82.0344	5.5662
Martin & Racine (2017)	0.8677	27.4288	0.0000	0.8471	0.8855	29.8816	0.0002	0.0334	76.5406	4.2627
Mond e al. (2008)	0.8673	29.4133	0.0000	0.8482	0.8840	37.4617	0.0000	0.0286	76.8184	4.3138
McLaren (2000_female)	0.8709	24.7847	0.0000	0.8482	0.8902	47.2008	0.0000	0.0458	83.4130	6.0288
McLaren (2000_male)	0.8710	25.1442	0.0000	0.8487	0.8901	47.5235	0.0000	0.0450	84.0961	6.2877
Ditmer et al. (2018)	0.8716	26.6761	0.0000	0.8507	0.8896	47.7931	0.0000	0.0418	83.9243	6.2206
Goodwin et al. (2011b)	0.8750	26.2626	0.0000	0.8541	0.8930	31.7410	0.0001	0.0401	77.3719	4.4193
Taranis & Meyer (2011_study2)	0.8740	26.4216	0.0000	0.8530	0.8919	46.7964	0.0000	0.0415	83.3532	6.0072
McLaren et al. (2001)	0.8709	24.8082	0.0000	0.8482	0.8902	47.2368	0.0000	0.0457	83.4957	6.0590

CET global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.8800	43.2723	0.0000	0.8679	0.8909	450.4404	0.0000	0.0979	93.1834	14.6701
Bezzina et al. (2019)	0.8790	43.8213	0.0000	0.8670	0.8899	448.1605	0.0000	0.0952	93.1039	14.5009
Brewsster et al. (2016)	0.8814	45.8707	0.0000	0.8701	0.8917	387.1389	0.0000	0.0868	92.3285	13.0352
Ditmer et al. (2018)	0.8799	43.6094	0.0000	0.8679	0.8908	450.8460	0.0000	0.0970	93.2264	14.7632
Donovan et al. (2020)	0.8792	43.2817	0.0000	0.8671	0.8902	439.8912	0.0000	0.0971	92.9763	14.2376
Fewell et al. (2018)	0.8785	44.2367	0.0000	0.8666	0.8893	441.5301	0.0000	0.0924	92.8926	14.0698
Goodwin et al. (2011)	0.8795	43.1614	0.0000	0.8673	0.8905	446.3593	0.0000	0.0979	92.9025	14.0894
Goodwin et al. (2011b)	0.8797	43.1459	0.0000	0.8676	0.8908	450.7528	0.0000	0.0982	92.8349	13.9566
Goodwin et al. (2011c)	0.8797	43.1389	0.0000	0.8676	0.8908	450.6736	0.0000	0.0982	92.6156	13.5421
Goodwin et al. (2012)	0.8797	43.1376	0.0000	0.8676	0.8908	450.6489	0.0000	0.0982	92.5519	13.4262
Goodwin et al. (2014)	0.8795	43.1619	0.0000	0.8673	0.8905	446.4468	0.0000	0.0979	92.9096	14.1035
Goodwin et al. (2014b)	0.8795	43.1920	0.0000	0.8673	0.8905	448.9507	0.0000	0.0978	93.1178	14.5302
Goodwin et al. (2014c_female)	0.8797	43.2360	0.0000	0.8676	0.8907	450.8774	0.0000	0.0980	93.2136	14.7353
Goodwin et al. (2014c_male)	0.8795	43.2688	0.0000	0.8674	0.8905	450.1492	0.0000	0.0977	93.2136	14.7353
Goodwin et al. (2016)	0.8795	43.1858	0.0000	0.8673	0.8905	448.6877	0.0000	0.0979	93.0956	14.4836
Gorrell et al. (2020)	0.8803	43.5376	0.0000	0.8683	0.8912	445.1730	0.0000	0.0969	93.0967	14.4858
Hefner et al. (2016)	0.8789	43.5333	0.0000	0.8668	0.8899	439.1241	0.0000	0.0957	93.0253	14.3374
Mathisen et al. (2018)	0.8805	43.7363	0.0000	0.8685	0.8913	444.9712	0.0000	0.0961	93.0982	14.4890
Meyer et al. (2016_clinical)	0.8781	44.6480	0.0000	0.8663	0.8889	397.1377	0.0000	0.0896	92.5387	13.4026
Meyer et al. (2016_control)	0.8800	43.2470	0.0000	0.8679	0.8910	450.2041	0.0000	0.0980	93.1305	14.5571
Naylor et al. (2011_ clinical)	0.8788	43.8378	0.0000	0.8668	0.8897	445.5779	0.0000	0.0946	93.0470	14.3822
Naylor et al. (2011_non clinical)	0.8793	43.4329	0.0000	0.8672	0.8903	449.4872	0.0000	0.0969	93.1984	14.7024
Noetel et al.(2016a)	0.8786	44.1434	0.0000	0.8667	0.8895	444.2166	0.0000	0.0931	92.9533	14.1910
Noetel et al.(2016b)	0.8785	44.2130	0.0000	0.8666	0.8894	442.2770	0.0000	0.0925	92.9079	14.1001
Patterson & Goodson (2017)	0.8805	43.7350	0.0000	0.8685	0.8913	443.5656	0.0000	0.0961	93.0770	14.4447
Patterson & Goodson (2018)	0.8805	43.7351	0.0000	0.8685	0.8913	443.7101	0.0000	0.0961	93.0792	14.4491
Prochnow et al. (2019)	0.8805	43.7350	0.0000	0.8685	0.8913	443.5656	0.0000	0.0961	93.0770	14.4447
Scharmer et al. (2020a)	0.8797	43.2143	0.0000	0.8676	0.8908	450.8705	0.0000	0.0980	93.1938	14.6924
Scharmer et al. (2020b)	0.8800	43.2584	0.0000	0.8679	0.8909	450.3337	0.0000	0.0979	93.1598	14.6194
Schlegl et al. (2018_anorexia)	0.8778	45.4227	0.0000	0.8662	0.8884	414.5191	0.0000	0.0861	92.3655	13.0984
Schlegl et al. (2018_bulimia)	0.8788	43.8474	0.0000	0.8668	0.8897	444.6283	0.0000	0.0944	93.0305	14.3483
Schlegl et al. (2018_healty controls)	0.8801	43.4518	0.0000	0.8681	0.8910	449.9316	0.0000	0.0974	93.2111	14.7298
Shu et al. (2019)	0.8795	43.2122	0.0000	0.8674	0.8905	449.5036	0.0000	0.0978	93.1638	14.6280
Taranis & Meyer (2010b).1	0.8797	43.1681	0.0000	0.8676	0.8908	450.8321	0.0000	0.0981	93.0756	14.4417
Taranis & Meyer (2010b).2	0.8811	44.8550	0.0000	0.8695	0.8917	401.0810	0.0000	0.0910	92.6170	13.5446
Taranis & Meyer (2011_study1)	0.8817	47.3594	0.0000	0.8708	0.8917	372.8302	0.0000	0.0809	91.8546	12.2769
Taranis & Meyer (2011_study2)	0.8806	44.0788	0.0000	0.8688	0.8914	445.8994	0.0000	0.0948	93.0627	14.4148
Taranis & Meyer (2011_study3)	0.8814	45.9813	0.0000	0.8701	0.8917	430.8505	0.0000	0.0867	92.4642	13.2700
Valetine et al. (2018)	0.8799	43.3573	0.0000	0.8679	0.8909	450.6999	0.0000	0.0977	93.2330	14.7775
Young et al. (2016)	0.8788	43.8500	0.0000	0.8668	0.8897	444.3690	0.0000	0.0944	93.0264	14.3398
Young et al. (2018)	0.8788	43.8500	0.0000	0.8668	0.8897	444.3690	0.0000	0.0944	93.0264	14.3398
Arrante (2019)	0.8803	43.5771	0.0000	0.8683	0.8912	448.5220	0.0000	0.0968	93.1729	14.6475
Buchman (2019)	0.8790	43.5720	0.0000	0.8670	0.8900	447.0547	0.0000	0.0959	93.1264	14.5483
Matthews (2010)	0.8803	43.5351	0.0000	0.8683	0.8912	444.6428	0.0000	0.0969	93.0846	14.4604
Schamer (2018)	0.8792	43.3068	0.0000	0.8671	0.8902	445.3435	0.0000	0.0971	93.1053	14.5040
Taranis (2010_study5)	0.8801	43.4431	0.0000	0.8681	0.8911	449.8492	0.0000	0.0974	93.2080	14.7231
Taranis (2010_study6)	0.8803	43.5766	0.0000	0.8683	0.8912	448.5013	0.0000	0.0968	93.1724	14.6465
Turning (2016)	0.8801	43.3847	0.0000	0.8681	0.8911	448.6753	0.0000	0.0975	93.1549	14.6089

CET-Avoidance

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Goodwin et al. (2011b)	0.9083	24.5807	0.0000	0.8891	0.9242	567.7994	0.0000	0.2293	95.6059	22.7580
Limburg et al. (2019)	0.9069	24.2222	0.0000	0.8872	0.9232	600.4290	0.0000	0.2339	96.1769	26.1569
Marin et al. (2020)	0.9065	24.2709	0.0000	0.8868	0.9228	599.4505	0.0000	0.2325	96.2125	26.4024
Matthews (2010)	0.9088	24.9070	0.0000	0.8899	0.9245	579.6639	0.0000	0.2242	95.9410	24.6368
Meyer et al. (2016_clinical)	0.9038	25.5773	0.0000	0.8849	0.9196	461.9096	0.0000	0.2017	95.4719	22.0841
Meyer et al. (2016_control)	0.9069	24.1971	0.0000	0.8872	0.9232	599.3417	0.0000	0.2341	96.0725	25.4613
Noetel et al.(2016a)	0.9057	24.5132	0.0000	0.8861	0.9219	596.1283	0.0000	0.2265	96.1410	25.9137
Noetel et al.(2016b)	0.9056	24.4989	0.0000	0.8860	0.9218	594.5750	0.0000	0.2263	96.1297	25.8379
Plateau et al. (2014)	0.9083	24.5820	0.0000	0.8891	0.9242	579.3221	0.0000	0.2293	95.7843	23.7206
Sauchelli et al. (2016)	0.9038	25.5576	0.0000	0.8849	0.9196	491.1195	0.0000	0.2021	95.5308	22.3754
Scharmer et al. (2020a)	0.9069	24.2107	0.0000	0.8872	0.9232	600.1073	0.0000	0.2340	96.1460	25.9471
Schlegl et al. (2018_healty controls)	0.9085	24.7432	0.0000	0.8894	0.9243	596.3204	0.0000	0.2272	96.1129	25.7264
Taranis & Meyer (2010a)	0.9089	25.0450	0.0000	0.8901	0.9245	592.4530	0.0000	0.2224	96.0403	25.2547
Taranis & Meyer (2010b).1	0.9096	25.6937	0.0000	0.8915	0.9248	531.0583	0.0000	0.2114	95.6558	23.0190
Taranis & Meyer (2011_study1)	0.9088	24.9095	0.0000	0.8899	0.9245	572.0638	0.0000	0.2241	95.8772	24.2552
Taranis & Meyer (2011_study3)	0.9091	25.2155	0.0000	0.8905	0.9246	588.8210	0.0000	0.2196	95.9859	24.9125
Taranis (2010_study6)	0.9085	24.7427	0.0000	0.8894	0.9243	595.8317	0.0000	0.2271	96.1062	25.6818
Badau & Badau (2018)	0.9069	24.2098	0.0000	0.8872	0.9232	600.0712	0.0000	0.2340	96.1425	25.9237
Goodwin et al. (2016)	0.9077	24.3319	0.0000	0.8881	0.9238	599.9773	0.0000	0.2330	96.0197	25.1240
Power (2020)	0.9082	24.6020	0.0000	0.8890	0.9241	597.8186	0.0000	0.2293	96.1362	25.8811
Schlegl et al. (2018_anorexia)	0.9048	24.8143	0.0000	0.8853	0.9209	568.7107	0.0000	0.2177	95.9231	24.5281
Schlegl et al. (2018_bulimia)	0.9056	24.4889	0.0000	0.8859	0.9218	592.7753	0.0000	0.2262	96.1176	25.7572
Taranis & Meyer (2010b).2	0.9065	24.1907	0.0000	0.8867	0.9228	588.9713	0.0000	0.2332	95.9736	24.8362
Taranis & Meyer (2011_study2)	0.9091	25.2187	0.0000	0.8905	0.9246	588.2802	0.0000	0.2195	95.9818	24.8868
Taranis (2010_study5)	0.9069	24.2482	0.0000	0.8872	0.9232	600.7978	0.0000	0.2336	96.2110	26.3921
Vrabel & Bratland-Sanda (2019)	0.9039	25.4921	0.0000	0.8849	0.9197	538.6686	0.0000	0.2037	95.6450	22.9621
Young et al. (2016)	0.9049	24.7851	0.0000	0.8855	0.9211	584.9373	0.0000	0.2190	95.9946	24.9660

CET-Weight control

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.8227	25.4758	0.0000	0.7975	0.8448	131.2184	0.0000	0.0751	87.8371	8.2217
Goodwin et al. (2011b)	0.8189	21.7576	0.0000	0.7888	0.8448	162.2497	0.0000	0.1054	89.7272	9.7344
Goodwin et al. (2016)	0.8165	21.3383	0.0000	0.7855	0.8429	174.2389	0.0000	0.1084	90.9437	11.0421
Limburg et al. (2019)	0.8170	21.4470	0.0000	0.7862	0.8433	175.4045	0.0000	0.1080	91.3251	11.5276
Marin et al. (2020)	0.8160	21.5393	0.0000	0.7853	0.8422	174.7905	0.0000	0.1069	91.4069	11.6372
Matthews (2010)	0.8175	21.4564	0.0000	0.7868	0.8438	175.3974	0.0000	0.1080	91.1114	11.2503
Meyer et al. (2016_clinical)	0.8188	21.7748	0.0000	0.7887	0.8447	171.4491	0.0000	0.1054	90.8144	10.8866
Meyer et al. (2016_control)	0.8159	21.3491	0.0000	0.7849	0.8424	172.4694	0.0000	0.1079	91.0020	11.1136
Noetel et al.(2016a)	0.8121	22.5718	0.0000	0.7828	0.8375	167.3083	0.0000	0.0941	90.4303	10.4497
Noetel et al.(2016b)	0.8117	22.6976	0.0000	0.7825	0.8370	164.9260	0.0000	0.0922	90.2303	10.2358
Plateau et al. (2014)	0.8165	21.3125	0.0000	0.7855	0.8430	173.2689	0.0000	0.1086	90.4732	10.4967
Power (2020)	0.8193	22.0776	0.0000	0.7896	0.8447	172.3389	0.0000	0.1031	91.0427	11.1641
Scharmer et al. (2020a)	0.8207	22.8575	0.0000	0.7923	0.8453	160.2939	0.0000	0.0957	90.2113	10.2158
Taranis & Meyer (2010a)	0.8154	21.5443	0.0000	0.7848	0.8417	173.9125	0.0000	0.1063	91.3437	11.5523
Taranis & Meyer (2011_study1)	0.8119	22.2897	0.0000	0.7821	0.8376	134.3373	0.0000	0.0947	89.7964	9.8005
Taranis & Meyer (2011_study2)	0.8126	22.1525	0.0000	0.7827	0.8384	164.9365	0.0000	0.0975	90.6124	10.6523
Taranis & Meyer (2011_study3)	0.8154	21.5285	0.0000	0.7847	0.8417	173.7641	0.0000	0.1063	91.3329	11.5379
Taranis (2010_study5)	0.8141	21.7028	0.0000	0.7836	0.8403	170.1786	0.0000	0.1033	91.0776	11.2077
Taranis (2010_study6)	0.8148	21.5803	0.0000	0.7841	0.8411	172.1085	0.0000	0.1051	91.2195	11.3889
Vrabel & Bratland-Sanda (2019)	0.8213	23.4349	0.0000	0.7936	0.8453	159.0166	0.0000	0.0909	89.8860	9.8873
Young et al. (2016)	0.8165	21.5673	0.0000	0.7859	0.8427	175.2545	0.0000	0.1071	91.4375	11.6788

CET-Mood improvement

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.8117	21.0574	0.0000	0.7801	0.8388	182.5792	0.0000	0.1023	90.9603	11.0623
Goodwin et al. (2011b)	0.8104	20.6357	0.0000	0.7779	0.8381	183.8251	0.0000	0.1056	89.9151	9.9158
Goodwin et al. (2016)	0.8073	20.5853	0.0000	0.7746	0.8353	180.8115	0.0000	0.1041	90.7822	10.8486
Limburg et al. (2019)	0.8112	20.9396	0.0000	0.7793	0.8385	185.0310	0.0000	0.1034	91.1612	11.3138
Meyer et al. (2016_clinical)	0.8051	21.1608	0.0000	0.7732	0.8325	163.3312	0.0000	0.0961	90.2114	10.2160
Noetel et al.(2016a)	0.8113	21.2677	0.0000	0.7800	0.8382	186.0701	0.0000	0.1015	91.2590	11.4404
Noetel et al.(2016b)	0.8115	21.2478	0.0000	0.7801	0.8384	185.7193	0.0000	0.1015	91.2316	11.4046
Plateau et al. (2014)	0.8142	22.1022	0.0000	0.7842	0.8399	133.9621	0.0000	0.0926	89.2013	9.2604
Power (2020)	0.8111	20.9683	0.0000	0.7793	0.8384	185.7109	0.0000	0.1034	91.2516	11.4307
Taranis & Meyer (2011_study1)	0.8059	20.8861	0.0000	0.7736	0.8336	170.9092	0.0000	0.0997	90.5050	10.5318
Taranis (2010_study5)	0.8127	21.5083	0.0000	0.7818	0.8392	181.9718	0.0000	0.0987	90.8923	10.9797
Vrabel & Bratland-Sanda (2019)	0.8008	25.1492	0.0000	0.7741	0.8244	134.5246	0.0000	0.0619	86.1059	7.1973
Young et al. (2016)	0.8066	20.9509	0.0000	0.7745	0.8341	184.0583	0.0000	0.1008	91.1410	11.2880
Matthews (2010)	0.8098	20.6104	0.0000	0.7773	0.8376	187.1230	0.0000	0.1058	91.1241	11.2665
Meyer et al. (2016_control)	0.8086	20.5224	0.0000	0.7759	0.8366	186.4872	0.0000	0.1059	91.0270	11.1446
Scharmer et al. (2020a)	0.8067	20.7267	0.0000	0.7742	0.8346	180.9888	0.0000	0.1023	90.9733	11.0782
Taranis & Meyer (2010a)	0.8132	21.7981	0.0000	0.7828	0.8393	180.9029	0.0000	0.0962	90.7261	10.7830
Taranis & Meyer (2011_study2)	0.8070	20.8061	0.0000	0.7747	0.8347	184.6725	0.0000	0.1024	91.2273	11.3990
Taranis & Meyer (2011_study3)	0.8077	20.7379	0.0000	0.7752	0.8354	185.8859	0.0000	0.1037	91.3334	11.5386
Taranis (2010_study6)	0.8134	21.8423	0.0000	0.7830	0.8395	179.3939	0.0000	0.0957	90.6344	10.6774

CET-Lack of enjoyment

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.7850	19.7862	0.0000	0.7496	0.8154	134.5941	0.0000	0.0819	86.2625	7.2793
Goodwin et al. (2011b)	0.7815	18.1355	0.0000	0.7425	0.8146	137.8107	0.0000	0.0979	86.3028	7.3008
Meyer et al. (2016_clinical)	0.7850	19.7304	0.0000	0.7495	0.8154	126.9402	0.0000	0.0822	85.9360	7.1104
Noetel et al.(2016a)	0.7765	17.9280	0.0000	0.7367	0.8102	154.9317	0.0000	0.1002	89.0100	9.0991
Noetel et al.(2016b)	0.7764	17.8567	0.0000	0.7364	0.8103	154.8016	0.0000	0.1005	89.0119	9.1008
Scharmer et al. (2020a)	0.7780	17.6380	0.0000	0.7376	0.8122	155.2948	0.0000	0.1027	88.7502	8.8890
Taranis & Meyer (2010a)	0.7768	17.7366	0.0000	0.7366	0.8109	154.8908	0.0000	0.1016	89.0145	9.1029
Taranis & Meyer (2011_study1)	0.7792	17.7097	0.0000	0.7390	0.8132	154.9386	0.0000	0.1022	88.1482	8.4375
Taranis & Meyer (2011_study2)	0.7803	18.0651	0.0000	0.7411	0.8136	154.2644	0.0000	0.0994	88.7359	8.8778
Matthews (2010)	0.7691	18.9194	0.0000	0.7312	0.8016	116.3296	0.0000	0.0812	85.9571	7.1210
Power (2020)	0.7779	17.7263	0.0000	0.7377	0.8120	155.3332	0.0000	0.1022	88.9831	9.0769
Goodwin et al. (2016)	0.7786	17.6413	0.0000	0.7382	0.8128	155.3572	0.0000	0.1028	88.2639	8.5207
Meyer et al. (2016_control)	0.7714	18.1726	0.0000	0.7320	0.8051	128.0072	0.0000	0.0910	87.1065	7.7559
Taranis & Meyer (2011_study3)	0.7807	18.1595	0.0000	0.7417	0.8138	153.8100	0.0000	0.0985	88.6589	8.8175
Vrabel & Bratland-Sanda (2019)	0.7687	19.1893	0.0000	0.7314	0.8008	128.9559	0.0000	0.0787	86.0281	7.1572
Young et al. (2016)	0.7744	17.8979	0.0000	0.7345	0.8083	152.5044	0.0000	0.0981	88.7241	8.8685
Taranis (2010_study5)	0.7761	17.6976	0.0000	0.7358	0.8103	154.2115	0.0000	0.1014	88.9356	9.0380
Taranis (2010_study6)	0.7768	17.6937	0.0000	0.7364	0.8109	154.7753	0.0000	0.1019	88.9798	9.0743

CET-Rigidity

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.7753	29.8627	0.0000	0.7522	0.7963	83.2008	0.0000	0.0364	74.6900	3.9510
Goodwin et al. (2011b)	0.7729	27.8714	0.0000	0.7479	0.7954	89.4750	0.0000	0.0426	75.1315	4.0211
Goodwin et al. (2016)	0.7746	28.9805	0.0000	0.7507	0.7962	84.3118	0.0000	0.0390	75.3769	4.0612
Matthews (2010)	0.7748	29.2571	0.0000	0.7512	0.7962	84.7966	0.0000	0.0382	75.3987	4.0648
Meyer et al. (2016_clinical)	0.7685	28.5424	0.0000	0.7440	0.7906	84.2535	0.0000	0.0388	75.4730	4.0771
Meyer et al. (2016_control)	0.7722	27.8771	0.0000	0.7473	0.7947	91.8582	0.0000	0.0427	77.2120	4.3883
Noetel et al.(2016a)	0.7705	28.6501	0.0000	0.7462	0.7925	91.4732	0.0000	0.0407	77.4272	4.4301
Noetel et al.(2016b)	0.7704	28.5644	0.0000	0.7460	0.7924	91.3055	0.0000	0.0407	77.4055	4.4259
Power (2020)	0.7735	28.6689	0.0000	0.7493	0.7954	90.4524	0.0000	0.0407	77.1392	4.3743
Sauchelli et al. (2016)	0.7706	27.8912	0.0000	0.7456	0.7931	91.1548	0.0000	0.0422	77.2586	4.3973
Scharmer et al. (2020a)	0.7700	28.0497	0.0000	0.7452	0.7925	90.3773	0.0000	0.0415	77.1286	4.3723
Schlegl et al. (2018_anorexia)	0.7733	28.4877	0.0000	0.7489	0.7953	90.8008	0.0000	0.0412	77.2730	4.4001
Schlegl et al. (2018_bulimia)	0.7716	28.3911	0.0000	0.7471	0.7938	92.0476	0.0000	0.0416	77.7360	4.4916
Schlegl et al. (2018_healty controls)	0.7747	29.5837	0.0000	0.7513	0.7959	87.4147	0.0000	0.0378	75.8832	4.1465
Taranis & Meyer (2010a)	0.7730	28.5739	0.0000	0.7487	0.7949	91.2603	0.0000	0.0411	77.4427	4.4332
Taranis & Meyer (2010b).1	0.7682	28.5832	0.0000	0.7437	0.7903	78.3360	0.0000	0.0383	74.3984	3.9060
Taranis & Meyer (2010b).2	0.7742	28.6654	0.0000	0.7501	0.7961	85.3294	0.0000	0.0400	75.5743	4.0941
Taranis & Meyer (2011_study1)	0.7667	29.8508	0.0000	0.7433	0.7879	74.5771	0.0000	0.0336	72.6585	3.6574
Taranis & Meyer (2011_study2)	0.7695	28.5501	0.0000	0.7451	0.7916	89.9656	0.0000	0.0400	76.9511	4.3386
Taranis & Meyer (2011_study3)	0.7709	28.2708	0.0000	0.7462	0.7931	91.7580	0.0000	0.0416	77.6529	4.4749
Taranis (2010_study5)	0.7682	29.1012	0.0000	0.7442	0.7899	86.7386	0.0000	0.0374	75.6714	4.1104
Taranis (2010_study6)	0.7731	28.5305	0.0000	0.7488	0.7951	91.0742	0.0000	0.0412	77.3787	4.4206
Young et al. (2016)	0.7683	29.2292	0.0000	0.7444	0.7900	87.2713	0.0000	0.0374	75.7902	4.1306

EAI global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alcaraz-Ibáñez et al. (2019)	0.7687	23.7162	0.0000	0.7389	0.7951	2237.3976	0.0000	0.1471	97.3261	37.3983
Babusa et al. (2015)	0.7689	23.7613	0.0000	0.7392	0.7952	2245.7272	0.0000	0.1469	97.3596	37.8725
Béres et al. (2017)	0.7714	24.5167	0.0000	0.7428	0.7968	2183.2184	0.0000	0.1396	97.2234	36.0155
Blackstone (2019)	0.7671	23.6755	0.0000	0.7372	0.7936	2258.4044	0.0000	0.1463	97.3348	37.5202
Bureau et al. (2017)	0.7685	23.6938	0.0000	0.7387	0.7948	2246.6229	0.0000	0.1472	97.3441	37.6521
Bureau et al. (2019)	0.7682	23.7869	0.0000	0.7385	0.7945	2257.4873	0.0000	0.1466	97.3817	38.1922
Cook et al. (2018)	0.7666	23.7751	0.0000	0.7369	0.7930	2257.8454	0.0000	0.1449	97.3468	37.6908
Ertl et al. (2017)	0.7668	23.7072	0.0000	0.7370	0.7933	2258.0383	0.0000	0.1456	97.3360	37.5379
Fernández & Fernández-Río (2019)	0.7706	24.1977	0.0000	0.7416	0.7964	2198.5548	0.0000	0.1428	97.2779	36.7361
Fernández-Río et al. (2020)	0.7682	23.7008	0.0000	0.7384	0.7946	2255.3090	0.0000	0.1471	97.3757	38.1051
Forbes (2019_sample1)	0.7668	23.7056	0.0000	0.7370	0.7933	2258.0070	0.0000	0.1456	97.3330	37.4951
Forbes (2019_sample2)	0.7639	24.5562	0.0000	0.7351	0.7896	2184.8652	0.0000	0.1326	97.0502	33.9010
Griffiths et al. (2005)	0.7662	23.8087	0.0000	0.7365	0.7926	2256.0054	0.0000	0.1439	97.3186	37.2939
Hopkins (2014)	0.7662	23.8059	0.0000	0.7365	0.7925	2255.4427	0.0000	0.1438	97.3125	37.2090
Kotyuk et al. (2018)	0.7679	23.6443	0.0000	0.7381	0.7944	2227.2876	0.0000	0.1473	97.0643	34.0639
Kovacsik et al. (2018)	0.7706	24.1970	0.0000	0.7416	0.7964	2201.6125	0.0000	0.1428	97.2803	36.7689
Kovacsik et al. (2020)	0.7706	24.2347	0.0000	0.7416	0.7964	2233.0965	0.0000	0.1426	97.3003	37.0410
Li et al. (2016)	0.7620	25.9929	0.0000	0.7347	0.7864	1730.2462	0.0000	0.1159	96.4954	28.5343
lichtenstein & Jensen (2016)	0.7691	23.7855	0.0000	0.7395	0.7954	2226.6872	0.0000	0.1467	97.3229	37.3535
lichtenstein et al. (2012)	0.7705	24.1405	0.0000	0.7414	0.7963	2179.3667	0.0000	0.1433	97.2685	36.6101
lichtenstein et al. (2014_fitness)	0.7697	23.9321	0.0000	0.7402	0.7958	2243.0498	0.0000	0.1455	97.3497	37.7318
lichtenstein et al. (2014_football)	0.7708	24.3206	0.0000	0.7419	0.7964	2239.0088	0.0000	0.1418	97.2923	36.9321
lichtenstein et al. (2017)	0.7680	23.6585	0.0000	0.7381	0.7944	2253.1932	0.0000	0.1472	97.3377	37.5610
Marmet et al. (2019)	0.7638	24.6049	0.0000	0.7350	0.7895	1397.7820	0.0000	0.1319	96.4579	28.2320
Mayolas et al. (2020)	0.7668	23.6892	0.0000	0.7369	0.7932	2256.0285	0.0000	0.1457	97.1506	35.0950
Mónok et al. (2012)	0.7694	23.8289	0.0000	0.7398	0.7956	2227.9950	0.0000	0.1463	97.3307	37.4633
Nogueira et al. (2019)	0.7636	24.7713	0.0000	0.7350	0.7891	2217.2555	0.0000	0.1301	97.0371	33.7502
Petty (2010)	0.7674	23.6830	0.0000	0.7376	0.7939	2258.1599	0.0000	0.1466	97.3663	37.9690
Raggatt et al. (2018)	0.7699	23.9778	0.0000	0.7405	0.7959	2240.3680	0.0000	0.1450	97.3417	37.6177
Rokcs et al. (2017)	0.7693	23.8551	0.0000	0.7397	0.7955	2249.3069	0.0000	0.1462	97.3655	37.9583
Rudolph (2017)	0.7689	23.7437	0.0000	0.7392	0.7953	2215.0063	0.0000	0.1470	97.2819	36.7904
Schou-Andreassen et al. (2013)	0.7668	23.7171	0.0000	0.7370	0.7933	2258.1585	0.0000	0.1456	97.3476	37.7022
Schüler et al. (2014)	0.7698	24.0334	0.0000	0.7405	0.7958	2250.2840	0.0000	0.1447	97.3480	37.7079
Schüler et al. (2018)	0.7693	23.8345	0.0000	0.7398	0.7955	2237.8430	0.0000	0.1463	97.3473	37.6976
Sicilia et al. (2013)	0.7698	23.9193	0.0000	0.7403	0.7959	2206.2352	0.0000	0.1455	97.3035	37.0856
Sicilia et al. (2017a)	0.7699	23.9748	0.0000	0.7405	0.7959	2233.1051	0.0000	0.1450	97.3333	37.4999
Sicilia et al. (2017b)	0.7703	24.0803	0.0000	0.7411	0.7962	2208.8375	0.0000	0.1440	97.2988	37.0210
Sicilia et al. (2020a)	0.7716	24.6131	0.0000	0.7431	0.7970	2102.1681	0.0000	0.1385	97.1676	35.3058
Szabo et al. (2013)	0.7682	23.6932	0.0000	0.7384	0.7946	2254.6462	0.0000	0.1472	97.3718	38.0491
Szabo et al. (2018)	0.7696	23.8719	0.0000	0.7401	0.7957	2217.2712	0.0000	0.1459	97.3166	37.2668
Terry et al. (2004)	0.7662	23.8087	0.0000	0.7365	0.7926	2256.0054	0.0000	0.1439	97.3186	37.2939
Trott et al. (2020)	0.7689	23.7405	0.0000	0.7392	0.7953	2184.7642	0.0000	0.1470	97.2077	35.8124

EDQ global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Grandi et al. (2013)	0.8530	41.0109	0.0000	0.8389	0.8659	25.5385	0.0044	0.0145	62.6732	2.6790
Hausenblas &Downs (2002a_study 1)	0.8643	27.7571	0.0000	0.8438	0.8822	65.4996	0.0000	0.0469	84.4011	6.4107
Odgen et al (1997)	0.8637	27.0583	0.0000	0.8425	0.8820	66.3961	0.0000	0.0492	84.1814	6.3217
Zmijewski & Howard (2003_female)	0.8601	27.0570	0.0000	0.8387	0.8787	68.5477	0.0000	0.0489	85.7049	6.9954
Zmijewski & Howard (2003_male)	0.8591	27.5716	0.0000	0.8380	0.8774	66.2374	0.0000	0.0463	84.9720	6.6542
Bishop (2009)	0.8625	27.0759	0.0000	0.8413	0.8809	69.9489	0.0000	0.0500	86.0465	7.1667
Heaney et al. (2010)	0.8599	26.8410	0.0000	0.8382	0.8786	66.9457	0.0000	0.0490	85.2104	6.7615
Hall et al. (2009)	0.8636	27.1033	0.0000	0.8425	0.8819	67.7446	0.0000	0.0492	84.8569	6.6036
Martin et al. (2008)	0.8619	26.4347	0.0000	0.8400	0.8807	70.0766	0.0000	0.0515	85.5292	6.9105
Serrao (2010)	0.8619	26.4325	0.0000	0.8400	0.8807	70.0765	0.0000	0.0515	85.5210	6.9066
MacLaren & Best (2007)	0.8628	26.6593	0.0000	0.8412	0.8814	69.6123	0.0000	0.0509	85.3234	6.8136
Ruby (2008)	0.8657	29.6672	0.0000	0.8466	0.8824	57.7200	0.0000	0.0403	82.2676	5.6394

EDQ-Interference

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7505	10.3975	0.0000	0.6759	0.8079	47.3811	0.0000	0.0918	88.3347	8.5725
Grandi et al. (2013)	0.7615	13.7027	0.0000	0.7073	0.8057	25.8375	0.0001	0.0498	78.9586	4.7525
Odgen et al (1997)	0.7268	10.6805	0.0000	0.6533	0.7847	25.8627	0.0001	0.0716	82.5946	5.7453
Zmijewski & Howard (2003_female)	0.7416	9.9080	0.0000	0.6623	0.8023	49.7254	0.0000	0.0978	89.4075	9.4406
Zmijewski & Howard (2003_male)	0.7416	9.8880	0.0000	0.6621	0.8024	49.7217	0.0000	0.0980	89.3551	9.3942
Hall et al. (2009)	0.7497	10.1802	0.0000	0.6732	0.8083	46.3251	0.0000	0.0946	87.2917	7.8689
Forrest et al. (2016)	0.7241	11.7019	0.0000	0.6577	0.7777	40.9293	0.0000	0.0594	83.9424	6.2276

EDQ-Positive reward

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7940	6.5055	0.0000	0.6684	0.8720	72.8122	0.0000	0.2808	96.0549	25.3478
Odgen et al (1997)	0.7863	6.2607	0.0000	0.6536	0.8682	75.2647	0.0000	0.2874	95.1370	20.5634
Zmijewski & Howard (2003_male)	0.8204	12.1532	0.0000	0.7631	0.8639	35.2091	0.0000	0.0870	88.7277	8.8713
Zmijewski & Howard (2003_female)	0.7772	6.3891	0.0000	0.6469	0.8595	73.2407	0.0000	0.2634	96.0063	25.0395
Grandi et al. (2013)	0.7593	7.8222	0.0000	0.6560	0.8315	34.4891	0.0000	0.1504	92.1716	12.7740
Hall et al. (2009)	0.7905	6.3509	0.0000	0.6606	0.8707	73.6861	0.0000	0.2870	95.5686	22.5660

EDQ-Withdrawal

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7874	15.6925	0.0000	0.7420	0.8248	22.1934	0.0005	0.0429	76.8195	4.3140
Grandi et al. (2013)	0.7529	17.8064	0.0000	0.7118	0.7881	12.9960	0.0234	0.0210	59.6879	2.4806
Hall et al. (2009)	0.7755	11.9223	0.0000	0.7130	0.8244	32.7050	0.0000	0.0768	83.9373	6.2256
Forrest et al. (2016)	0.7734	12.1254	0.0000	0.7119	0.8217	35.1371	0.0000	0.0757	86.2000	7.2464
Odgen et al (1997)	0.7659	11.6324	0.0000	0.7010	0.8167	33.8574	0.0000	0.0754	82.4156	5.6868
Zmijewski & Howard (2003_female)	0.7735	12.0403	0.0000	0.7115	0.8221	35.0514	0.0000	0.0763	86.0655	7.1765
Zmijewski & Howard (2003_male)	0.7750	12.1469	0.0000	0.7137	0.8231	34.5410	0.0000	0.0753	85.8087	7.0466

EDQ-Weight control

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7223	12.3898	0.0000	0.6599	0.7733	18.6929	0.0009	0.0401	77.6722	4.4787
Odgen et al (1997)	0.7005	17.1262	0.0000	0.6562	0.7391	7.2604	0.1228	0.0097	39.8746	1.6632
Zmijewski & Howard (2003_female)	0.7083	14.0663	0.0000	0.6536	0.7543	15.7745	0.0033	0.0263	70.5902	3.4002
Zmijewski & Howard (2003_male)	0.7305	14.3134	0.0000	0.6775	0.7748	15.9496	0.0031	0.0297	72.8458	3.6827
Grandi et al. (2013)	0.7286	13.0753	0.0000	0.6700	0.7768	16.0001	0.0030	0.0352	73.3539	3.7529
Hall et al. (2009)	0.7290	13.0701	0.0000	0.6704	0.7772	15.3614	0.0040	0.0349	72.4086	3.6243

EDQ-Insight in to problem

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.6921	9.9407	0.0000	0.6116	0.7560	24.7865	0.0001	0.0567	83.0866	5.9125
Odgen et al (1997)	0.6694	11.7083	0.0000	0.6021	0.7253	10.9696	0.0269	0.0290	66.3800	2.9744
Zmijewski & Howard (2003_female)	0.6993	10.8330	0.0000	0.6263	0.7581	23.2341	0.0001	0.0492	81.7793	5.4883
Zmijewski & Howard (2003_male)	0.6723	11.6621	0.0000	0.6048	0.7284	19.7972	0.0005	0.0334	75.1276	4.0205
Grandi et al. (2013)	0.7036	11.2206	0.0000	0.6334	0.7603	19.1519	0.0007	0.0440	77.4941	4.4433
Hall et al. (2009)	0.7022	10.8548	0.0000	0.6294	0.7607	19.4842	0.0006	0.0471	77.9761	4.5405

EDQ-Social reason

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.6419	6.7827	0.0000	0.5182	0.7338	41.3545	0.0000	0.0991	88.4211	8.6364
Hall et al. (2009)	0.6039	5.3031	0.0000	0.4422	0.7187	53.3254	0.0000	0.1349	90.0108	10.0109
Odgen et al (1997)	0.5719	6.7192	0.0000	0.4517	0.6658	19.6111	0.0006	0.0617	78.8819	4.7353
Zmijewski & Howard (2003_female)	0.6251	5.7724	0.0000	0.4769	0.7313	51.3650	0.0000	0.1302	91.3516	11.5629
Zmijewski & Howard (2003_male)	0.5961	5.4858	0.0000	0.4416	0.7078	52.3281	0.0000	0.1220	90.7514	10.8125
Grandi et al. (2013)	0.6426	6.7761	0.0000	0.5187	0.7346	33.6396	0.0000	0.0983	87.2444	7.8397

EDQ-Health reason

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7681	7.7169	0.0000	0.6639	0.8400	55.6380	0.0000	0.1636	92.6540	13.6129
Hall et al. (2009)	0.7783	7.8554	0.0000	0.6772	0.8478	55.8484	0.0000	0.1663	91.7418	12.1092
Odgen et al (1997)	0.7871	8.6204	0.0000	0.6974	0.8502	41.0981	0.0000	0.1427	89.6223	9.6360
Zmijewski & Howard (2003_female)	0.7705	7.7740	0.0000	0.6674	0.8417	56.4510	0.0000	0.1650	93.0475	14.3833
Zmijewski & Howard (2003_male)	0.7924	9.8768	0.0000	0.7164	0.8481	48.0050	0.0000	0.1123	90.0263	10.0264
Grandi et al. (2013)	0.7409	13.3525	0.0000	0.6841	0.7875	12.5251	0.0138	0.0349	70.8077	3.4256

EDQ-Stereotype behavior

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.6701	7.0701	0.0000	0.5513	0.7574	25.2827	0.0000	0.1025	85.5573	6.9239
Odgen et al (1997)	0.6850	8.6604	0.0000	0.5908	0.7574	15.1862	0.0043	0.0651	74.7156	3.9550
Zmijewski & Howard (2003_female)	0.6466	7.0661	0.0000	0.5284	0.7351	22.1384	0.0002	0.0897	84.5111	6.4562
Zmijewski & Howard (2003_male)	0.6222	9.4197	0.0000	0.5374	0.6914	12.5757	0.0135	0.0351	67.9332	3.1185
Grandi et al. (2013)	0.6547	6.6672	0.0000	0.5280	0.7474	22.5554	0.0002	0.1047	84.5278	6.4632
Hall et al. (2009)	0.6775	7.4690	0.0000	0.5660	0.7603	23.5131	0.0001	0.0918	82.1414	5.5995

EDS-21 global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Buchman (2019)	0.9305	50.7546	0.0000	0.9230	0.9373	3889.3657	0.0000	0.2336	97.7690	44.8221
Chittester (2007)	0.9303	50.3362	0.0000	0.9226	0.9371	3902.5495	0.0000	0.2369	97.7980	45.4131
Damon (2017)	0.9300	50.2727	0.0000	0.9223	0.9369	3906.5734	0.0000	0.2370	97.8037	45.5308
Hopkins (2014)	0.9308	51.6305	0.0000	0.9235	0.9375	3782.2003	0.0000	0.2260	97.6852	43.2009
Johnson (2020)	0.9295	50.7201	0.0000	0.9219	0.9364	3897.3928	0.0000	0.2317	97.7546	44.5360
Kessler (2010)	0.9299	50.2023	0.0000	0.9223	0.9368	3905.7955	0.0000	0.2373	97.7993	45.4396
Lewis (2012)	0.9301	50.1859	0.0000	0.9224	0.9370	3906.6242	0.0000	0.2377	97.7856	45.1592
North (2011)	0.9304	50.4152	0.0000	0.9228	0.9372	3856.6234	0.0000	0.2362	97.7556	44.5551
Parnell (2011)	0.9302	50.2657	0.0000	0.9225	0.9370	3905.4677	0.0000	0.2374	97.8027	45.5104
Scharmer et al. (2020a)	0.9299	50.1921	0.0000	0.9223	0.9368	3905.2368	0.0000	0.2374	97.7946	45.3434
Scott (2011)	0.9302	50.2940	0.0000	0.9225	0.9370	3906.0832	0.0000	0.2372	97.8044	45.5447
Alcaraz-Ibáñez et al. (2019)	0.9302	50.2320	0.0000	0.9225	0.9371	3898.1217	0.0000	0.2375	97.7701	44.8448
Alchieri et al. (2015_sample1)	0.9305	50.6535	0.0000	0.9229	0.9373	3870.4316	0.0000	0.2343	97.7664	44.7709
Allegre (2008)	0.9304	50.5321	0.0000	0.9228	0.9373	3848.2724	0.0000	0.2353	97.7574	44.5905
Back et al. (2019)	0.9306	50.9251	0.0000	0.9231	0.9374	3823.5714	0.0000	0.2320	97.7384	44.2156
Badau & Badau (2018)	0.9303	50.3215	0.0000	0.9226	0.9371	3897.5488	0.0000	0.2370	97.7904	45.2568
Berger et al. (2014)	0.9293	50.9279	0.0000	0.9218	0.9362	3374.3156	0.0000	0.2286	97.6218	42.0486
Blackstone (2020)	0.9299	50.1859	0.0000	0.9223	0.9368	3904.5209	0.0000	0.2374	97.7884	45.2161
Bratland-Sanda (2009)	0.9295	50.7315	0.0000	0.9219	0.9364	3896.4456	0.0000	0.2315	97.7526	44.4968
Bratland-Sanda (2011_control)	0.9302	50.3048	0.0000	0.9225	0.9370	3906.2034	0.0000	0.2372	97.8044	45.5466
Bratland-Sanda (2011_patients)	0.9295	50.7652	0.0000	0.9219	0.9363	3892.9708	0.0000	0.2309	97.7469	44.3824
Bratland-Sanda (2015_female)	0.9306	50.7953	0.0000	0.9230	0.9374	3765.5700	0.0000	0.2331	97.7257	43.9697
Bratland-Sanda (2015_male)	0.9305	50.6487	0.0000	0.9229	0.9373	3883.3299	0.0000	0.2344	97.7724	44.8908
Brosof et al. (2019)	0.9301	50.2038	0.0000	0.9224	0.9370	3906.7667	0.0000	0.2376	97.8011	45.4783
Cabrita et al. (2017)	0.9309	51.8190	0.0000	0.9235	0.9375	3657.7907	0.0000	0.2243	97.6557	42.6560
Chisttter & Hausenblas (2009)	0.9303	50.3362	0.0000	0.9226	0.9371	3902.5495	0.0000	0.2369	97.7980	45.4131
Compte et al. (2018)	0.9303	50.4209	0.0000	0.9227	0.9372	3892.1873	0.0000	0.2362	97.7860	45.1669
Condello et al. (2016)	0.9303	50.3261	0.0000	0.9226	0.9371	3899.9755	0.0000	0.2369	97.7942	45.3342
Cook & Hausenblas (2008)	0.9301	50.1894	0.0000	0.9224	0.9370	3906.6778	0.0000	0.2377	97.7916	45.2812
Cook & Hausenblas (2011)	0.9298	50.2555	0.0000	0.9221	0.9367	3889.8679	0.0000	0.2363	97.7752	44.9473
Cook & Luke (2017)	0.9301	50.2020	0.0000	0.9224	0.9370	3906.7607	0.0000	0.2376	97.8005	45.4656
Cook et al. (2011)	0.9299	50.1806	0.0000	0.9223	0.9368	3903.0907	0.0000	0.2374	97.7758	44.9608
Cook et al. (2013a)	0.9294	50.9078	0.0000	0.9218	0.9362	3784.1775	0.0000	0.2289	97.7047	43.5679
Cook et al. (2013b)	0.9299	50.1810	0.0000	0.9223	0.9368	3903.2757	0.0000	0.2374	97.7775	44.9936
Cook et al. (2013c)	0.9301	50.1759	0.0000	0.9224	0.9370	3905.3027	0.0000	0.2378	97.6465	42.4892
Cook et al. (2015a)	0.9295	50.7571	0.0000	0.9219	0.9363	3893.9187	0.0000	0.2311	97.7482	44.4099
Cook et al. (2015b)	0.9301	50.1768	0.0000	0.9224	0.9370	3905.8527	0.0000	0.2378	97.7018	43.5124
Costa et al. (2012b)	0.9303	50.3158	0.0000	0.9226	0.9371	3890.3758	0.0000	0.2370	97.7791	45.0260
Costa et al. (2013)	0.9299	50.1834	0.0000	0.9223	0.9368	3904.0130	0.0000	0.2374	97.7839	45.1252
Costa et al. (2014)	0.9305	50.7844	0.0000	0.9230	0.9373	3853.7162	0.0000	0.2332	97.7542	44.5275
Costa et al. (2015)	0.9302	50.2511	0.0000	0.9225	0.9371	3904.6222	0.0000	0.2374	97.7994	45.4414
Costa et al. (2016_female)	0.9299	50.1997	0.0000	0.9223	0.9368	3905.6909	0.0000	0.2373	97.7984	45.4221
Costa et al. (2016_male)	0.9298	50.2653	0.0000	0.9221	0.9367	3899.1363	0.0000	0.2363	97.7884	45.2164
Dorneles et al. (2019)	0.9307	51.0759	0.0000	0.9232	0.9374	3755.7672	0.0000	0.2307	97.7150	43.7645
Downs et al. (2004_study1)	0.9302	50.2360	0.0000	0.9225	0.9371	3901.3872	0.0000	0.2375	97.7849	45.1454
Downs et al. (2004_study2)	0.9304	50.5323	0.0000	0.9229	0.9373	3808.6859	0.0000	0.2353	97.7356	44.1625
Downs et al. (2013)	0.9299	50.1776	0.0000	0.9223	0.9368	3901.1821	0.0000	0.2374	97.7592	44.6260
Edmunds et al. (2006)	0.9303	50.4176	0.0000	0.9227	0.9372	3882.1668	0.0000	0.2362	97.7773	44.9909
Ergun & Guzel (2018)	0.9298	50.2513	0.0000	0.9221	0.9367	3872.2298	0.0000	0.2363	97.7504	44.4517
Gaetan et al. (2018)	0.9299	50.2132	0.0000	0.9223	0.9368	3906.0878	0.0000	0.2373	97.8015	45.4860
González-Cutre & Sicilia (2012a)	0.9302	50.2335	0.0000	0.9225	0.9371	3899.7051	0.0000	0.2375	97.7773	44.9899
González-Cutre & Sicilia (2012b)	0.9302	50.2335	0.0000	0.9225	0.9371	3899.7051	0.0000	0.2375	97.7773	44.9899
Hale et al. (2010)	0.9301	50.2081	0.0000	0.9224	0.9370	3906.7787	0.0000	0.2376	97.8023	45.5030
Hausenblas &Giacobbi Jr (2004)	0.9301	50.1871	0.0000	0.9224	0.9370	3906.6447	0.0000	0.2377	97.7879	45.2059
Hausenblas et al. (2008)	0.9298	50.3231	0.0000	0.9222	0.9367	3905.1964	0.0000	0.2362	97.7967	45.3867
Karademir (2020)	0.9302	50.2360	0.0000	0.9225	0.9371	3901.3599	0.0000	0.2375	97.7848	45.1429
Kelly et al. (2018)	0.9296	50.4575	0.0000	0.9220	0.9365	3755.6822	0.0000	0.2338	97.7051	43.5740
Kelly et al. (2020)	0.9296	50.4575	0.0000	0.9220	0.9365	3756.3838	0.0000	0.2338	97.7054	43.5801
Lamarche &Gammage (2012)	0.9301	50.1959	0.0000	0.9224	0.9370	3906.7322	0.0000	0.2377	97.7975	45.4036
Latorre-Román et al. (2015)	0.9301	50.2233	0.0000	0.9224	0.9370	3906.8043	0.0000	0.2375	97.8046	45.5502
Latorre-Román et al. (2016)	0.9302	50.2544	0.0000	0.9225	0.9371	3904.8910	0.0000	0.2374	97.8005	45.4645
Levallius et al. (2020)	0.9296	50.4566	0.0000	0.9220	0.9365	3840.3383	0.0000	0.2338	97.7449	44.3431
Liu et al (2018)	0.9308	51.3475	0.0000	0.9233	0.9375	3794.5002	0.0000	0.2284	97.7069	43.6099
Lukás et al. (2019)	0.9303	50.4192	0.0000	0.9227	0.9372	3888.2178	0.0000	0.2362	97.7825	45.0968
Maclntyre et al. (2020_black men)	0.9296	50.4516	0.0000	0.9220	0.9365	3897.7517	0.0000	0.2343	97.7766	44.9754
Maclntyre et al. (2020_black women)	0.9298	50.2585	0.0000	0.9221	0.9367	3894.4049	0.0000	0.2363	97.7816	45.0784
Maclntyre et al. (2020_white men)	0.9294	50.8574	0.0000	0.9218	0.9363	3868.5873	0.0000	0.2296	97.7288	44.0296
Maclntyre et al. (2020_white women)	0.9296	50.4560	0.0000	0.9220	0.9365	3859.2282	0.0000	0.2339	97.7541	44.5266
Maselli et al. (2018)	0.9309	51.9686	0.0000	0.9236	0.9375	3644.2402	0.0000	0.2231	97.6437	42.4398
Menczel et al. (2017)	0.9304	50.4139	0.0000	0.9228	0.9372	3798.1876	0.0000	0.2362	97.7076	43.6215
Miller & Mesagno (2014)	0.9302	50.2725	0.0000	0.9225	0.9370	3905.6820	0.0000	0.2373	97.8034	45.5251
Müller et al. (2013)	0.9296	50.4578	0.0000	0.9220	0.9365	3684.9190	0.0000	0.2338	97.6732	42.9776
Müller et al. (2015a)	0.9304	50.5325	0.0000	0.9228	0.9372	3900.2183	0.0000	0.2355	97.7883	45.2150
Müller et al. (2015b)	0.9303	50.3330	0.0000	0.9226	0.9371	3901.9653	0.0000	0.2369	97.7972	45.3958
Orhan et al. (2019)	0.9294	50.8661	0.0000	0.9218	0.9362	3862.8720	0.0000	0.2295	97.7264	43.9837
Pinto et al. (2019)	0.9290	51.9212	0.0000	0.9216	0.9358	3710.7352	0.0000	0.2188	97.6087	41.8190
Pugh & Hadjistavropoulos (2011)	0.9298	50.2636	0.0000	0.9221	0.9367	3898.2982	0.0000	0.2363	97.7872	45.1919
Qesnel et al. (2017)	0.9298	50.2507	0.0000	0.9221	0.9367	3866.7369	0.0000	0.2363	97.7428	44.3019
Rankin et al. (2019)	0.9301	50.2105	0.0000	0.9224	0.9370	3906.7841	0.0000	0.2376	97.8029	45.5138
Reche-García et al. (2020)	0.9304	50.5320	0.0000	0.9228	0.9373	3863.1362	0.0000	0.2353	97.7657	44.7568
Rogers et al. (2018)	0.9296	50.4567	0.0000	0.9220	0.9365	3834.9135	0.0000	0.2338	97.7422	44.2915
Schamer (2018)	0.9299	50.1881	0.0000	0.9223	0.9368	3904.8386	0.0000	0.2374	97.7912	45.2728
Sicilia et al. (2011)	0.9302	50.2336	0.0000	0.9225	0.9371	3899.7600	0.0000	0.2375	97.7775	44.9950
Sicilia et al. (2020b)	0.9306	50.9227	0.0000	0.9231	0.9374	3832.2765	0.0000	0.2320	97.7408	44.2637
Soler et al. (2013)	0.9304	50.5314	0.0000	0.9228	0.9372	3890.0490	0.0000	0.2353	97.7814	45.0733
Szabo et al. (2019)	0.9290	51.9212	0.0000	0.9216	0.9358	3710.7352	0.0000	0.2188	97.6087	41.8190
Terry et al. (2004)	0.9298	50.2656	0.0000	0.9221	0.9367	3899.2575	0.0000	0.2363	97.7886	45.2199
Tornero-quiñones et al. (2019)	0.9302	50.2448	0.0000	0.9225	0.9371	3903.8681	0.0000	0.2375	97.7961	45.3742
White et al. (2020)	0.9301	50.2215	0.0000	0.9224	0.9370	3906.8021	0.0000	0.2375	97.8045	45.5467
Yildiz et al. (2020)	0.9305	50.6576	0.0000	0.9229	0.9373	3843.0336	0.0000	0.2342	97.7548	44.5387

EDS-21 Tolerance

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8588	34.9628	0.0000	0.8424	0.8734	628.8485	0.0000	0.1195	93.6733	15.8060
Alchieri et al. (2015_sample2)	0.8577	33.9112	0.0000	0.8407	0.8728	655.1690	0.0000	0.1266	93.9316	16.4788
Allegre (2008)	0.8563	33.5136	0.0000	0.8391	0.8717	673.1431	0.0000	0.1285	94.0245	16.7350
Badau & Badau (2018)	0.8570	33.6476	0.0000	0.8399	0.8724	672.0795	0.0000	0.1283	94.1146	16.9911
Chang et al. (2018)	0.8581	34.2943	0.0000	0.8414	0.8731	658.1967	0.0000	0.1241	93.9393	16.4998
Compte et al. (2018)	0.8576	33.9237	0.0000	0.8406	0.8728	666.9436	0.0000	0.1266	94.0566	16.8253
Cook (2011)	0.8541	34.9474	0.0000	0.8375	0.8691	612.9454	0.0000	0.1153	93.4373	15.2376
Costa et al. (2012a)	0.8563	33.5134	0.0000	0.8391	0.8717	673.1391	0.0000	0.1285	94.0235	16.7321
Costa et al. (2012b)	0.8575	33.8000	0.0000	0.8404	0.8727	663.7628	0.0000	0.1273	94.0064	16.6844
Costa et al. (2013)	0.8577	33.9135	0.0000	0.8407	0.8728	659.7248	0.0000	0.1266	93.9789	16.6083
Costa et al. (2014)	0.8573	33.7195	0.0000	0.8402	0.8725	670.0390	0.0000	0.1279	94.0893	16.9184
Costa et al. (2015)	0.8558	33.6784	0.0000	0.8386	0.8712	670.8747	0.0000	0.1269	94.0813	16.8957
Divine et al. (2016)	0.8571	33.6298	0.0000	0.8399	0.8724	671.3549	0.0000	0.1284	94.0820	16.8977
Downs et al. (2004_study1)	0.8582	34.3222	0.0000	0.8415	0.8732	643.8275	0.0000	0.1238	93.8532	16.2686
Downs et al. (2004_study2)	0.8550	34.0457	0.0000	0.8379	0.8702	618.5369	0.0000	0.1228	93.6367	15.7151
González-Cutre & Sicilia (2012a)	0.8589	35.2059	0.0000	0.8427	0.8735	592.0886	0.0000	0.1178	93.5101	15.4085
Guíu-Carrera & Leyton-Román (2019)	0.8560	33.7646	0.0000	0.8388	0.8713	672.6920	0.0000	0.1269	94.1175	16.9996
Hale et al. (2010)	0.8574	33.8371	0.0000	0.8404	0.8726	670.4327	0.0000	0.1273	94.1049	16.9632
Hillet al. (2015)	0.8561	33.5815	0.0000	0.8388	0.8715	672.1444	0.0000	0.1278	94.0929	16.9289
Kern (2007_study1)	0.8575	33.9622	0.0000	0.8405	0.8726	671.4039	0.0000	0.1267	94.1067	16.9684
Kern (2007_study2)	0.8573	33.8805	0.0000	0.8403	0.8725	672.0114	0.0000	0.1272	94.1252	17.0217
Kern (2007_study3)	0.8563	33.5006	0.0000	0.8390	0.8717	672.7404	0.0000	0.1286	93.9201	16.4477
Lease & Bond (2013)	0.8547	34.3732	0.0000	0.8378	0.8698	643.3359	0.0000	0.1201	93.7157	15.9127
Lindwall & Palmeira (2019_portuguese)	0.8561	33.5768	0.0000	0.8388	0.8715	671.9999	0.0000	0.1279	94.0858	16.9084
Lindwall & Palmeira (2019_swedish)	0.8585	34.6887	0.0000	0.8419	0.8733	654.8954	0.0000	0.1215	93.8378	16.2280
Lu et al. (2012)	0.8573	33.7211	0.0000	0.8402	0.8725	670.1716	0.0000	0.1279	94.0923	16.9271
Maselli et al. (2018)	0.8563	33.5082	0.0000	0.8390	0.8717	673.0176	0.0000	0.1285	93.9917	16.6436
Mónok et al. (2012)	0.8563	33.5167	0.0000	0.8391	0.8717	673.1992	0.0000	0.1285	94.0392	16.7763
Müller et al. (2013)	0.8557	33.6215	0.0000	0.8385	0.8711	642.7270	0.0000	0.1269	93.5596	15.5270
Murray et al. (2012)	0.8561	33.6609	0.0000	0.8389	0.8715	673.1456	0.0000	0.1276	94.1376	17.0577
Nuzzo et al.(2013)	0.8554	33.7921	0.0000	0.8382	0.8707	659.7011	0.0000	0.1253	93.9275	16.4677
Paradis et al. (2013)	0.8573	33.6981	0.0000	0.8402	0.8726	666.7810	0.0000	0.1279	94.0129	16.7026
Parastatidou et al.(2012)	0.8560	33.5459	0.0000	0.8388	0.8714	669.8066	0.0000	0.1279	93.9756	16.5991
Parastatidou et al.(2014)	0.8573	33.6966	0.0000	0.8402	0.8726	666.3255	0.0000	0.1280	94.0022	16.6729
Parnell (2011)	0.8566	33.6404	0.0000	0.8394	0.8719	673.8039	0.0000	0.1282	94.1618	17.1285
Pollock (2014)	0.8550	34.0256	0.0000	0.8380	0.8703	653.5811	0.0000	0.1232	93.8539	16.2706
Pugh & Hadjistavropoulos (2011)	0.8547	34.3274	0.0000	0.8378	0.8699	654.1321	0.0000	0.1207	93.7831	16.0851
Reche-García et al. (2018b)	0.8566	33.5577	0.0000	0.8394	0.8720	673.7965	0.0000	0.1286	94.1276	17.0288
Reche-García et al. (2020)	0.8563	33.5253	0.0000	0.8391	0.8717	673.3145	0.0000	0.1285	94.0694	16.8618
Rogers et al. (2018)	0.8550	34.0379	0.0000	0.8379	0.8703	639.6521	0.0000	0.1229	93.7618	16.0302
Scharmer et al. (2020a)	0.8542	34.8479	0.0000	0.8376	0.8692	637.3268	0.0000	0.1163	93.5472	15.4971
Sicilia et al. (2011)	0.8589	35.2050	0.0000	0.8427	0.8735	592.7273	0.0000	0.1178	93.5120	15.4130
Soler et al. (2013)	0.8586	34.8206	0.0000	0.8421	0.8733	653.8007	0.0000	0.1207	93.8003	16.1298

EDS-21 Withdrawal

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8310	34.0743	0.0000	0.8128	0.8474	557.2407	0.0000	0.0994	92.3803	13.1238
Alchieri et al. (2015_sample2)	0.8314	34.5577	0.0000	0.8135	0.8476	512.6042	0.0000	0.0965	92.0692	12.6091
Allegre (2008)	0.8280	32.2573	0.0000	0.8086	0.8454	603.3107	0.0000	0.1097	92.9668	14.2183
Badau & Badau (2018)	0.8302	33.2374	0.0000	0.8115	0.8471	585.7013	0.0000	0.1045	92.7687	13.8288
Chang et al. (2018)	0.8297	32.8534	0.0000	0.8107	0.8468	594.6649	0.0000	0.1069	92.9283	14.1409
Compte et al. (2018)	0.8293	32.6450	0.0000	0.8102	0.8465	598.9015	0.0000	0.1081	93.0098	14.3058
Cook (2011)	0.8264	32.8101	0.0000	0.8072	0.8436	579.9501	0.0000	0.1045	92.6984	13.6957
Costa et al. (2012a)	0.8292	32.5240	0.0000	0.8100	0.8464	595.0439	0.0000	0.1087	92.9037	14.0918
Costa et al. (2012b)	0.8296	32.7416	0.0000	0.8105	0.8467	589.7097	0.0000	0.1075	92.8698	14.0249
Costa et al. (2013)	0.8292	32.5296	0.0000	0.8100	0.8464	596.9498	0.0000	0.1087	92.9518	14.1880
Costa et al. (2014)	0.8285	32.3413	0.0000	0.8092	0.8459	603.3704	0.0000	0.1097	93.0740	14.4383
Costa et al. (2015)	0.8285	32.3792	0.0000	0.8092	0.8459	603.5137	0.0000	0.1095	93.1066	14.5066
Divine et al. (2016)	0.8283	32.2900	0.0000	0.8089	0.8457	603.7555	0.0000	0.1098	93.0475	14.3834
Downs et al. (2004_study1)	0.8244	35.2336	0.0000	0.8065	0.8406	496.7849	0.0000	0.0878	91.4165	11.6502
Downs et al. (2004_study2)	0.8254	33.6924	0.0000	0.8067	0.8422	485.8339	0.0000	0.0977	92.0016	12.5025
González-Cutre & Sicilia (2012a)	0.8277	32.2745	0.0000	0.8083	0.8452	601.3413	0.0000	0.1094	92.9386	14.1614
Guíu-Carrera & Leyton-Román (2019)	0.8266	32.8954	0.0000	0.8075	0.8438	597.9580	0.0000	0.1048	92.8652	14.0157
Hale et al. (2010)	0.8283	32.3641	0.0000	0.8089	0.8456	603.7620	0.0000	0.1095	93.1163	14.5271
Hillet al. (2015)	0.8283	32.3119	0.0000	0.8089	0.8457	603.7586	0.0000	0.1097	93.0827	14.4566
Kern (2007_study1)	0.8298	33.0882	0.0000	0.8110	0.8468	598.4583	0.0000	0.1059	92.9285	14.1413
Kern (2007_study2)	0.8301	33.2883	0.0000	0.8114	0.8469	596.1338	0.0000	0.1046	92.8479	13.9818
Kern (2007_study3)	0.8285	32.2896	0.0000	0.8091	0.8459	602.4876	0.0000	0.1099	92.8452	13.9766
Lease & Bond (2013)	0.8264	32.8005	0.0000	0.8073	0.8437	585.3119	0.0000	0.1046	92.7473	13.7879
Lindwall & Palmeira (2019_portuguese)	0.8289	32.4607	0.0000	0.8097	0.8462	601.0748	0.0000	0.1091	93.0389	14.3656
Lindwall & Palmeira (2019_swedish)	0.8285	32.3836	0.0000	0.8092	0.8458	603.5244	0.0000	0.1095	93.1087	14.5111
Lu et al. (2012)	0.8300	33.1065	0.0000	0.8112	0.8470	587.6913	0.0000	0.1053	92.8135	13.9151
Mónok et al. (2012)	0.8290	32.4374	0.0000	0.8097	0.8463	598.9432	0.0000	0.1092	92.9527	14.1898
Müller et al. (2013)	0.8288	32.3360	0.0000	0.8094	0.8461	594.9894	0.0000	0.1097	92.4926	13.3202
Murray et al. (2012)	0.8276	32.4423	0.0000	0.8082	0.8449	602.6391	0.0000	0.1086	93.0801	14.4511
Nuzzo et al.(2013)	0.8267	32.5867	0.0000	0.8075	0.8441	588.3347	0.0000	0.1064	92.8143	13.9166
Paradis et al. (2013)	0.8283	32.2717	0.0000	0.8089	0.8457	603.7506	0.0000	0.1099	92.9897	14.2647
Parastatidou et al.(2012)	0.8283	32.2639	0.0000	0.8089	0.8457	603.7471	0.0000	0.1099	92.9472	14.1787
Parastatidou et al.(2014)	0.8290	32.4351	0.0000	0.8097	0.8463	598.5628	0.0000	0.1092	92.9372	14.1587
Parnell (2011)	0.8278	32.4034	0.0000	0.8085	0.8452	603.3030	0.0000	0.1090	93.1048	14.5027
Pollock (2014)	0.8271	32.4405	0.0000	0.8078	0.8445	596.4269	0.0000	0.1078	92.9325	14.1493
Pugh & Hadjistavropoulos (2011)	0.8278	32.3337	0.0000	0.8084	0.8452	602.8921	0.0000	0.1092	93.0761	14.4428
Reche-García et al. (2018b)	0.8289	32.4670	0.0000	0.8097	0.8462	601.3717	0.0000	0.1091	93.0506	14.3897
Reche-García et al. (2020)	0.8292	32.5311	0.0000	0.8100	0.8464	597.3276	0.0000	0.1087	92.9614	14.2073
Rogers et al. (2018)	0.8259	33.1578	0.0000	0.8070	0.8430	553.3935	0.0000	0.1017	92.4390	13.2258
Scharmer et al. (2020a)	0.8268	32.5882	0.0000	0.8076	0.8441	594.7367	0.0000	0.1065	92.8979	14.0804
Sicilia et al. (2011)	0.8277	32.2748	0.0000	0.8083	0.8452	601.3602	0.0000	0.1094	92.9403	14.1649
Soler et al. (2013)	0.8280	32.3484	0.0000	0.8087	0.8454	603.6377	0.0000	0.1094	93.1090	14.5116

EDS-21 Intention effects

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8812	32.0829	0.0000	0.8647	0.8957	903.4707	0.0000	0.1731	95.5949	22.7009
Alchieri et al. (2015_sample2)	0.8818	32.3389	0.0000	0.8655	0.8962	882.4303	0.0000	0.1710	95.4873	22.1596
Allegre (2008)	0.8826	33.0238	0.0000	0.8667	0.8966	835.8404	0.0000	0.1646	95.3268	21.3988
Badau & Badau (2018)	0.8816	32.2496	0.0000	0.8652	0.8960	899.0555	0.0000	0.1718	95.5897	22.6741
Chang et al. (2018)	0.8810	32.0553	0.0000	0.8644	0.8955	905.6567	0.0000	0.1732	95.6290	22.8783
Compte et al. (2018)	0.8825	32.9714	0.0000	0.8666	0.8966	879.1045	0.0000	0.1653	95.4332	21.8970
Cook (2011)	0.8785	33.5290	0.0000	0.8625	0.8925	820.7851	0.0000	0.1538	95.0557	20.2251
Costa et al. (2012a)	0.8807	32.0010	0.0000	0.8641	0.8953	905.9626	0.0000	0.1732	95.5482	22.4628
Costa et al. (2012b)	0.8816	32.2365	0.0000	0.8652	0.8960	893.6172	0.0000	0.1719	95.5411	22.4271
Costa et al. (2013)	0.8820	32.4580	0.0000	0.8657	0.8963	881.6432	0.0000	0.1699	95.4958	22.2015
Costa et al. (2014)	0.8821	32.5804	0.0000	0.8659	0.8963	886.0863	0.0000	0.1688	95.5096	22.2698
Costa et al. (2015)	0.8814	32.1811	0.0000	0.8649	0.8958	903.1820	0.0000	0.1724	95.6240	22.8519
Divine et al. (2016)	0.8794	32.4729	0.0000	0.8630	0.8939	880.8055	0.0000	0.1661	95.4183	21.8262
Downs et al. (2004_study1)	0.8798	32.2342	0.0000	0.8633	0.8943	890.4135	0.0000	0.1693	95.4801	22.1243
Downs et al. (2004_study2)	0.8807	31.9908	0.0000	0.8641	0.8953	905.9281	0.0000	0.1733	95.4588	22.0208
González-Cutre & Sicilia (2012a)	0.8820	32.4576	0.0000	0.8657	0.8963	874.0937	0.0000	0.1699	95.4615	22.0338
Guíu-Carrera & Leyton-Román (2019)	0.8824	32.9533	0.0000	0.8664	0.8965	896.2159	0.0000	0.1659	95.4883	22.1648
Hale et al. (2010)	0.8807	32.0626	0.0000	0.8642	0.8953	905.9992	0.0000	0.1729	95.6415	22.9434
Hillet al. (2015)	0.8798	32.2395	0.0000	0.8633	0.8943	896.6551	0.0000	0.1694	95.5270	22.3563
Kern (2007_study1)	0.8818	32.4733	0.0000	0.8655	0.8961	901.8496	0.0000	0.1702	95.5961	22.7073
Kern (2007_study2)	0.8818	32.4714	0.0000	0.8656	0.8961	901.4961	0.0000	0.1702	95.5941	22.6966
Kern (2007_study3)	0.8807	31.9917	0.0000	0.8641	0.8953	905.9327	0.0000	0.1733	95.4706	22.0778
Lease & Bond (2013)	0.8794	32.4707	0.0000	0.8630	0.8939	883.6249	0.0000	0.1662	95.4305	21.8841
Lindwall & Palmeira (2019_portuguese)	0.8831	33.6134	0.0000	0.8675	0.8968	847.5002	0.0000	0.1592	95.2489	21.0479
Lindwall & Palmeira (2019_swedish)	0.8812	32.1187	0.0000	0.8647	0.8957	904.7970	0.0000	0.1729	95.6364	22.9168
Lu et al. (2012)	0.8807	32.0273	0.0000	0.8641	0.8953	905.9889	0.0000	0.1731	95.6169	22.8151
Mónok et al. (2012)	0.8810	32.0232	0.0000	0.8644	0.8955	905.2144	0.0000	0.1733	95.5636	22.5407
Müller et al. (2013)	0.8793	32.4896	0.0000	0.8629	0.8938	775.2586	0.0000	0.1657	95.0534	20.2158
Murray et al. (2012)	0.8815	32.2892	0.0000	0.8652	0.8959	903.1558	0.0000	0.1717	95.6242	22.8532
North (2011)	0.8798	32.2311	0.0000	0.8632	0.8943	879.4691	0.0000	0.1692	95.4028	21.7524
Nuzzo et al.(2013)	0.8798	32.2345	0.0000	0.8633	0.8943	890.8860	0.0000	0.1693	95.4835	22.1412
Paradis et al. (2013)	0.8798	32.2331	0.0000	0.8632	0.8943	887.5637	0.0000	0.1692	95.4595	22.0240
Parastatidou et al.(2012)	0.8814	32.1402	0.0000	0.8649	0.8959	895.9411	0.0000	0.1726	95.5170	22.3066
Parastatidou et al.(2014)	0.8820	32.4577	0.0000	0.8657	0.8963	875.4015	0.0000	0.1699	95.4674	22.0624
Parnell (2011)	0.8796	32.4439	0.0000	0.8631	0.8940	898.3455	0.0000	0.1671	95.5092	22.2679
Pollock (2014)	0.8798	32.2363	0.0000	0.8633	0.8943	893.6669	0.0000	0.1693	95.5041	22.2427
Pugh & Hadjistavropoulos (2011)	0.8816	32.2563	0.0000	0.8652	0.8960	900.3519	0.0000	0.1718	95.6011	22.7330
Reche-García et al. (2018b)	0.8827	33.1301	0.0000	0.8668	0.8967	869.1862	0.0000	0.1637	95.3820	21.6543
Reche-García et al. (2020)	0.8825	32.8622	0.0000	0.8664	0.8965	861.6418	0.0000	0.1661	95.4048	21.7620
Reel et al. (2016)	0.8790	32.8455	0.0000	0.8628	0.8933	871.4361	0.0000	0.1616	95.3181	21.3590
Rogers et al. (2018)	0.8794	32.4802	0.0000	0.8630	0.8938	865.2584	0.0000	0.1659	95.3563	21.5344
Scharmer et al. (2020a)	0.8790	32.8353	0.0000	0.8628	0.8934	875.4373	0.0000	0.1618	95.3313	21.4194
Sicilia et al. (2011)	0.8820	32.4577	0.0000	0.8657	0.8963	874.3431	0.0000	0.1699	95.4626	22.0392

EDS-21 Lack of control

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8241	31.2320	0.0000	0.8038	0.8422	674.5539	0.0000	0.1211	93.8215	16.1850
Alchieri et al. (2015_sample2)	0.8248	31.7028	0.0000	0.8048	0.8427	638.7194	0.0000	0.1177	93.5782	15.5719
Allegre (2008)	0.8233	30.8811	0.0000	0.8028	0.8418	683.4137	0.0000	0.1234	93.8643	16.2981
Badau & Badau (2018)	0.8242	31.3261	0.0000	0.8040	0.8423	676.7216	0.0000	0.1205	93.8261	16.1971
Chang et al. (2018)	0.8217	30.8104	0.0000	0.8010	0.8402	688.6738	0.0000	0.1228	93.9411	16.5048
Compte et al. (2018)	0.8231	30.8560	0.0000	0.8025	0.8415	689.5624	0.0000	0.1237	93.9866	16.6295
Cook (2011)	0.8187	33.1495	0.0000	0.7995	0.8361	588.1557	0.0000	0.1022	92.7376	13.7696
Costa et al. (2012a)	0.8213	30.8688	0.0000	0.8006	0.8398	678.6587	0.0000	0.1217	93.7828	16.0844
Costa et al. (2012b)	0.8222	30.7107	0.0000	0.8015	0.8407	690.8592	0.0000	0.1239	93.9205	16.4487
Costa et al. (2013)	0.8219	30.7342	0.0000	0.8012	0.8405	689.2252	0.0000	0.1235	93.9051	16.4072
Costa et al. (2014)	0.8213	30.8818	0.0000	0.8007	0.8398	685.0790	0.0000	0.1218	93.8798	16.3395
Costa et al. (2015)	0.8247	31.7186	0.0000	0.8048	0.8426	673.1768	0.0000	0.1178	93.7207	15.9255
Divine et al. (2016)	0.8216	30.7912	0.0000	0.8009	0.8402	687.0904	0.0000	0.1228	93.8974	16.3865
Downs et al. (2004_study1)	0.8216	30.7854	0.0000	0.8009	0.8402	686.1917	0.0000	0.1228	93.8727	16.3204
Downs et al. (2004_study2)	0.8224	30.6911	0.0000	0.8017	0.8410	691.3728	0.0000	0.1242	93.7810	16.0797
Duffy et al. (2018)	0.8206	31.2043	0.0000	0.8001	0.8389	656.3996	0.0000	0.1183	93.6047	15.6366
González-Cutre & Sicilia (2012a)	0.8236	30.9561	0.0000	0.8031	0.8419	679.1846	0.0000	0.1230	93.8365	16.2246
Guíu-Carrera & Leyton-Román (2019)	0.8219	30.9136	0.0000	0.8013	0.8403	690.5731	0.0000	0.1226	93.9890	16.6361
Hale et al. (2010)	0.8238	31.1418	0.0000	0.8034	0.8420	685.5860	0.0000	0.1219	93.9266	16.4652
Hillet al. (2015)	0.8210	31.0049	0.0000	0.8005	0.8395	681.3273	0.0000	0.1205	93.8224	16.1876
Kern (2007_study1)	0.8238	31.2211	0.0000	0.8035	0.8420	687.8218	0.0000	0.1216	93.9385	16.4975
Kern (2007_study2)	0.8238	31.2208	0.0000	0.8035	0.8420	687.5203	0.0000	0.1216	93.9350	16.4880
Kern (2007_study3)	0.8222	30.6915	0.0000	0.8014	0.8407	690.3616	0.0000	0.1240	93.7856	16.0916
Lease & Bond (2013)	0.8193	32.3154	0.0000	0.7996	0.8371	633.6515	0.0000	0.1087	93.1738	14.6494
Lindwall & Palmeira (2019_portuguese)	0.8237	31.0502	0.0000	0.8033	0.8420	683.0603	0.0000	0.1224	93.9052	16.4075
Lindwall & Palmeira (2019_swedish)	0.8255	32.5223	0.0000	0.8062	0.8430	658.7297	0.0000	0.1122	93.4299	15.2205
Lu et al. (2012)	0.8231	30.8436	0.0000	0.8025	0.8416	689.1051	0.0000	0.1237	93.9710	16.5865
Mónok et al. (2012)	0.8260	32.9938	0.0000	0.8069	0.8431	586.3842	0.0000	0.1088	93.1114	14.5168
Müller et al. (2013)	0.8209	31.0072	0.0000	0.8003	0.8393	619.7306	0.0000	0.1201	93.3106	14.9489
Murray et al. (2012)	0.8218	30.8655	0.0000	0.8011	0.8403	690.1330	0.0000	0.1227	93.9798	16.6108
Nuzzo et al.(2013)	0.8219	30.7354	0.0000	0.8012	0.8405	689.2955	0.0000	0.1235	93.9096	16.4193
Paradis et al. (2013)	0.8219	30.7288	0.0000	0.8012	0.8405	688.8395	0.0000	0.1235	93.8803	16.3408
Parastatidou et al.(2012)	0.8234	30.8786	0.0000	0.8028	0.8418	682.3710	0.0000	0.1235	93.8414	16.2375
Parastatidou et al.(2014)	0.8233	30.8813	0.0000	0.8028	0.8418	683.5095	0.0000	0.1234	93.8664	16.3037
Parnell (2011)	0.8222	30.8142	0.0000	0.8016	0.8407	691.2485	0.0000	0.1236	94.0163	16.7121
Pollock (2014)	0.8219	30.7435	0.0000	0.8012	0.8405	689.6772	0.0000	0.1235	93.9341	16.4855
Pugh & Hadjistavropoulos (2011)	0.8229	30.8110	0.0000	0.8023	0.8414	690.5465	0.0000	0.1239	93.9988	16.6634
Reche-García et al. (2018b)	0.8231	30.8464	0.0000	0.8025	0.8415	689.2242	0.0000	0.1237	93.9751	16.5979
Reche-García et al. (2020)	0.8235	30.9620	0.0000	0.8031	0.8419	682.5808	0.0000	0.1230	93.8878	16.3607
Rogers et al. (2018)	0.8206	31.2043	0.0000	0.8001	0.8389	656.3996	0.0000	0.1183	93.6047	15.6366
Scharmer et al. (2020a)	0.8219	30.7604	0.0000	0.8012	0.8405	690.1565	0.0000	0.1234	93.9642	16.5679
Sicilia et al. (2011)	0.8236	30.9562	0.0000	0.8031	0.8419	679.2797	0.0000	0.1230	93.8379	16.2283
Soler et al. (2013)	0.8236	31.0646	0.0000	0.8032	0.8419	686.7672	0.0000	0.1224	93.9485	16.5247
Stenseng et al. (2015_study2)	0.8239	31.1346	0.0000	0.8036	0.8422	665.5897	0.0000	0.1217	93.7446	15.9861

EDS-21 Time

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8499	39.6358	0.0000	0.8351	0.8633	516.7822	0.0000	0.0845	91.4841	11.7428
Alchieri et al. (2015_sample2)	0.8503	40.2653	0.0000	0.8358	0.8635	479.2435	0.0000	0.0817	91.1150	11.2549
Allegre (2008)	0.8482	38.1031	0.0000	0.8328	0.8622	548.3235	0.0000	0.0910	91.9619	12.4407
Badau & Badau (2018)	0.8484	38.2382	0.0000	0.8330	0.8624	547.9763	0.0000	0.0906	92.0571	12.5899
Compte et al. (2018)	0.8482	38.1808	0.0000	0.8328	0.8622	549.3429	0.0000	0.0908	92.0910	12.6439
Cook (2011)	0.8468	38.4349	0.0000	0.8314	0.8608	539.8240	0.0000	0.0883	91.7997	12.1946
Costa et al. (2012a)	0.8480	38.0545	0.0000	0.8325	0.8620	549.7932	0.0000	0.0911	91.9672	12.4489
Costa et al. (2012b)	0.8491	38.6120	0.0000	0.8339	0.8629	535.2457	0.0000	0.0890	91.8365	12.2496
Costa et al. (2013)	0.8492	38.7923	0.0000	0.8341	0.8630	531.0757	0.0000	0.0882	91.7759	12.1594
Costa et al. (2014)	0.8484	38.2310	0.0000	0.8330	0.8624	547.7977	0.0000	0.0906	92.0487	12.5766
Costa et al. (2015)	0.8477	38.1556	0.0000	0.8323	0.8618	549.9010	0.0000	0.0907	92.0968	12.6532
Divine et al. (2016)	0.8468	38.4352	0.0000	0.8314	0.8608	541.1162	0.0000	0.0884	91.8256	12.2334
Downs et al. (2004_study1)	0.8468	38.4348	0.0000	0.8314	0.8608	539.2563	0.0000	0.0883	91.7885	12.1780
Downs et al. (2004_study2)	0.8474	38.0828	0.0000	0.8319	0.8615	546.2882	0.0000	0.0905	91.7609	12.1372
González-Cutre & Sicilia (2012a)	0.8482	38.1016	0.0000	0.8328	0.8622	548.2736	0.0000	0.0910	91.9552	12.4304
Guíu-Carrera & Leyton-Román (2019)	0.8480	38.3441	0.0000	0.8326	0.8619	549.9551	0.0000	0.0903	92.1172	12.6858
Hale et al. (2010)	0.8486	38.3829	0.0000	0.8333	0.8625	547.7496	0.0000	0.0901	92.0635	12.5999
Hillet al. (2015)	0.8469	38.4370	0.0000	0.8315	0.8608	543.5450	0.0000	0.0885	91.8773	12.3112
Kern (2007_study1)	0.8490	38.8509	0.0000	0.8339	0.8628	545.8805	0.0000	0.0884	91.9547	12.4296
Kern (2007_study2)	0.8492	38.9774	0.0000	0.8341	0.8629	544.5300	0.0000	0.0878	91.9029	12.3501
Kern (2007_study3)	0.8474	38.0844	0.0000	0.8319	0.8615	546.4883	0.0000	0.0905	91.7810	12.1670
Lease & Bond (2013)	0.8447	42.4544	0.0000	0.8308	0.8575	470.3671	0.0000	0.0693	89.8312	9.8340
Lindwall & Palmeira (2019_portuguese)	0.8488	38.4633	0.0000	0.8336	0.8627	543.4530	0.0000	0.0897	91.9686	12.4512
Lindwall & Palmeira (2019_swedish)	0.8469	38.4436	0.0000	0.8316	0.8609	545.8156	0.0000	0.0886	91.9317	12.3942
Lu et al. (2012)	0.8482	38.1568	0.0000	0.8328	0.8622	549.1827	0.0000	0.0909	92.0728	12.6148
Maselli et al. (2018)	0.8474	38.0947	0.0000	0.8319	0.8615	547.3920	0.0000	0.0905	91.8736	12.3056
Mónok et al. (2012)	0.8491	38.6120	0.0000	0.8339	0.8629	533.4087	0.0000	0.0890	91.8111	12.2116
Müller et al. (2013)	0.8459	39.3732	0.0000	0.8309	0.8596	413.8636	0.0000	0.0829	90.7081	10.7620
Murray et al. (2012)	0.8468	38.6564	0.0000	0.8315	0.8607	545.3511	0.0000	0.0876	91.8768	12.3103
Nuzzo et al.(2013)	0.8465	38.7547	0.0000	0.8312	0.8603	531.2297	0.0000	0.0865	91.6322	11.9505
Paradis et al. (2013)	0.8474	38.1056	0.0000	0.8319	0.8615	547.9582	0.0000	0.0904	91.9325	12.3955
Parastatidou et al.(2012)	0.8484	38.1829	0.0000	0.8330	0.8624	545.0266	0.0000	0.0907	91.9092	12.3597
Parastatidou et al.(2014)	0.8482	38.1038	0.0000	0.8328	0.8622	548.3434	0.0000	0.0910	91.9645	12.4448
Parnell (2011)	0.8493	39.0232	0.0000	0.8343	0.8630	542.6078	0.0000	0.0875	91.8629	12.2894
Pollock (2014)	0.8486	38.3237	0.0000	0.8333	0.8626	544.9253	0.0000	0.0902	91.9878	12.4809
Pugh & Hadjistavropoulos (2011)	0.8480	38.1415	0.0000	0.8325	0.8620	549.9092	0.0000	0.0909	92.0986	12.6560
Reche-García et al. (2018b)	0.8480	38.1178	0.0000	0.8325	0.8620	549.8940	0.0000	0.0909	92.0835	12.6319
Reche-García et al. (2020)	0.8501	39.9171	0.0000	0.8354	0.8634	505.4393	0.0000	0.0832	91.3401	11.5474
Rogers et al. (2018)	0.8471	38.2216	0.0000	0.8317	0.8611	543.2170	0.0000	0.0896	91.8339	12.2458
Scharmer et al. (2020a)	0.8469	38.4375	0.0000	0.8315	0.8608	543.8898	0.0000	0.0885	91.8851	12.3230
Sicilia et al. (2011)	0.8482	38.1020	0.0000	0.8328	0.8622	548.2870	0.0000	0.0910	91.9570	12.4332
Soler et al. (2013)	0.8491	38.7595	0.0000	0.8340	0.8629	543.1664	0.0000	0.0885	91.9291	12.3903
Stenseng et al. (2015_study2)	0.8489	38.4434	0.0000	0.8336	0.8628	534.4137	0.0000	0.0897	91.7994	12.1943

EDS-21 Reduction in other activities

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.7005	25.8225	0.0000	0.6718	0.7267	658.6454	0.0000	0.0988	92.1194	12.6894
Alchieri et al. (2015_sample2)	0.7034	25.0868	0.0000	0.6739	0.7303	692.0534	0.0000	0.1073	92.6217	13.5532
Allegre (2008)	0.7064	25.6692	0.0000	0.6776	0.7326	657.6889	0.0000	0.1038	92.4000	13.1578
Badau & Badau (2018)	0.7046	25.2174	0.0000	0.6753	0.7314	689.6031	0.0000	0.1070	92.7125	13.7222
Brosof et al. (2019)	0.7056	25.4480	0.0000	0.6765	0.7320	685.5164	0.0000	0.1055	92.6474	13.6006
Chang et al. (2018)	0.7035	25.1248	0.0000	0.6740	0.7303	692.1121	0.0000	0.1071	92.7306	13.7563
Compte et al. (2018)	0.7065	25.7456	0.0000	0.6778	0.7326	676.0348	0.0000	0.1033	92.4896	13.3149
Costa et al. (2012a)	0.7041	25.1165	0.0000	0.6746	0.7309	690.9483	0.0000	0.1074	92.6376	13.5826
Costa et al. (2012b)	0.7045	25.1685	0.0000	0.6751	0.7312	689.0529	0.0000	0.1072	92.6603	13.6246
Costa et al. (2013)	0.7041	25.1239	0.0000	0.6746	0.7309	691.2096	0.0000	0.1074	92.6761	13.6540
Costa et al. (2014)	0.7050	25.2799	0.0000	0.6757	0.7316	687.2346	0.0000	0.1066	92.6809	13.6629
Costa et al. (2015)	0.6998	26.3513	0.0000	0.6717	0.7255	660.2324	0.0000	0.0941	91.8277	12.2364
Divine et al. (2016)	0.7049	25.2370	0.0000	0.6755	0.7315	687.2247	0.0000	0.1068	92.6680	13.6388
Downs et al. (2004_study1)	0.7041	25.1239	0.0000	0.6746	0.7309	691.2120	0.0000	0.1074	92.6765	13.6546
Downs et al. (2004_study2)	0.7022	25.1960	0.0000	0.6728	0.7290	676.7035	0.0000	0.1053	92.3781	13.1200
Duffy et al. (2018)	0.6985	27.7243	0.0000	0.6718	0.7230	535.6208	0.0000	0.0829	90.6524	10.6979
González-Cutre & Sicilia (2012a)	0.7045	25.1624	0.0000	0.6751	0.7313	688.2356	0.0000	0.1072	92.6221	13.5540
Guíu-Carrera & Leyton-Román (2019)	0.7063	25.7621	0.0000	0.6776	0.7324	685.6191	0.0000	0.1035	92.5540	13.4300
Hale et al. (2010)	0.7027	25.1976	0.0000	0.6733	0.7294	690.5246	0.0000	0.1060	92.6867	13.6737
Hillet al. (2015)	0.7048	25.2472	0.0000	0.6755	0.7315	688.5722	0.0000	0.1068	92.6991	13.6969
Kern (2007_study1)	0.7061	25.7005	0.0000	0.6774	0.7323	685.9759	0.0000	0.1039	92.5787	13.4747
Kern (2007_study2)	0.7061	25.6701	0.0000	0.6773	0.7323	686.0171	0.0000	0.1041	92.5893	13.4940
Kern (2007_study3)	0.7030	25.0946	0.0000	0.6734	0.7298	689.3363	0.0000	0.1068	92.4916	13.3184
Lease & Bond (2013)	0.7028	25.1398	0.0000	0.6733	0.7296	690.1367	0.0000	0.1064	92.6549	13.6145
Lindwall & Palmeira (2019_portuguese)	0.7033	25.1155	0.0000	0.6737	0.7301	691.8173	0.0000	0.1070	92.7033	13.7048
Lindwall & Palmeira (2019_swedish)	0.7064	25.7295	0.0000	0.6777	0.7326	679.3500	0.0000	0.1035	92.5164	13.3625
Lu et al. (2012)	0.7030	25.1284	0.0000	0.6735	0.7299	691.3032	0.0000	0.1067	92.6932	13.6859
Magee et al. (2016)	0.7054	25.3539	0.0000	0.6762	0.7319	682.2163	0.0000	0.1061	92.6172	13.5450
Maselli et al. (2018)	0.7045	25.1593	0.0000	0.6751	0.7313	687.6382	0.0000	0.1073	92.5941	13.5027
Mónok et al. (2012)	0.7047	25.1950	0.0000	0.6753	0.7314	687.0566	0.0000	0.1071	92.6324	13.5730
Müller et al. (2013)	0.7006	25.7254	0.0000	0.6718	0.7269	553.9652	0.0000	0.0995	91.6753	12.0125
Müller et al. (2014_ patients ED)	0.7017	25.5985	0.0000	0.6727	0.7281	687.5220	0.0000	0.1025	92.4998	13.3330
Müller et al. (2014_clients of fitness)	0.7070	26.1652	0.0000	0.6788	0.7327	683.2112	0.0000	0.1008	92.3826	13.1278
Müller et al. (2014_sports studies)	0.7066	26.0108	0.0000	0.6782	0.7325	685.3181	0.0000	0.1020	92.4656	13.2725
Murray et al. (2012)	0.7057	25.5272	0.0000	0.6767	0.7321	686.9811	0.0000	0.1051	92.6433	13.5931
Nuzzo et al.(2013)	0.7047	25.1997	0.0000	0.6753	0.7314	687.9162	0.0000	0.1070	92.6601	13.6241
Paradis et al. (2013)	0.7059	25.4981	0.0000	0.6769	0.7323	669.7681	0.0000	0.1050	92.4981	13.3299
Parastatidou et al.(2012)	0.7045	25.1604	0.0000	0.6751	0.7313	687.8539	0.0000	0.1072	92.6042	13.5212
Parastatidou et al.(2014)	0.7041	25.1170	0.0000	0.6746	0.7309	690.9698	0.0000	0.1074	92.6408	13.5885
Pugh & Hadjistavropoulos (2011)	0.7007	25.7560	0.0000	0.6720	0.7270	672.5545	0.0000	0.0996	92.2328	12.8746
Reche-García et al. (2018b)	0.7048	25.2485	0.0000	0.6755	0.7315	688.6900	0.0000	0.1068	92.7017	13.7018
Reche-García et al. (2020)	0.7049	25.2334	0.0000	0.6755	0.7315	686.5086	0.0000	0.1068	92.6511	13.6074
Reel et al. (2016)	0.7026	25.1724	0.0000	0.6731	0.7294	689.1623	0.0000	0.1060	92.6413	13.5894
Rogers et al. (2018)	0.7008	25.6879	0.0000	0.6719	0.7271	648.6267	0.0000	0.1000	92.1273	12.7022
Scharmer et al. (2020a)	0.7052	25.3203	0.0000	0.6759	0.7318	686.6412	0.0000	0.1063	92.6751	13.6520
Sicilia et al. (2011)	0.7045	25.1626	0.0000	0.6751	0.7313	688.2660	0.0000	0.1072	92.6235	13.5566
Soler et al. (2013).1	0.7037	25.1538	0.0000	0.6743	0.7305	692.1413	0.0000	0.1071	92.7538	13.8003
Soler et al. (2013).2	0.7022	25.2705	0.0000	0.6729	0.7289	688.3836	0.0000	0.1050	92.6198	13.5498
Stenseng et al. (2015_study2)	0.7056	25.3958	0.0000	0.6765	0.7321	670.3343	0.0000	0.1057	92.4906	13.3166
Cook (2011)	0.7035	25.0971	0.0000	0.6739	0.7303	692.0810	0.0000	0.1072	92.6744	13.6507
North (2011)	0.7039	25.0941	0.0000	0.6744	0.7307	691.5988	0.0000	0.1075	92.5805	13.4779
Parnell (2011)	0.7047	25.2926	0.0000	0.6755	0.7314	690.6489	0.0000	0.1066	92.7392	13.7726
Pollock (2014)	0.7068	25.8344	0.0000	0.6782	0.7328	663.6825	0.0000	0.1026	92.3928	13.1455

EDS-21 Continuance

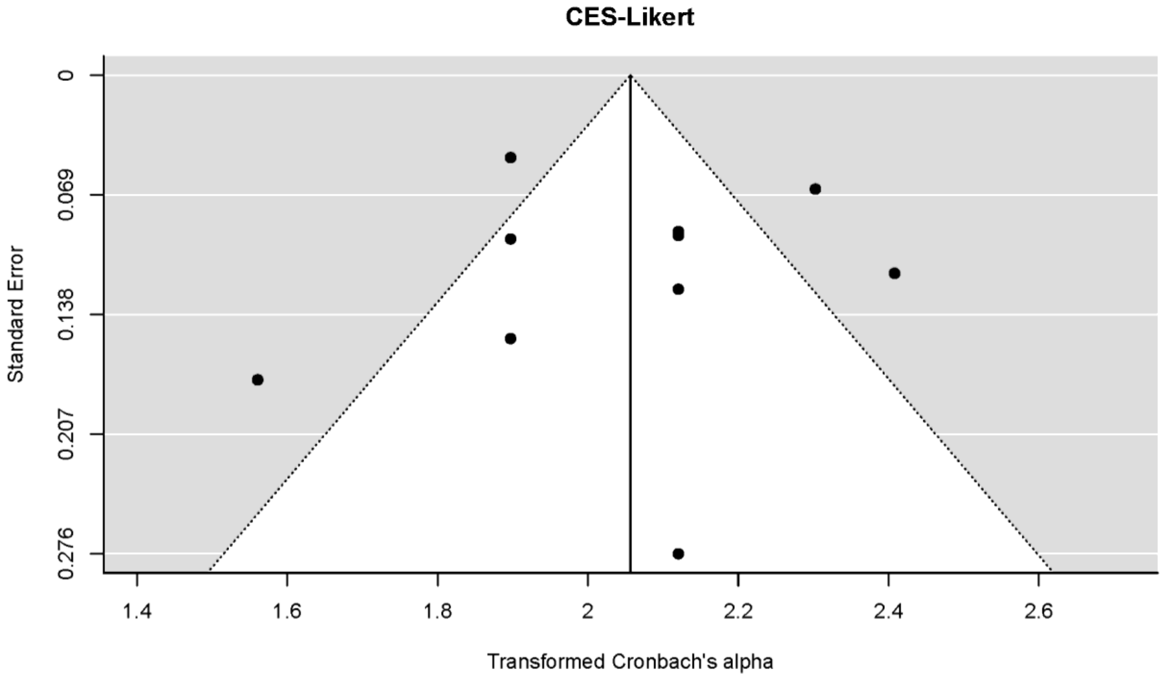
	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8324	32.9678	0.0000	0.8136	0.8492	592.8035	0.0000	0.1112	93.2027	14.7118
Alchieri et al. (2015_sample2)	0.8339	32.5559	0.0000	0.8149	0.8509	611.3019	0.0000	0.1155	93.3583	15.0565
Allegre (2008)	0.8354	33.0983	0.0000	0.8168	0.8521	592.1977	0.0000	0.1126	93.2090	14.7255
Badau & Badau (2018)	0.8374	35.5314	0.0000	0.8203	0.8529	551.9249	0.0000	0.0978	92.3906	13.1416
Chang et al. (2018)	0.8341	32.6331	0.0000	0.8152	0.8511	611.4422	0.0000	0.1153	93.4771	15.3307
Compte et al. (2018)	0.8349	32.8956	0.0000	0.8162	0.8517	607.6149	0.0000	0.1140	93.4126	15.1805
Cook (2011)	0.8323	32.9700	0.0000	0.8136	0.8492	589.6787	0.0000	0.1111	93.1767	14.6557
Costa et al. (2012a)	0.8359	33.5054	0.0000	0.8176	0.8524	574.9866	0.0000	0.1100	93.0598	14.4087
Costa et al. (2012b)	0.8362	33.7961	0.0000	0.8181	0.8525	571.4853	0.0000	0.1082	92.9922	14.2698
Costa et al. (2013)	0.8359	33.4931	0.0000	0.8176	0.8523	582.9570	0.0000	0.1101	93.1121	14.5182
Costa et al. (2014)	0.8350	32.8874	0.0000	0.8162	0.8518	606.4561	0.0000	0.1140	93.3889	15.1260
Costa et al. (2015)	0.8331	32.7102	0.0000	0.8142	0.8501	608.2500	0.0000	0.1139	93.4234	15.2055
Divine et al. (2016)	0.8327	32.7906	0.0000	0.8138	0.8497	599.7228	0.0000	0.1128	93.2911	14.9055
Downs et al. (2004_study1)	0.8315	33.6247	0.0000	0.8131	0.8481	560.1668	0.0000	0.1057	92.8448	13.9759
Downs et al. (2004_study2)	0.8319	33.2696	0.0000	0.8132	0.8486	535.6231	0.0000	0.1084	92.8218	13.9311
Duffy et al. (2018)	0.8330	32.6614	0.0000	0.8141	0.8500	600.7829	0.0000	0.1139	93.2726	14.8645
González-Cutre & Sicilia (2012a)	0.8346	32.6956	0.0000	0.8157	0.8515	607.9671	0.0000	0.1150	93.3349	15.0035
Guíu-Carrera & Leyton-Román (2019)	0.8349	33.0270	0.0000	0.8163	0.8516	609.7495	0.0000	0.1135	93.4439	15.2529
Hale et al. (2010)	0.8325	32.9556	0.0000	0.8137	0.8494	603.4609	0.0000	0.1116	93.3074	14.9419
Hillet al. (2015)	0.8327	32.7967	0.0000	0.8139	0.8497	602.9520	0.0000	0.1128	93.3319	14.9968
Kern (2007_study1)	0.8346	32.8954	0.0000	0.8159	0.8514	610.6363	0.0000	0.1142	93.4784	15.3337
Kern (2007_study2)	0.8345	32.8324	0.0000	0.8157	0.8513	610.9992	0.0000	0.1145	93.4919	15.3656
Kern (2007_study3)	0.8350	32.8680	0.0000	0.8163	0.8518	595.2441	0.0000	0.1140	93.1667	14.6342
Lease & Bond (2013)	0.8306	34.8722	0.0000	0.8128	0.8467	536.2442	0.0000	0.0969	92.2917	12.9731
Lindwall & Palmeira (2019_portuguese)	0.8327	32.7949	0.0000	0.8139	0.8497	602.2101	0.0000	0.1128	93.3223	14.9752
Lindwall & Palmeira (2019_swedish)	0.8336	32.6337	0.0000	0.8147	0.8506	610.9895	0.0000	0.1150	93.4830	15.3445
Lu et al. (2012)	0.8336	32.5956	0.0000	0.8147	0.8506	610.6954	0.0000	0.1151	93.4529	15.2740
Mónok et al. (2012)	0.8368	34.4887	0.0000	0.8191	0.8527	540.7906	0.0000	0.1039	92.6991	13.6970
Müller et al. (2013)	0.8341	32.5564	0.0000	0.8152	0.8511	611.0333	0.0000	0.1156	92.9432	14.1707
Murray et al. (2012)	0.8334	32.7088	0.0000	0.8146	0.8504	610.5814	0.0000	0.1145	93.4797	15.3367
Nuzzo et al.(2013)	0.8330	32.6698	0.0000	0.8141	0.8500	603.7231	0.0000	0.1139	93.3311	14.9951
Paradis et al. (2013)	0.8336	32.5607	0.0000	0.8146	0.8506	609.9466	0.0000	0.1152	93.3677	15.0777
Parastatidou et al.(2012)	0.8344	32.6267	0.0000	0.8155	0.8513	610.0486	0.0000	0.1153	93.3327	14.9986
Parastatidou et al.(2014)	0.8339	32.5579	0.0000	0.8149	0.8509	611.3119	0.0000	0.1155	93.3685	15.0795
Parnell (2011)	0.8347	32.8575	0.0000	0.8159	0.8515	610.2329	0.0000	0.1143	93.4710	15.3163
Pollock (2014)	0.8336	32.5796	0.0000	0.8147	0.8506	610.4602	0.0000	0.1152	93.4267	15.2131
Pugh & Hadjistavropoulos (2011)	0.8353	33.0915	0.0000	0.8167	0.8520	604.3234	0.0000	0.1128	93.3507	15.0393
Reche-García et al. (2018b)	0.8343	32.6689	0.0000	0.8155	0.8513	610.9155	0.0000	0.1152	93.4612	15.2934
Reche-García et al. (2020)	0.8348	32.7857	0.0000	0.8160	0.8516	606.7289	0.0000	0.1145	93.3675	15.0774
Rogers et al. (2018)	0.8330	32.6614	0.0000	0.8141	0.8500	600.7829	0.0000	0.1139	93.2726	14.8645
Scharmer et al. (2020a)	0.8336	32.6010	0.0000	0.8147	0.8506	610.7538	0.0000	0.1151	93.4593	15.2888
Sicilia et al. (2011)	0.8346	32.6959	0.0000	0.8157	0.8515	607.9947	0.0000	0.1150	93.3364	15.0070
Soler et al. (2013)	0.8351	32.9949	0.0000	0.8164	0.8518	607.4046	0.0000	0.1134	93.4053	15.1636

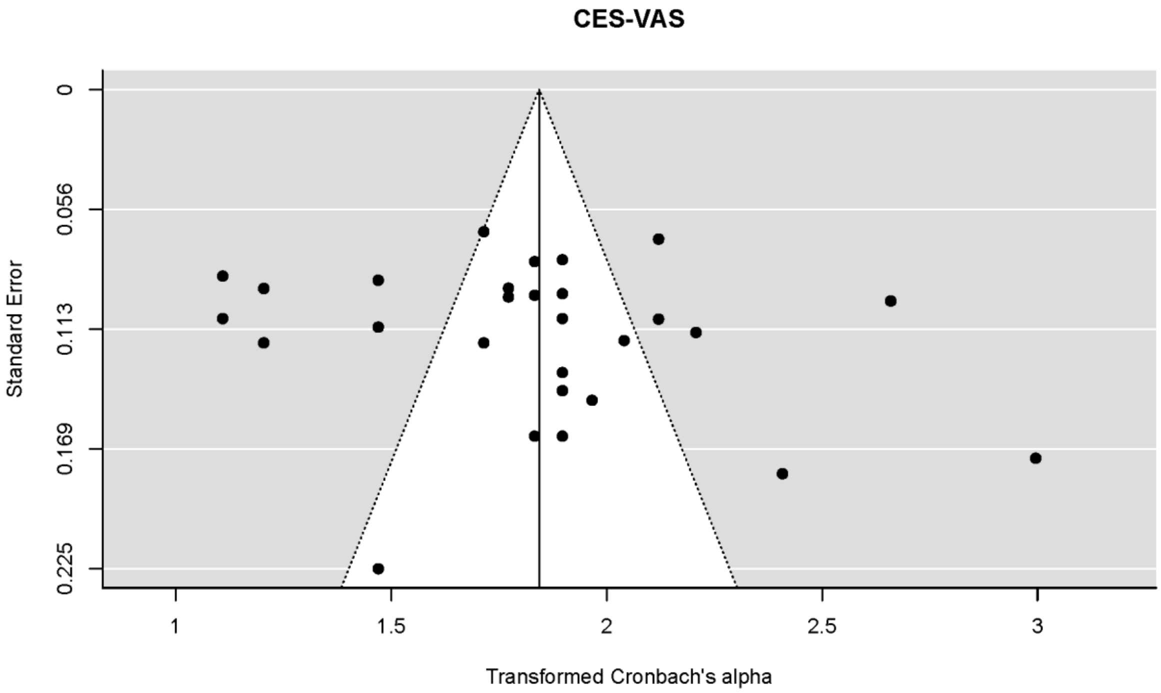
OEQ global score

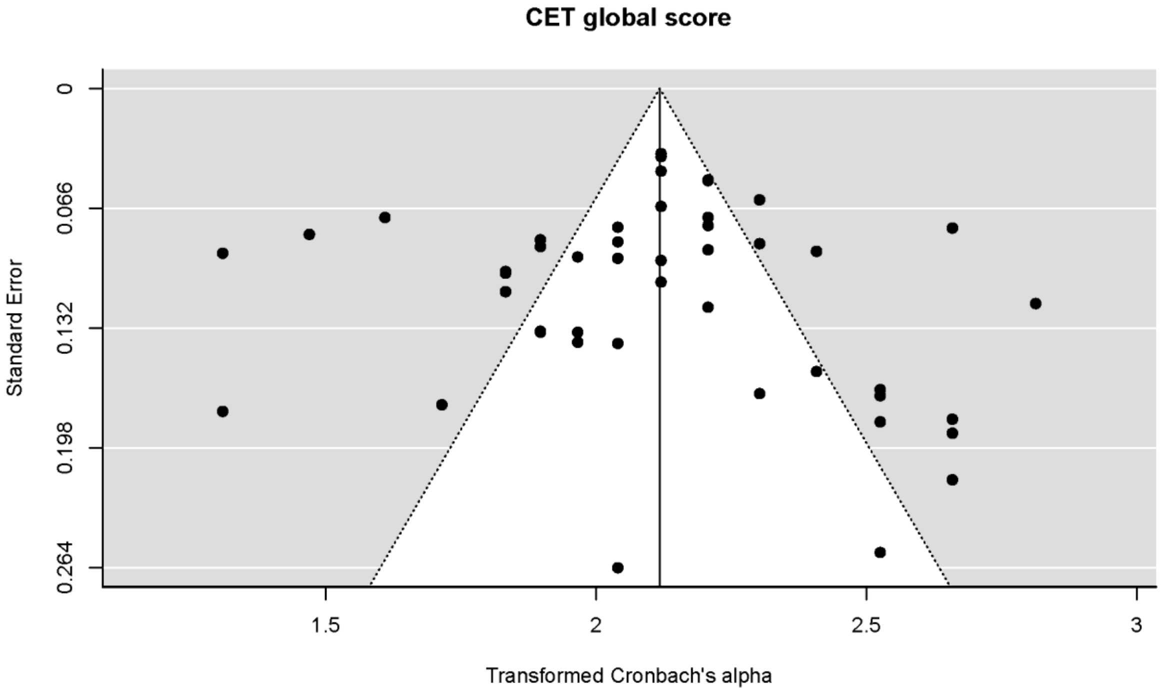
	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Becker (2000)	0.8697	32.1657	0.0000	0.8524	0.8849	556.5220	0.0000	0.1366	94.5995	18.5166
Bell et al. (2015)	0.8679	32.7842	0.0000	0.8509	0.8829	512.7912	0.0000	0.1290	94.2257	17.3182
Boroughs (2010)	0.8687	32.2608	0.0000	0.8514	0.8839	522.4044	0.0000	0.1344	94.1274	17.0282
Braun (2009_female)	0.8691	32.1945	0.0000	0.8518	0.8843	553.8036	0.0000	0.1357	94.5821	18.4573
Braun (2009_male)	0.8691	32.1948	0.0000	0.8518	0.8843	553.8164	0.0000	0.1357	94.5826	18.4590
Brehm & Steffen (2013_female)	0.8720	33.9327	0.0000	0.8558	0.8863	516.2538	0.0000	0.1239	94.1149	16.9921
Brehm & Steffen (2013_male)	0.8715	33.3322	0.0000	0.8550	0.8861	530.3410	0.0000	0.1284	94.3071	17.5657
Brehm (1995)	0.8704	32.3976	0.0000	0.8533	0.8855	551.0083	0.0000	0.1353	94.5508	18.3514
Cahill & Mussap (2007_female)	0.8719	33.8421	0.0000	0.8557	0.8862	529.0656	0.0000	0.1247	94.1833	17.1918
Cahill & Mussap (2007_male)	0.8707	32.6681	0.0000	0.8538	0.8856	551.7309	0.0000	0.1336	94.5690	18.4129
Coen & Ogles (1993)	0.8713	33.1024	0.0000	0.8546	0.8860	543.9506	0.0000	0.1303	94.4284	17.9481
De Young & Anderson (2009)	0.8691	32.2068	0.0000	0.8518	0.8843	554.3397	0.0000	0.1356	94.6028	18.5283
De Young & Anderson (2010)	0.8690	32.1852	0.0000	0.8518	0.8843	553.1986	0.0000	0.1357	94.5584	18.3768
Diehl et al.(1998)	0.8694	32.1820	0.0000	0.8521	0.8846	556.1113	0.0000	0.1362	94.6344	18.6374
Federay (2011)	0.8697	32.1892	0.0000	0.8524	0.8849	556.5235	0.0000	0.1364	94.6363	18.6438
Gapin & Petruzzello (2011)	0.8706	32.5284	0.0000	0.8536	0.8856	550.1575	0.0000	0.1344	94.5564	18.3703
Hausenblas &Downs (2002a_study 4)	0.8708	32.6615	0.0000	0.8540	0.8858	536.8243	0.0000	0.1333	94.4133	17.8995
Karr et al.(2013_half-marathon)	0.8704	32.3729	0.0000	0.8534	0.8855	529.7106	0.0000	0.1353	94.1089	16.9747
Karr et al.(2013_marathon)	0.8713	33.0092	0.0000	0.8546	0.8860	500.8232	0.0000	0.1307	94.1886	17.2077
Karr et al.(2013_shorter distance)	0.8697	32.1295	0.0000	0.8524	0.8849	556.5123	0.0000	0.1367	94.3540	17.7118
Knepp et al. (2015)	0.8697	32.2203	0.0000	0.8525	0.8848	556.5245	0.0000	0.1363	94.6582	18.7204
Lease & Bond (2013)	0.8697	32.1564	0.0000	0.8524	0.8849	556.5210	0.0000	0.1366	94.5738	18.4291
Magnus et al. (2009)	0.8699	32.2147	0.0000	0.8527	0.8851	555.7418	0.0000	0.1364	94.5926	18.4931
Montayne (2017)	0.8697	32.2915	0.0000	0.8525	0.8848	556.5255	0.0000	0.1360	94.6733	18.7734
Mussap (2006)	0.8708	32.6652	0.0000	0.8539	0.8857	550.2918	0.0000	0.1335	94.5523	18.3563
Mussap (2007)	0.8708	32.6645	0.0000	0.8539	0.8857	549.7568	0.0000	0.1335	94.5463	18.3360
Pasman & Thompson (1988)	0.8659	36.1300	0.0000	0.8504	0.8797	498.5796	0.0000	0.1030	93.0695	14.4290
Pritchard et al. (2012)	0.8694	32.1435	0.0000	0.8521	0.8846	555.7160	0.0000	0.1364	94.5638	18.3953
Rash (2004)	0.8687	32.2860	0.0000	0.8515	0.8839	548.8056	0.0000	0.1344	94.5214	18.2528
Rodgers et al. (2001)	0.8662	35.2950	0.0000	0.8504	0.8803	451.8267	0.0000	0.1083	93.2916	14.9066
Serier et al. (2018)	0.8694	32.2737	0.0000	0.8522	0.8846	556.3495	0.0000	0.1358	94.6673	18.7523
Taranis & Meyer (2011_study3)	0.8703	32.4442	0.0000	0.8533	0.8854	554.4441	0.0000	0.1351	94.6264	18.6095
Terry et al. (2004)	0.8687	32.2987	0.0000	0.8515	0.8839	551.0221	0.0000	0.1344	94.5579	18.3753
Uhlmann et al. (2018)	0.8683	32.4656	0.0000	0.8512	0.8835	533.7804	0.0000	0.1323	94.3776	17.7859
Velkoff et al. (2019)	0.8688	32.3448	0.0000	0.8516	0.8840	553.9192	0.0000	0.1344	94.6060	18.5391
Woods (2007)	0.8710	32.8215	0.0000	0.8543	0.8859	532.8987	0.0000	0.1321	94.3877	17.8180
Yager et al. (2017)	0.8687	32.2665	0.0000	0.8514	0.8839	537.1431	0.0000	0.1344	94.3378	17.6610
Yager & O´Dea (2010)	0.8694	32.1774	0.0000	0.8521	0.8846	556.0846	0.0000	0.1362	94.6299	18.6217

Appendix D: Publication bias analyses by PE

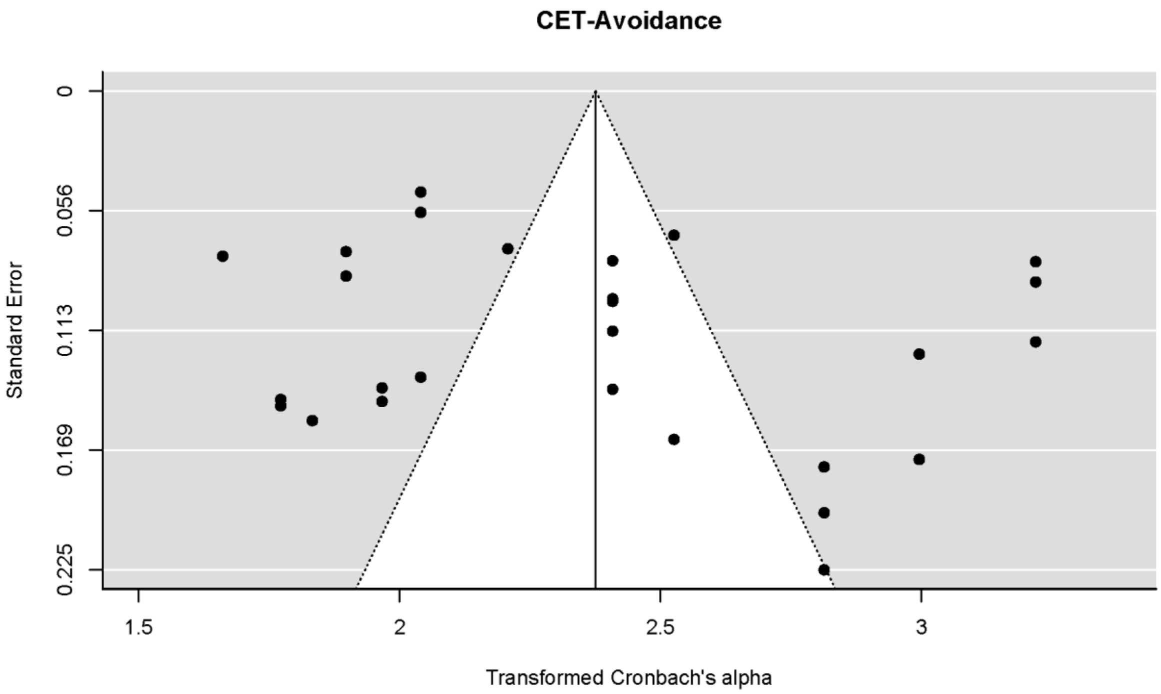
Due to unavailability of data ($K < 10$) publication bias analyses were not conducted in the case of EDQ subscales. Evidence of publication bias was suggested by funnel plot asymmetry and the results of Egger test both for the CET (global score, $p = .084$; and weight control subscale, $p = .026$) and the EDS-21 (global score, $p = .096$; and reduction in other activities subscale, $p = .027$) (see Appendix G). Additionally, the 'trim and fill' procedure showed differences between the pooled and the adjusted pooled estimates in the following cases: (a) the global score on the CET ($\bar{\alpha} = .880$, $p < .001$; 95% CI = 868. to .891, $I^2 = 92.99$ vs. adjusted $\bar{\alpha} = .876$, $p < .001$; 95% CI = .863 to .887, $I^2 = 93.67$; missing studies $K = 3$); (b) the weight control subscale of the CET ($\bar{\alpha} = .817$, $p < .001$; 95% CI = 787. to .842, $I^2 = 90.72$ vs. adjusted $\bar{\alpha} = .792$, $p < .001$; 95% CI = .755 to .823, $I^2 = 93.31$; missing studies $K = 5$); and (c) the reduction in other activities subscale of the EDS-21 ($\bar{\alpha} = .704$, $p < .001$; 95% CI = 675. to .730, $I^2 = 92.53$ vs. adjusted $\bar{\alpha} = .730$, $p < .001$; 95% CI = .702 to .755, $I^2 = 93.59$; missing studies $K = 10$). Conversely, no significant differences between the pooled estimate ($\bar{\alpha} = .930$, $p < .001$; 95% CI = 923. to .937, $I^2 = 97.76$) and adjusted pooled estimate ($\bar{\alpha} = .930$, $p < .001$; 95% CI = .923 to .937, $I^2 = 97.76$; missing studies $K = 0$) were found in the case of the global score on the EDS-21.


CES-Likert
Standard Error
0
0.069
0.138
0.207
0.276
1.4
1.6
1.8
2
2.2
2.4
2.6
Transformed Cronbach's alpha

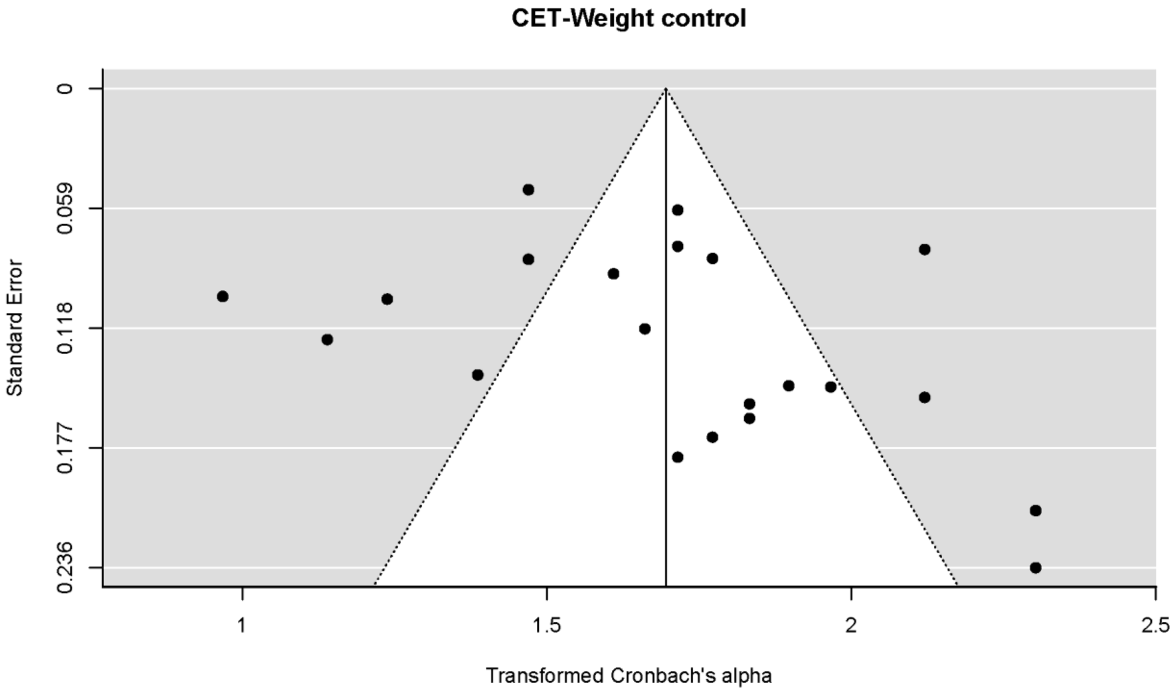

CES-VAS
Standard Error
0
0.056
0.113
0.169
0.225
1
1.5
2
2.5
3
Transformed Cronbach's alpha

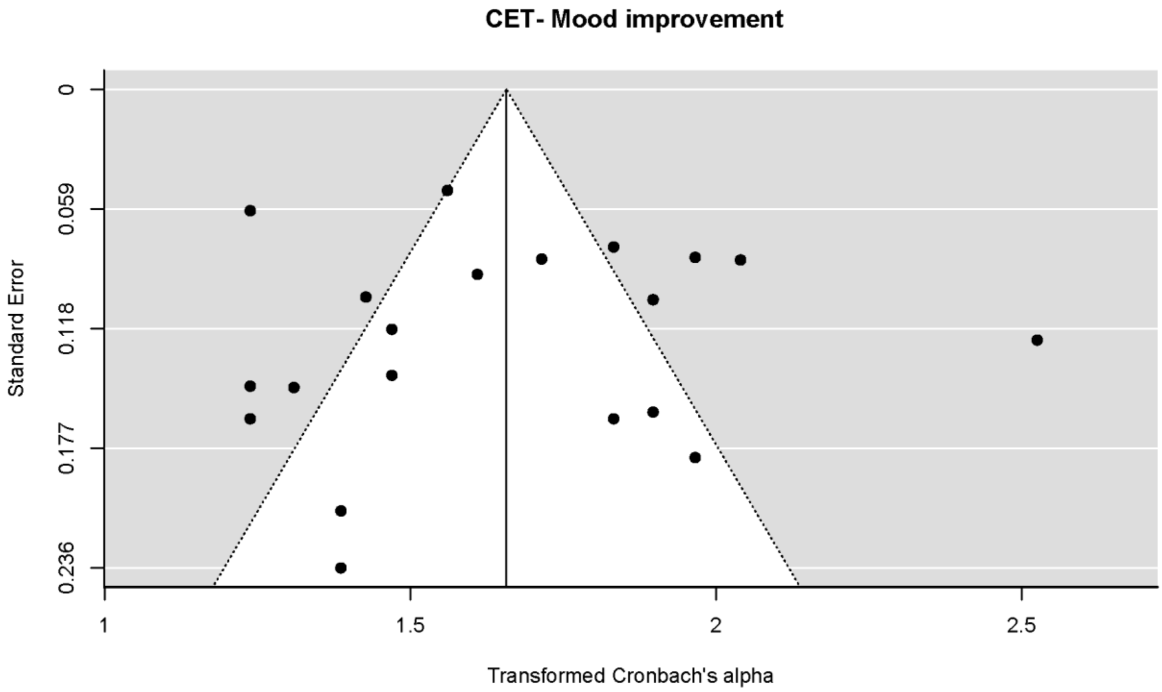


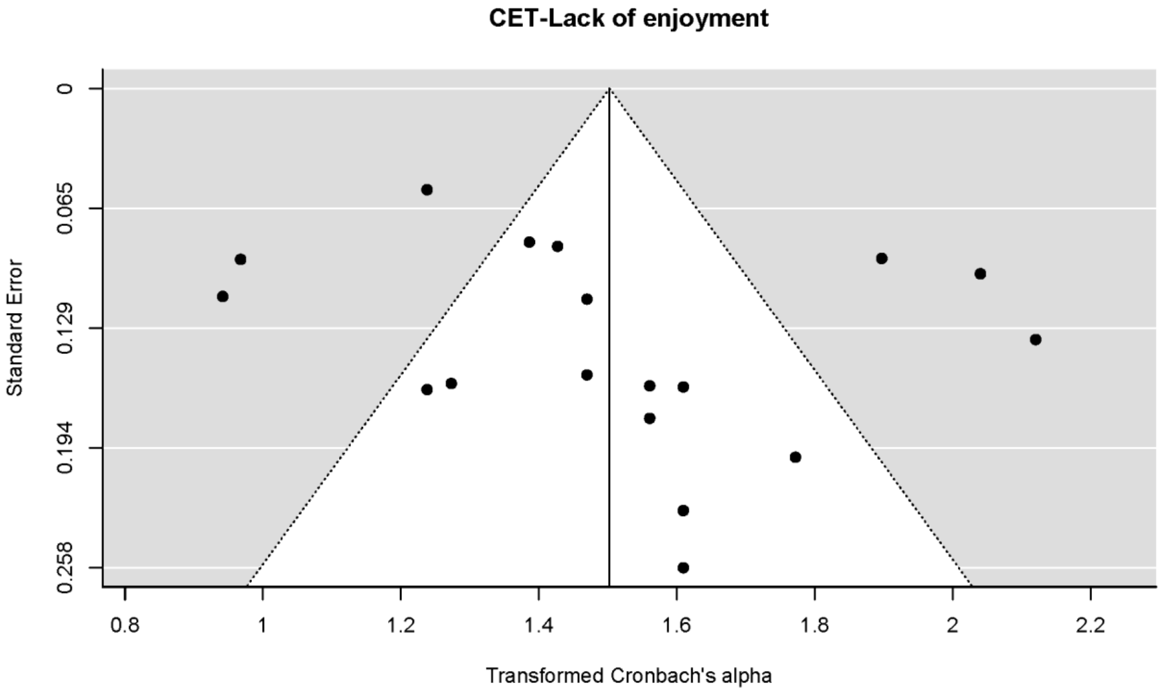
CET global score
Standard Error
0
0.066
0.132
0.198
0.264
1.5
2
2.5
3
Transformed Cronbach's alpha

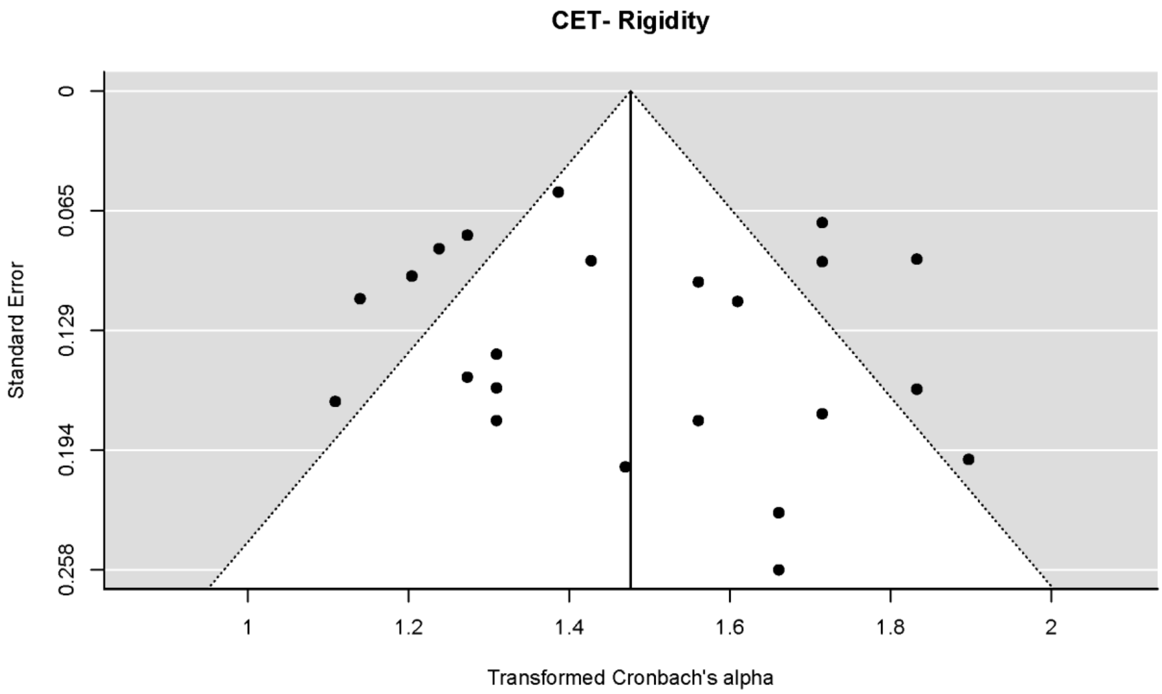


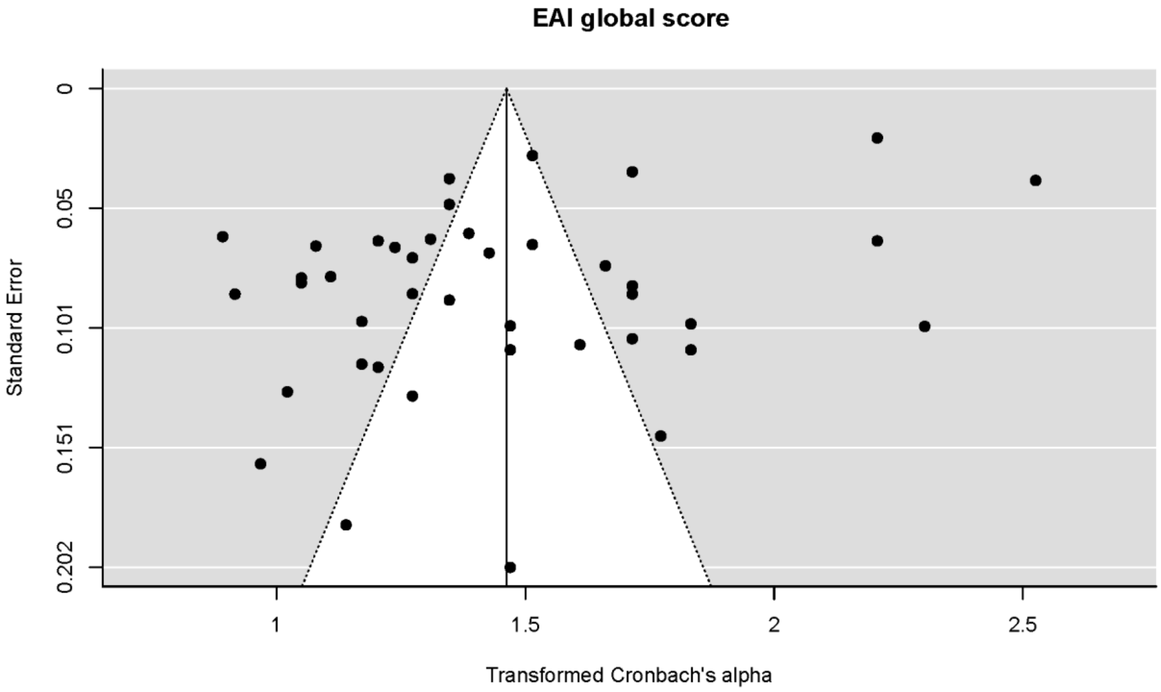
CET-Avoidance
Standard Error
0
0.056
0.113
0.169
0.225
1.5
2
2.5
3
Transformed Cronbach's alpha

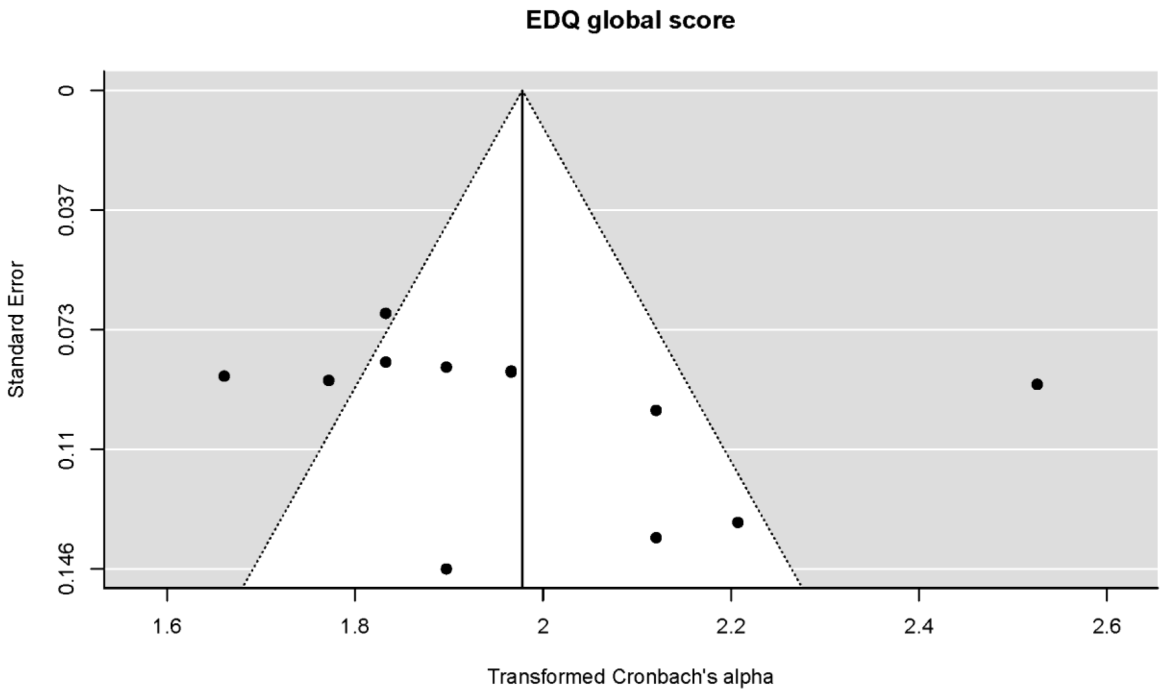

CET-Weight control
Standard Error
0
0.059
0.118
0.177
0.236
1
1.5
2
2.5
Transformed Cronbach's alpha

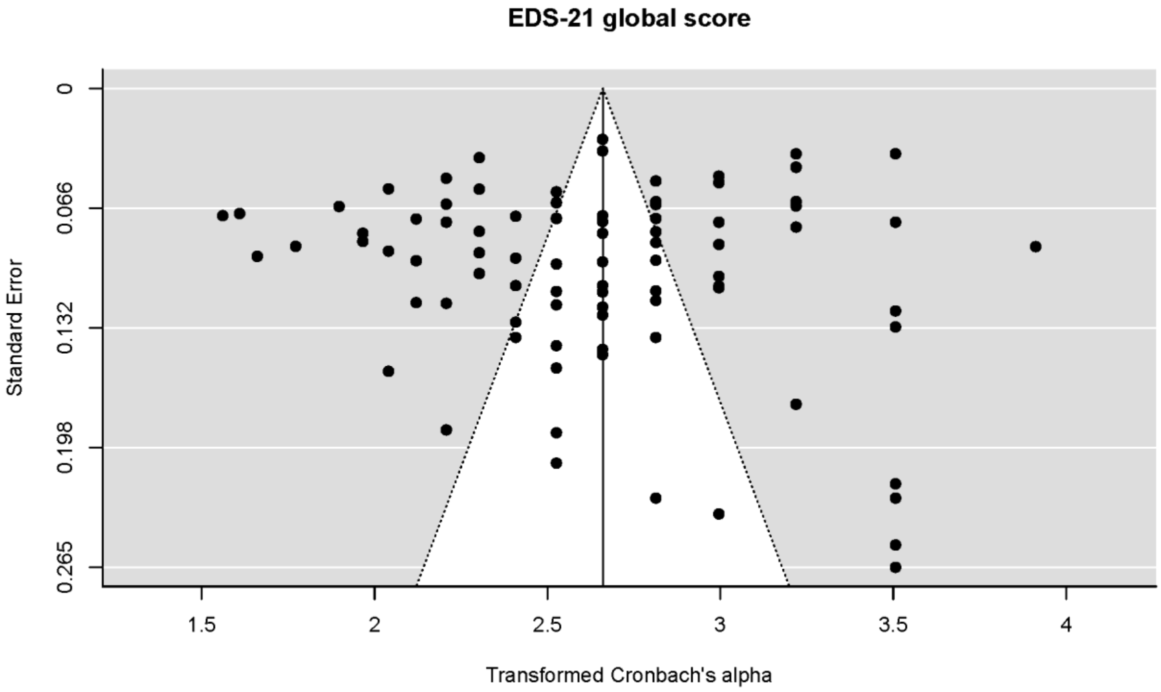

CET- Mood improvement
Standard Error
0
0.059
0.118
0.177
0.236
1
1.5
2
2.5
Transformed Cronbach's alpha

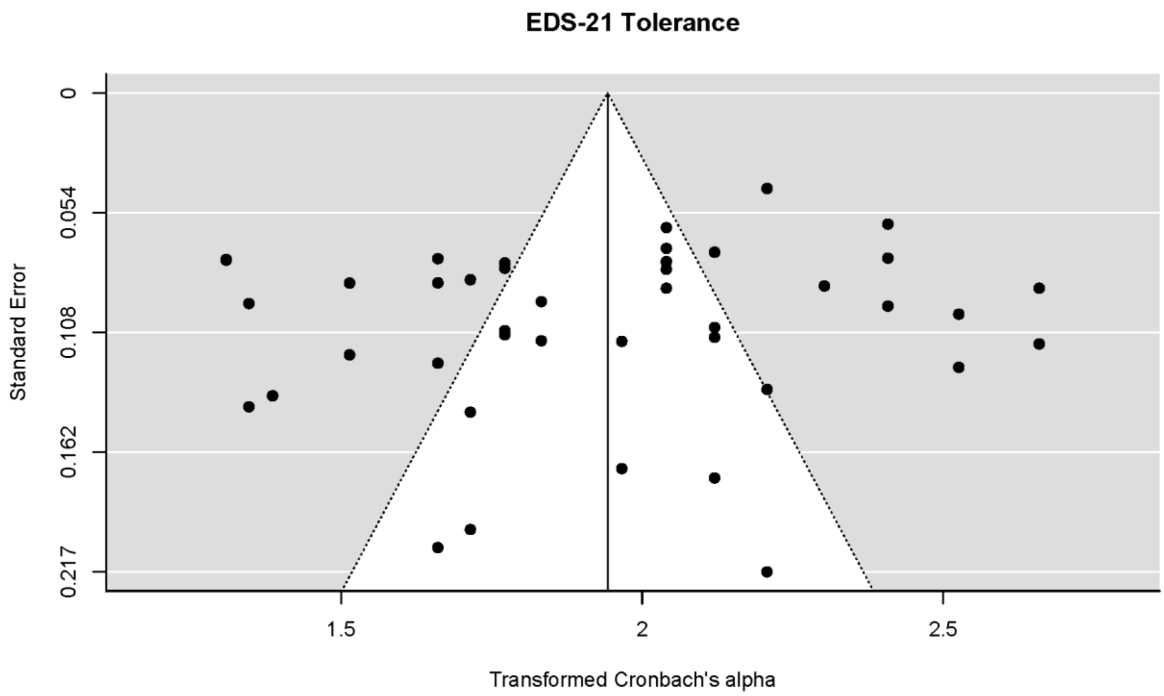

CET-Lack of enjoyment
Standard Error
0
0.065
0.129
0.194
0.258
0.8
1
1.2
1.4
1.6
1.8
2
2.2
Transformed Cronbach's alpha

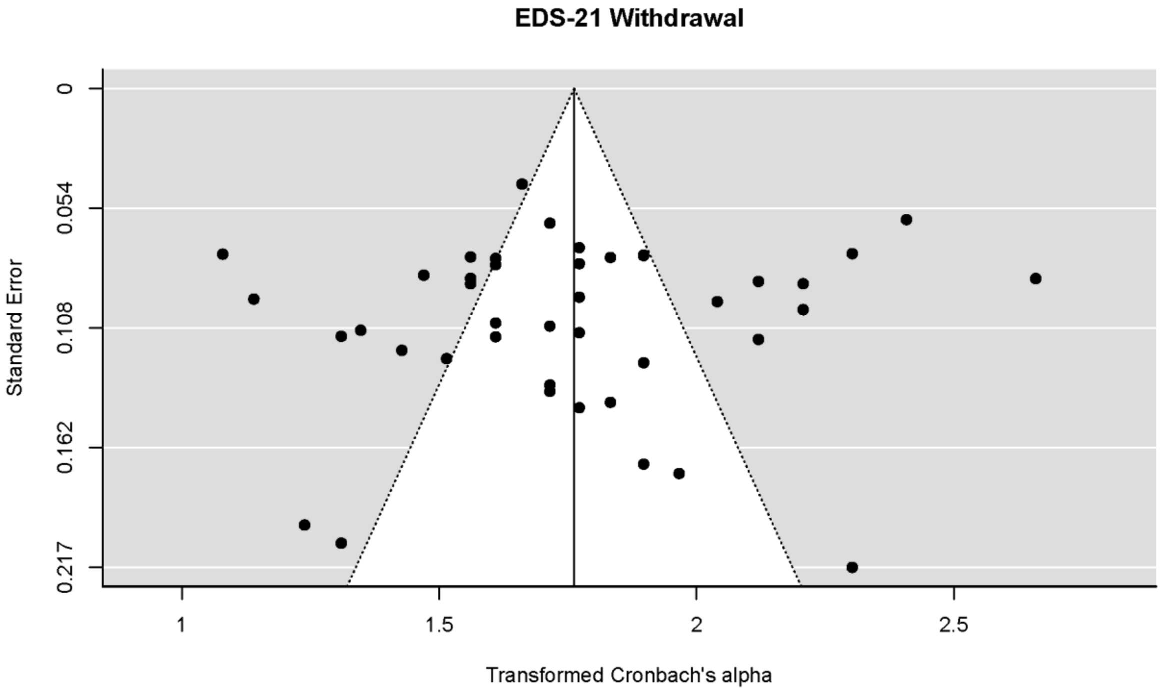

CET- Rigidity
Standard Error
0
0.065
0.129
0.194
0.258
1
1.2
1.4
1.6
1.8
2
Transformed Cronbach's alpha

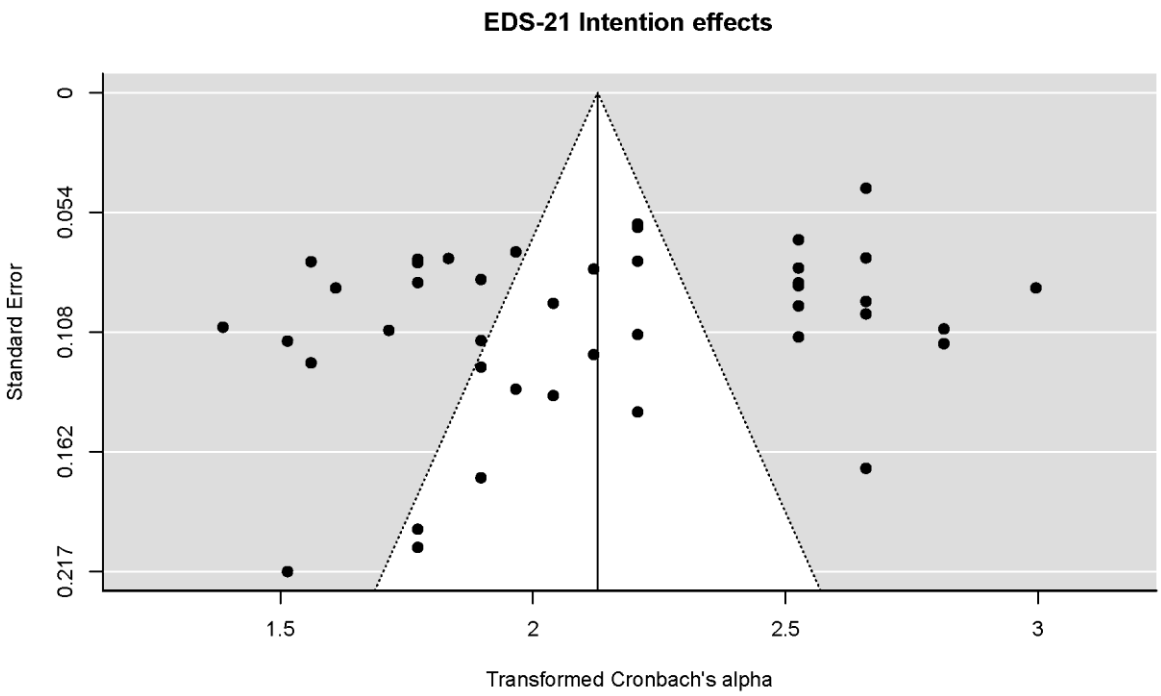

EAI global score
Standard Error
0
0.05
0.101
0.151
0.202
1
1.5
2
2.5
Transformed Cronbach's alpha


EDQ global score
Standard Error
0
0.037
0.073
0.11
0.146
1.6
1.8
2
2.2
2.4
2.6
Transformed Cronbach's alpha

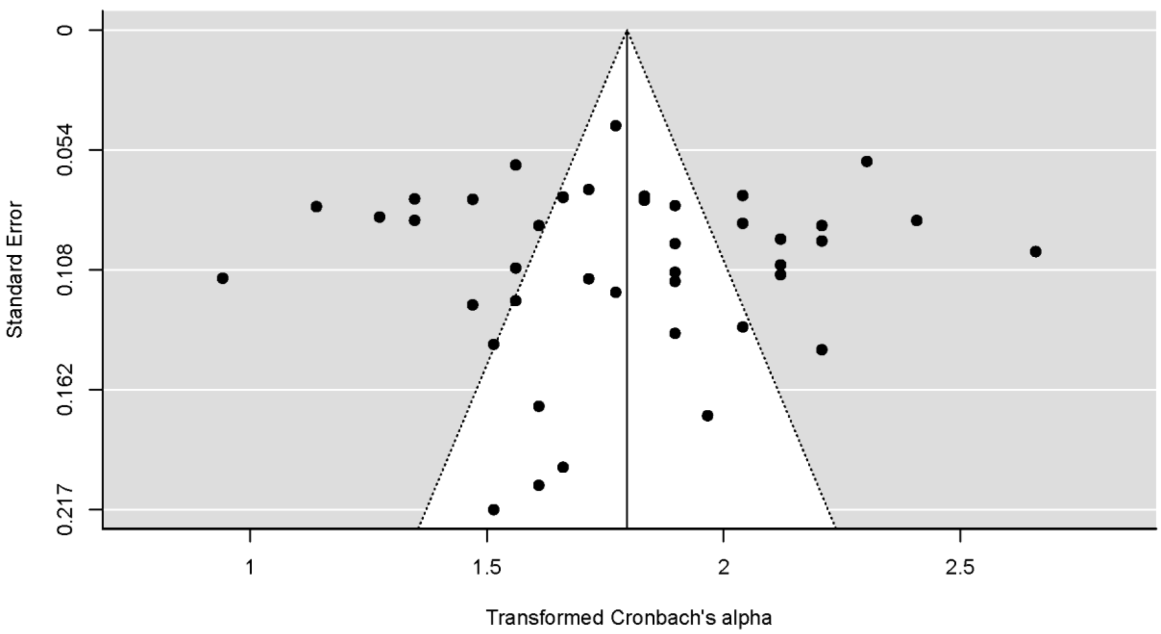

EDS-21 global score
Standard Error
0
0.066
0.132
0.198
0.265
1.5
2
2.5
3
3.5
4
Transformed Cronbach's alpha


EDS-21 Tolerance
Standard Error
0
0.054
0.108
0.162
0.217
1.5
2
2.5
Transformed Cronbach's alpha

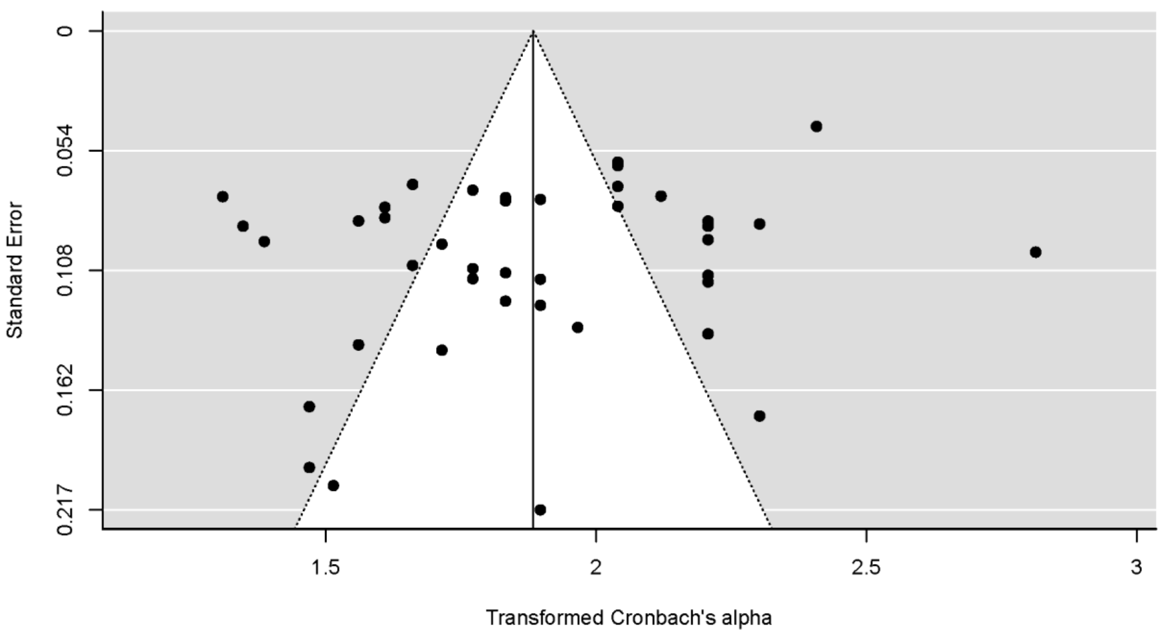

EDS-21 Withdrawal
Standard Error
0
0.054
0.108
0.162
0.217
1
1.5
2
2.5
Transformed Cronbach's alpha

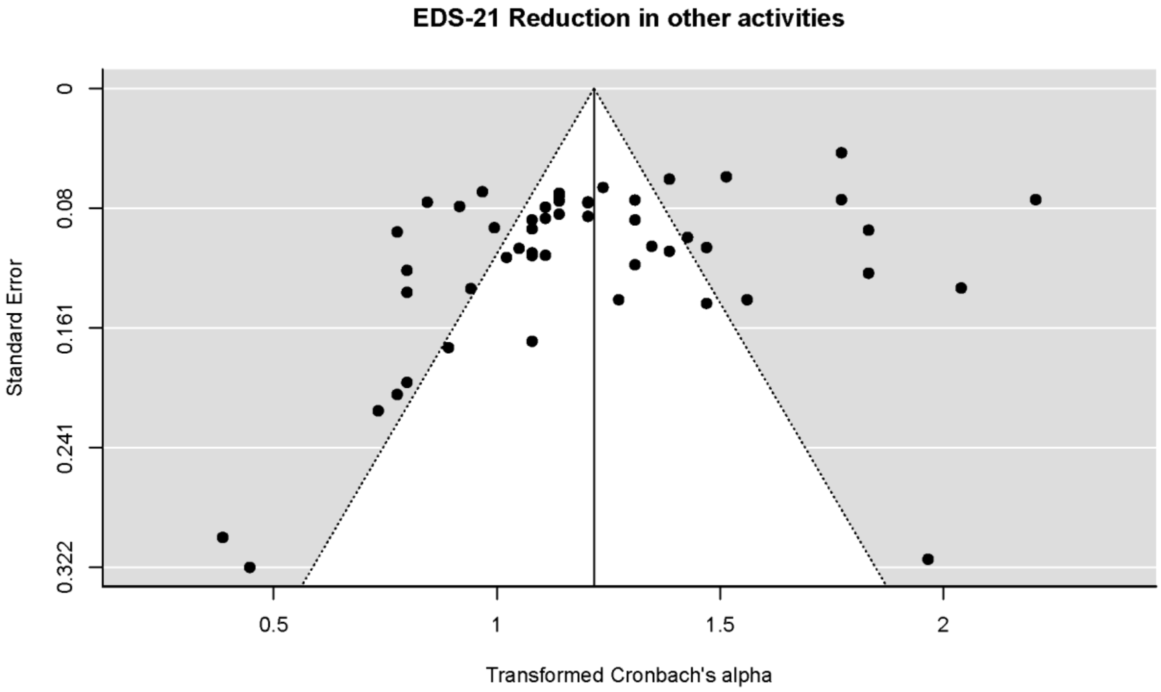

EDS-21 Intention effects
Standard Error
0
0.054
0.108
0.162
0.217
1.5
2
2.5
3
Transformed Cronbach's alpha

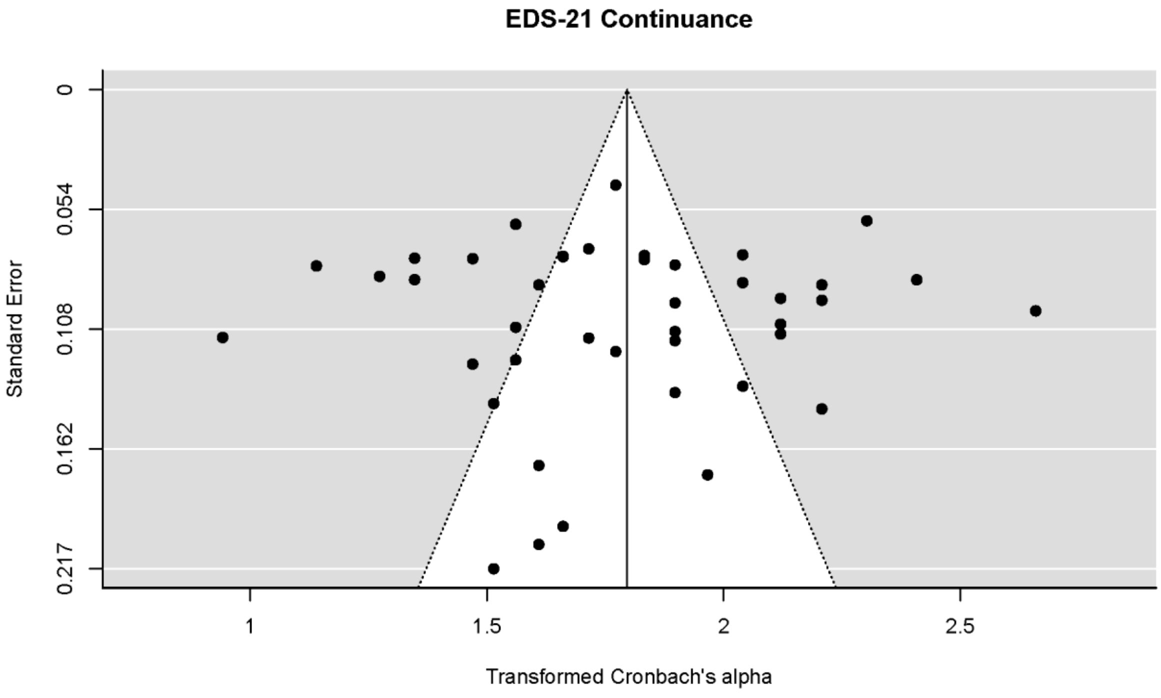
EDS-21 Lack of control

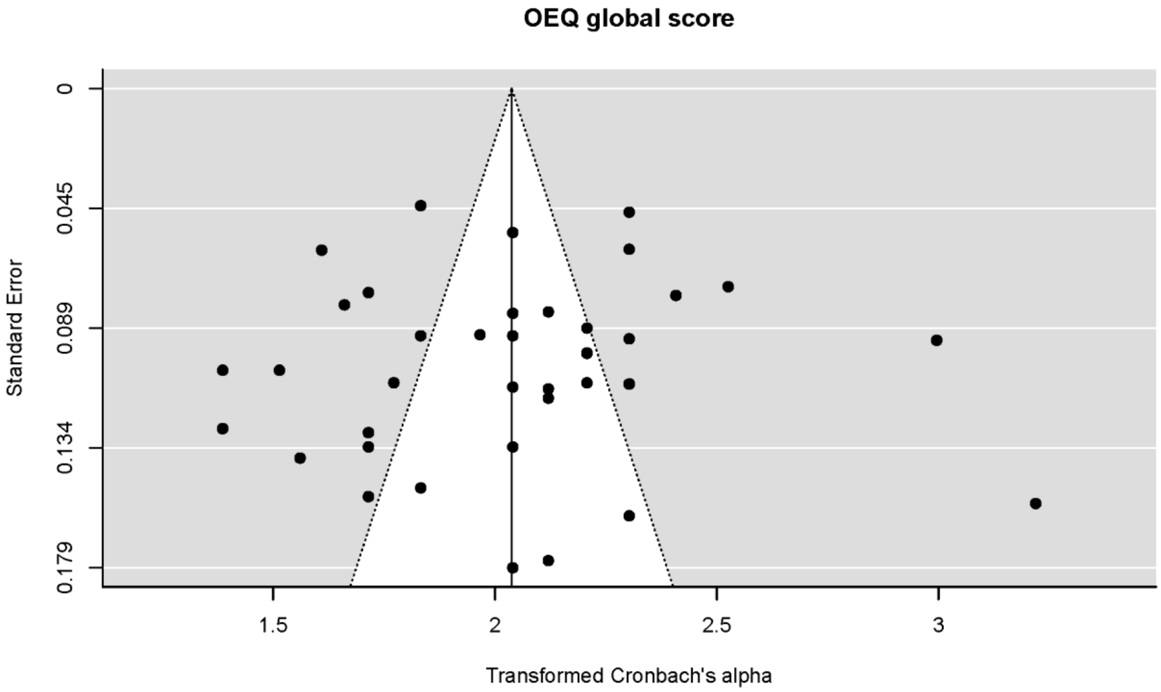


EDS-21 Time

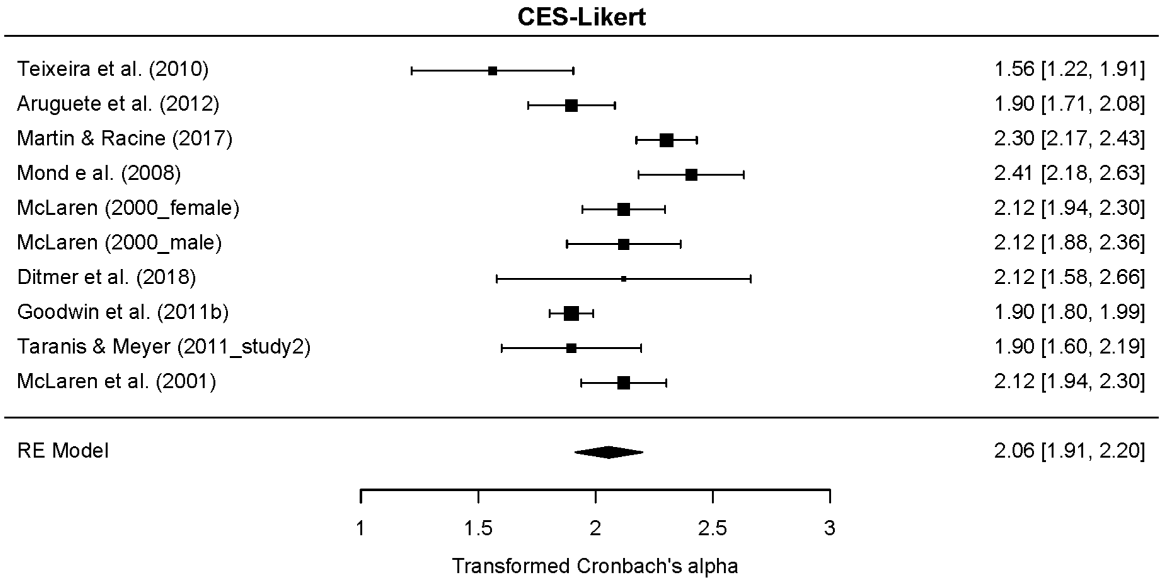


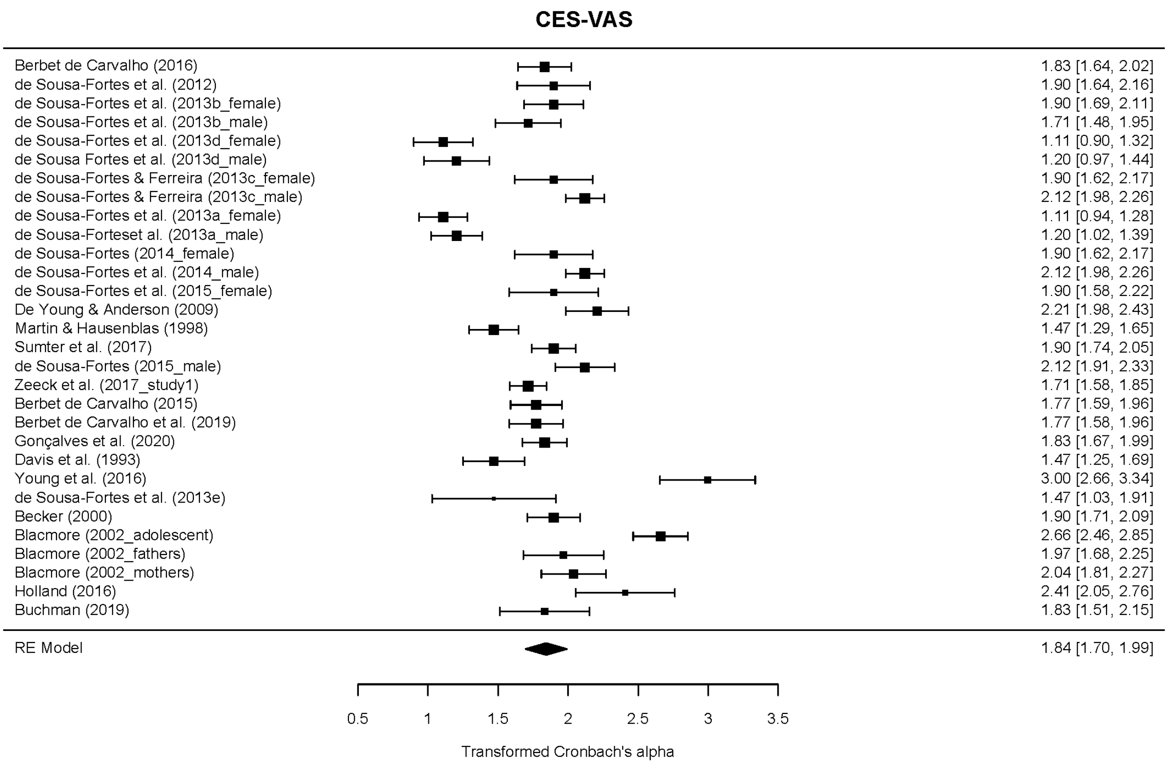

EDS-21 Reduction in other activities
Standard Error
0
0.08
0.161
0.241
0.322
0.5
1
1.5
2
Transformed Cronbach's alpha


EDS-21 Continuance
Standard Error
0
0.054
0.108
0.162
0.217
1
1.5
2
2.5
Transformed Cronbach's alpha

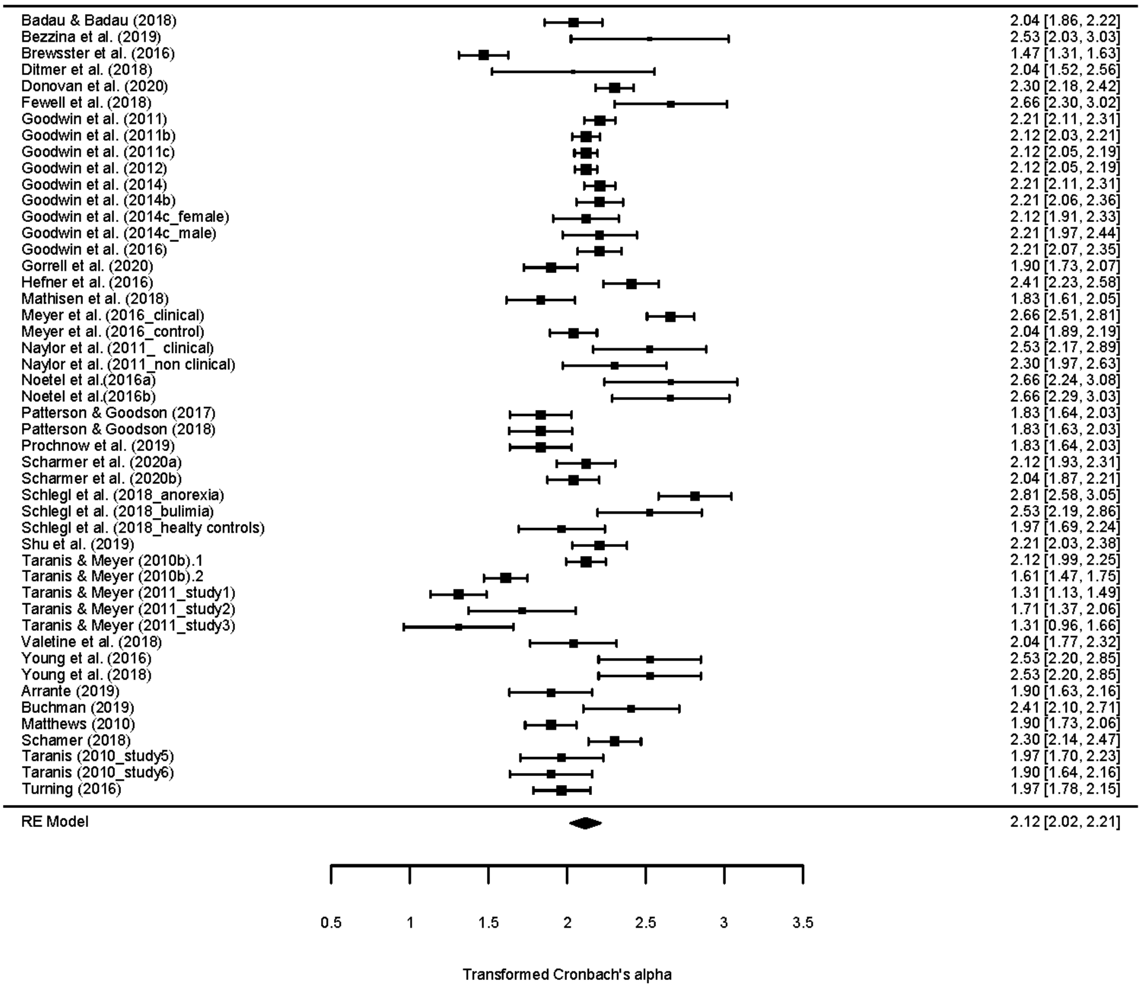

OEQ global score
Standard Error
0
0.045
0.089
0.134
0.179
1.5
2
2.5
3
Transformed Cronbach's alpha

Appendix E: Forest plots by PE

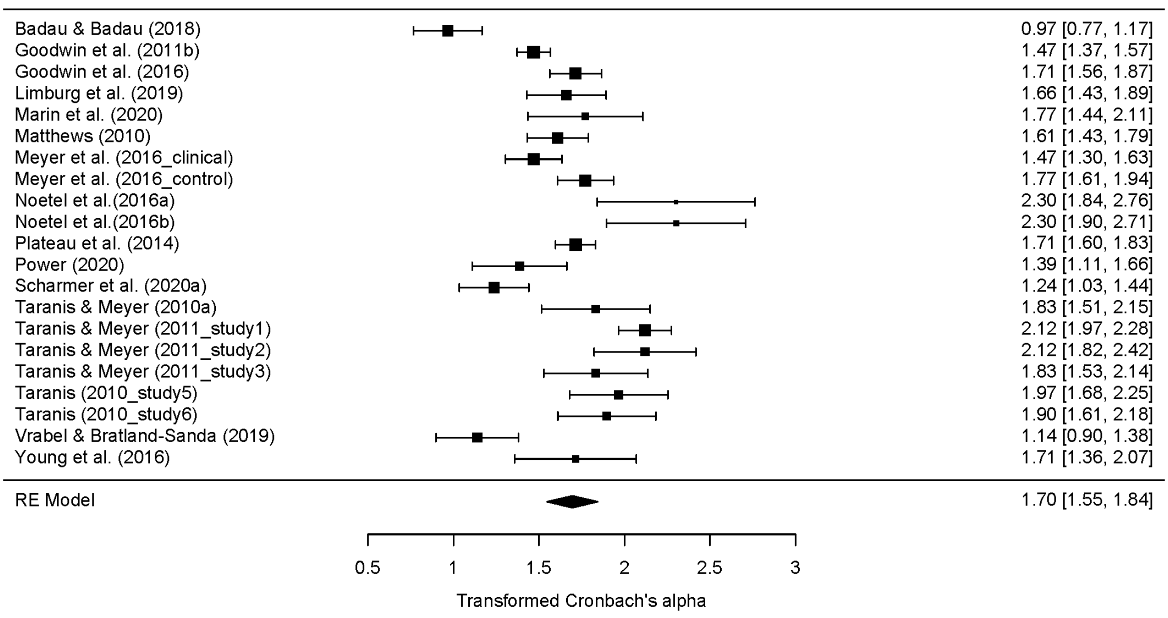


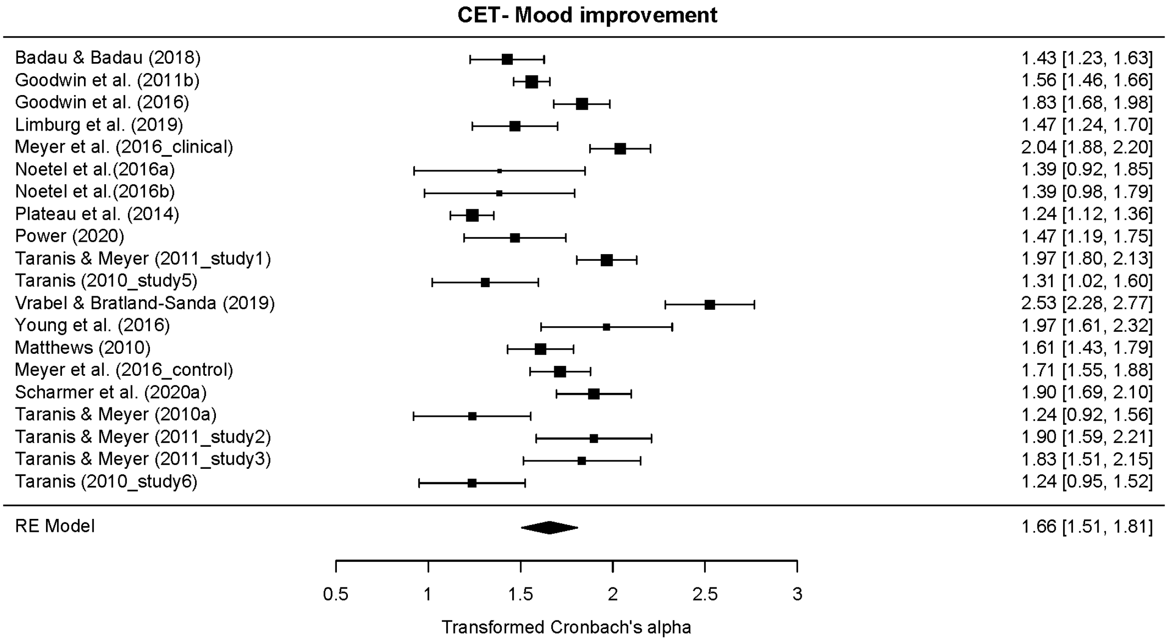


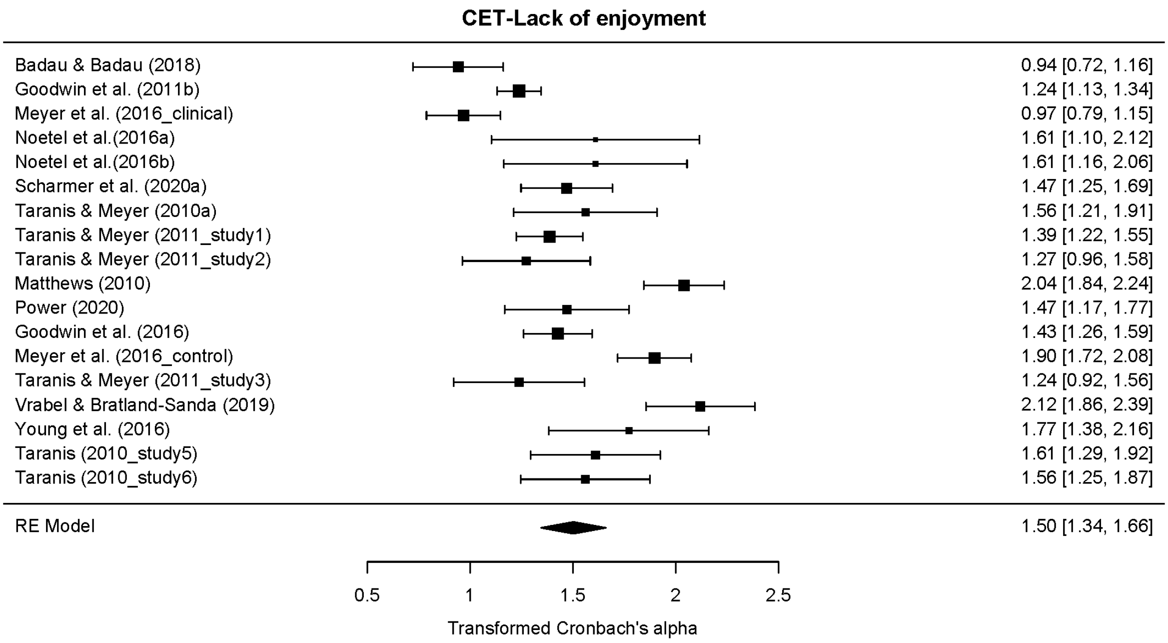
CET global score

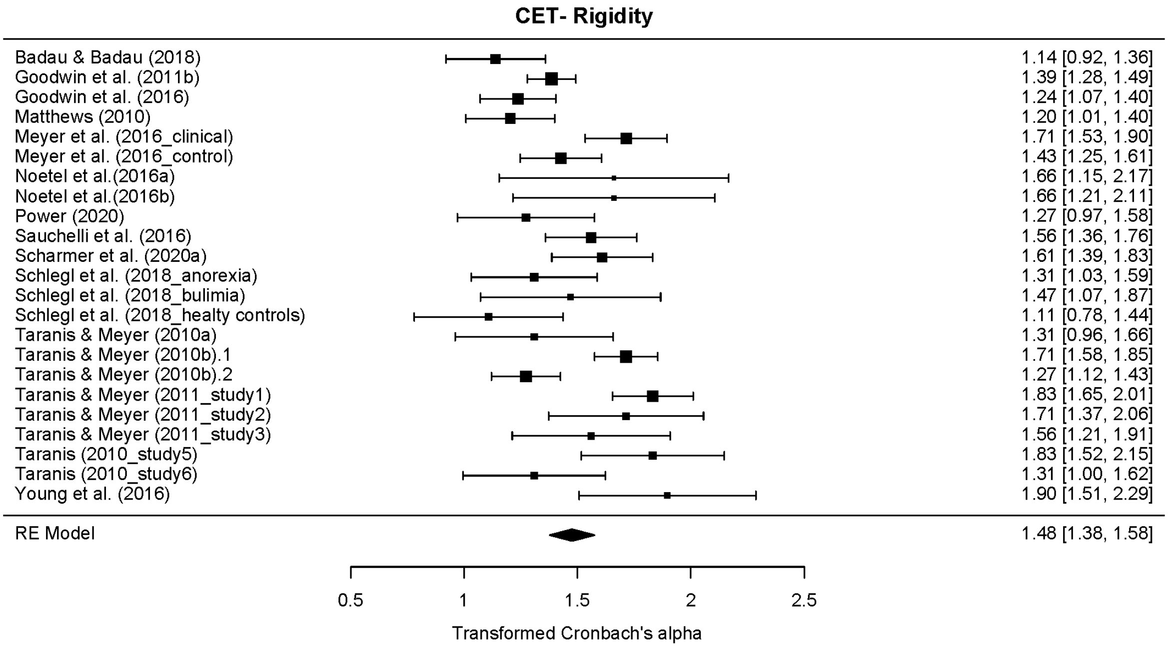


CET-Weight control

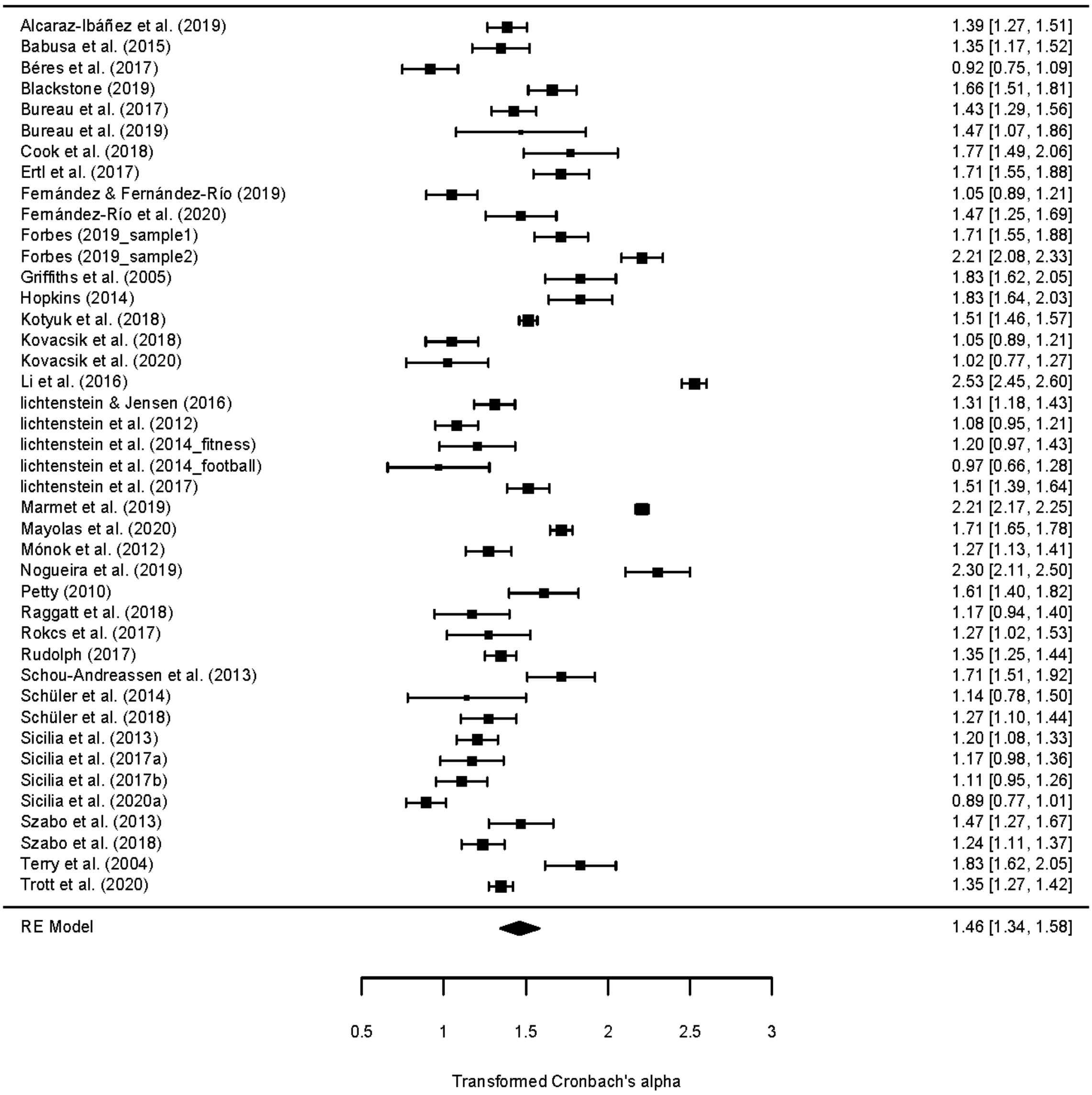


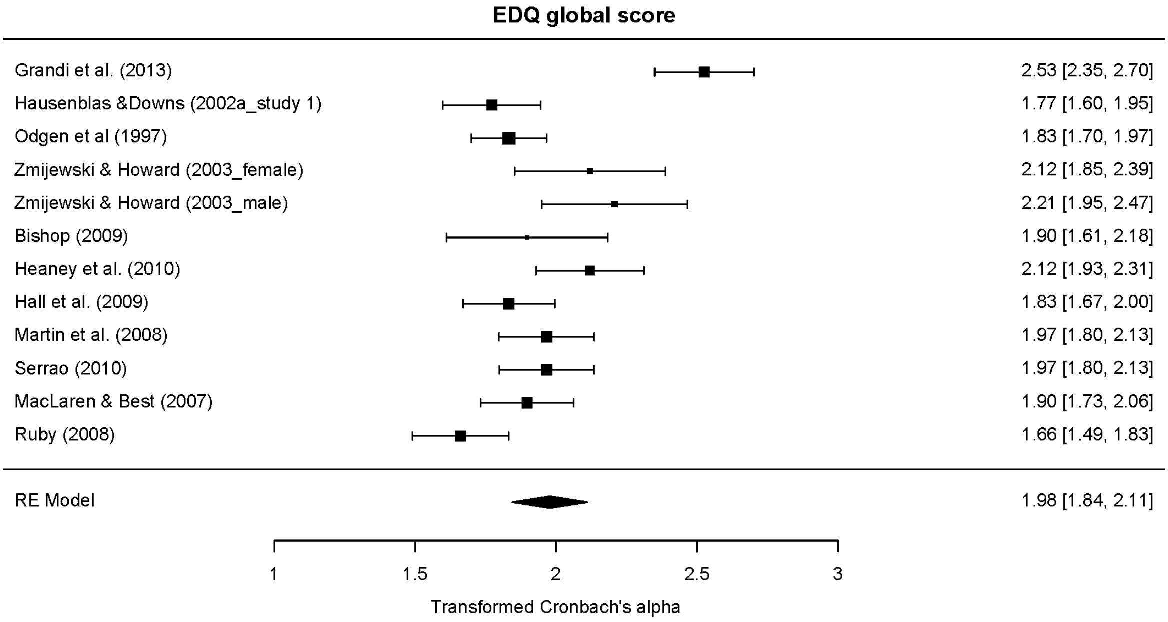

CET- Mood improvement
Badau & Badau (2018) 1.43 [1.23, 1.63]
Goodwin et al. (2011b) 1.56 [1.46, 1.66]
Goodwin et al. (2016) 1.83 [1.68, 1.98]
Limburg et al. (2019) 1.47 [1.24, 1.70]
Meyer et al. (2016_clinical) 2.04 [1.88, 2.20]
Noetel et al.(2016a) 1.39 [0.92, 1.85]
Noetel et al.(2016b) 1.39 [0.98, 1.79]
Plateau et al. (2014) 1.24 [1.12, 1.36]
Power (2020) 1.47 [1.19, 1.75]
Taranis & Meyer (2011_study1) 1.97 [1.80, 2.13]
Taranis (2010_study5) 1.31 [1.02, 1.60]
Vrabel & Bratland-Sanda (2019) 2.53 [2.28, 2.77]
Young et al. (2016) 1.97 [1.61, 2.32]
Matthews (2010) 1.61 [1.43, 1.79]
Meyer et al. (2016_control) 1.71 [1.55, 1.88]
Scharmer et al. (2020a) 1.90 [1.69, 2.10]
Taranis & Meyer (2010a) 1.24 [0.92, 1.56]
Taranis & Meyer (2011_study2) 1.90 [1.59, 2.21]
Taranis & Meyer (2011_study3) 1.83 [1.51, 2.15]
Taranis (2010_study6) 1.24 [0.95, 1.52]
RE Model 1.66 [1.51, 1.81]
0.5 1 1.5 2 2.5 3
Transformed Cronbach's alpha

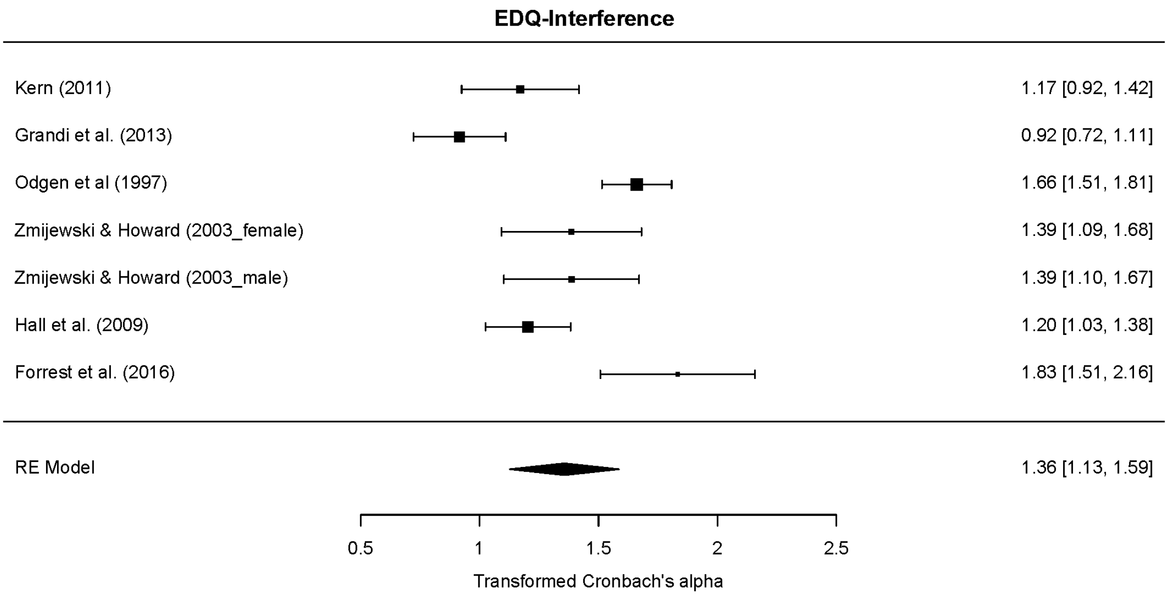

CET-Lack of enjoyment
Badau & Badau (2018) 0.94 [0.72, 1.16]
Goodwin et al. (2011b) 1.24 [1.13, 1.34]
Meyer et al. (2016_clinical) 0.97 [0.79, 1.15]
Noetel et al.(2016a) 1.61 [1.10, 2.12]
Noetel et al.(2016b) 1.61 [1.16, 2.06]
Scharmer et al. (2020a) 1.47 [1.25, 1.69]
Taranis & Meyer (2010a) 1.56 [1.21, 1.91]
Taranis & Meyer (2011_study1) 1.39 [1.22, 1.55]
Taranis & Meyer (2011_study2) 1.27 [0.96, 1.58]
Matthews (2010) 2.04 [1.84, 2.24]
Power (2020) 1.47 [1.17, 1.77]
Goodwin et al. (2016) 1.43 [1.26, 1.59]
Meyer et al. (2016_control) 1.90 [1.72, 2.08]
Taranis & Meyer (2011_study3) 1.24 [0.92, 1.56]
Vrabel & Bratland-Sanda (2019) 2.12 [1.86, 2.39]
Young et al. (2016) 1.77 [1.38, 2.16]
Taranis (2010_study5) 1.61 [1.29, 1.92]
Taranis (2010_study6) 1.56 [1.25, 1.87]
RE Model 1.50 [1.34, 1.66]
0.5 1 1.5 2 2.5
Transformed Cronbach's alpha

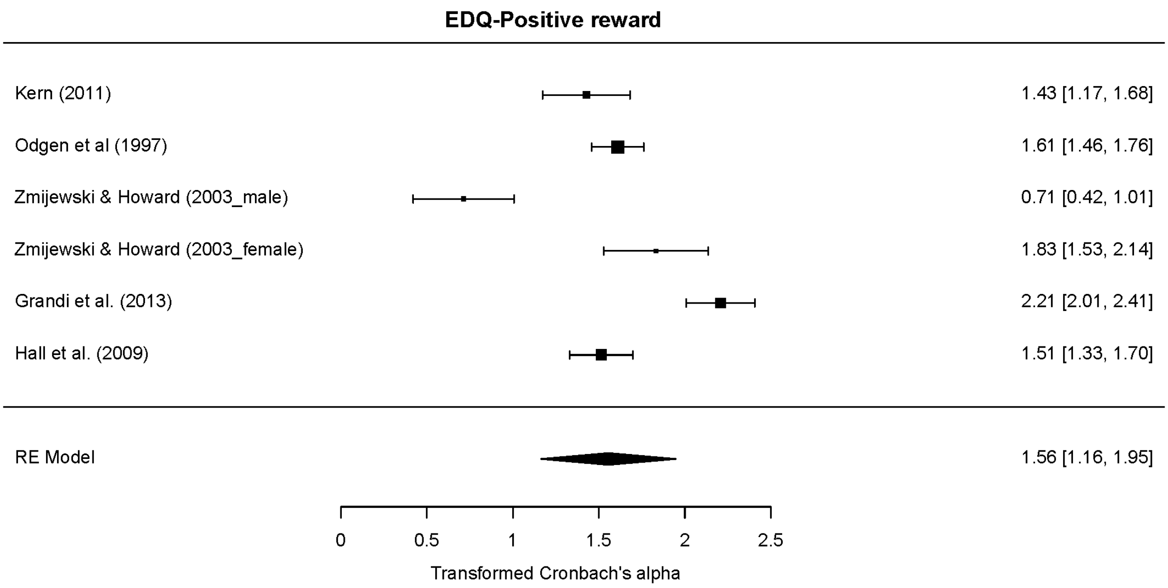

CET- Rigidity
Badau & Badau (2018) 1.14 [0.92, 1.36]
Goodwin et al. (2011b) 1.39 [1.28, 1.49]
Goodwin et al. (2016) 1.24 [1.07, 1.40]
Matthews (2010) 1.20 [1.01, 1.40]
Meyer et al. (2016_clinical) 1.71 [1.53, 1.90]
Meyer et al. (2016_control) 1.43 [1.25, 1.61]
Noetel et al.(2016a) 1.66 [1.15, 2.17]
Noetel et al.(2016b) 1.66 [1.21, 2.11]
Power (2020) 1.27 [0.97, 1.58]
Sauchelli et al. (2016) 1.56 [1.36, 1.76]
Scharmer et al. (2020a) 1.61 [1.39, 1.83]
Schlegl et al. (2018_anorexia) 1.31 [1.03, 1.59]
Schlegl et al. (2018_bulimia) 1.47 [1.07, 1.87]
Schlegl et al. (2018_healty controls) 1.11 [0.78, 1.44]
Taranis & Meyer (2010a) 1.31 [0.96, 1.66]
Taranis & Meyer (2010b).1 1.71 [1.58, 1.85]
Taranis & Meyer (2010b).2 1.27 [1.12, 1.43]
Taranis & Meyer (2011_study1) 1.83 [1.65, 2.01]
Taranis & Meyer (2011_study2) 1.71 [1.37, 2.06]
Taranis & Meyer (2011_study3) 1.56 [1.21, 1.91]
Taranis (2010_study5) 1.83 [1.52, 2.15]
Taranis (2010_study6) 1.31 [1.00, 1.62]
Young et al. (2016) 1.90 [1.51, 2.29]
RE Model 1.48 [1.38, 1.58]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

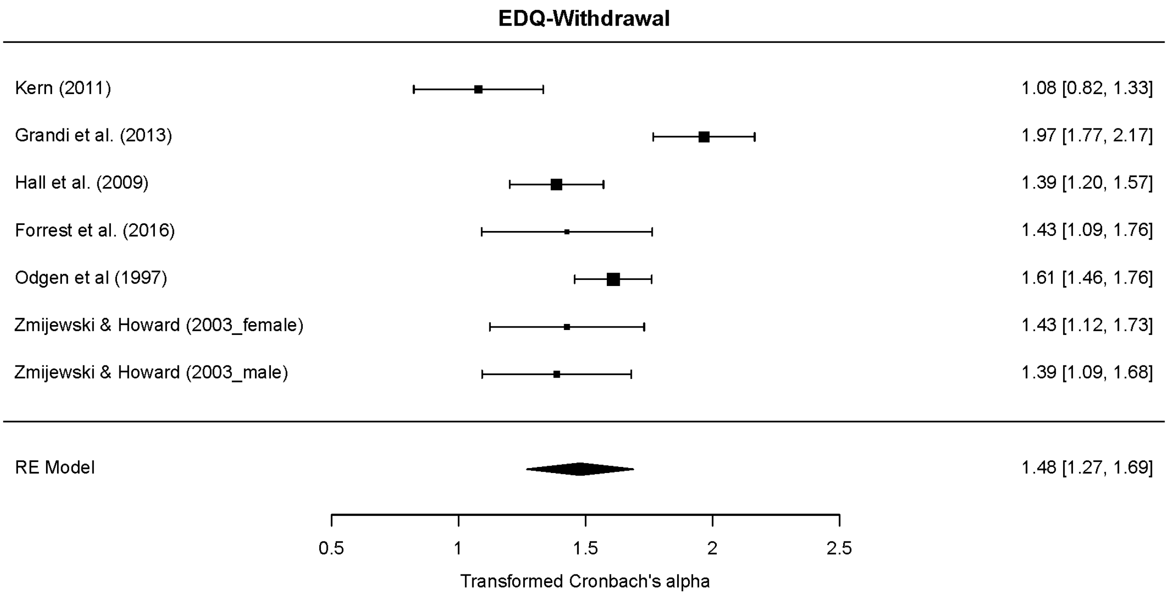
EAI global score

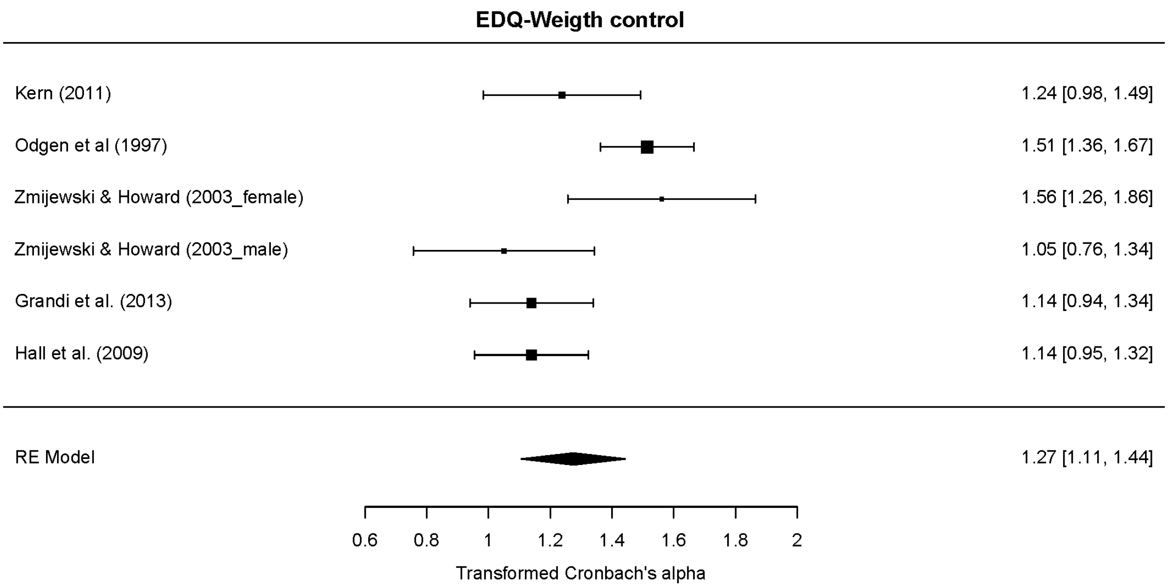


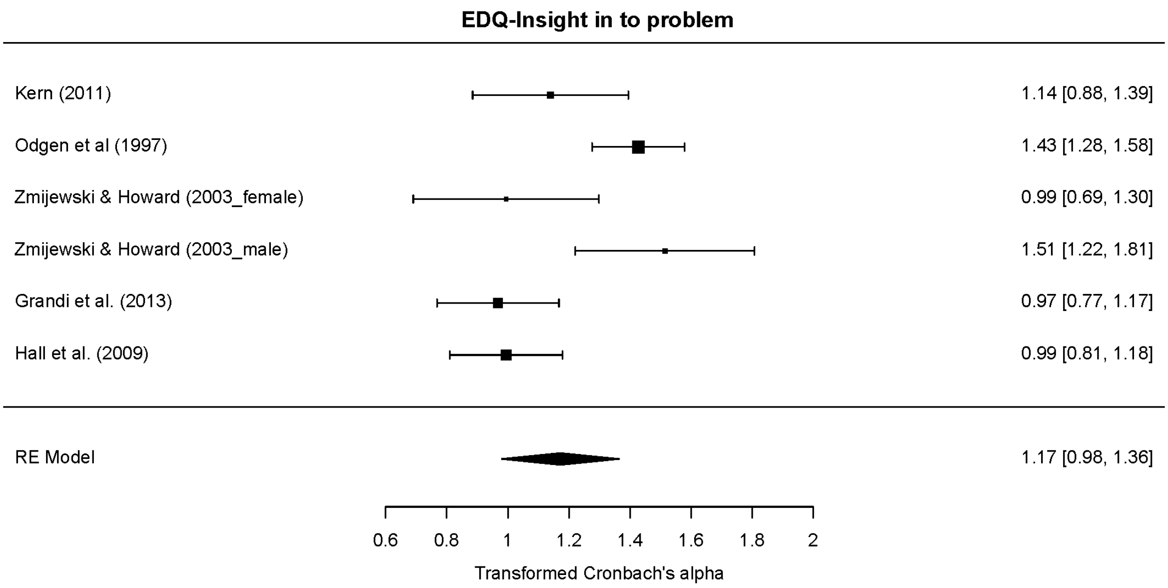

EDQ global score
Grandi et al. (2013)
Hausenblas &Downs (2002a_study 1)
Odgen et al (1997)
Zmijewski & Howard (2003_female)
Zmijewski & Howard (2003_male)
Bishop (2009)
Heaney et al. (2010)
Hall et al. (2009)
Martin et al. (2008)
Serrao (2010)
MacLaren & Best (2007)
Ruby (2008)
RE Model
2.53 [2.35, 2.70]
1.77 [1.60, 1.95]
1.83 [1.70, 1.97]
2.12 [1.85, 2.39]
2.21 [1.95, 2.47]
1.90 [1.61, 2.18]
2.12 [1.93, 2.31]
1.83 [1.67, 2.00]
1.97 [1.80, 2.13]
1.97 [1.80, 2.13]
1.90 [1.73, 2.06]
1.66 [1.49, 1.83]
1.98 [1.84, 2.11]
1
1.5
2
2.5
3
Transformed Cronbach's alpha

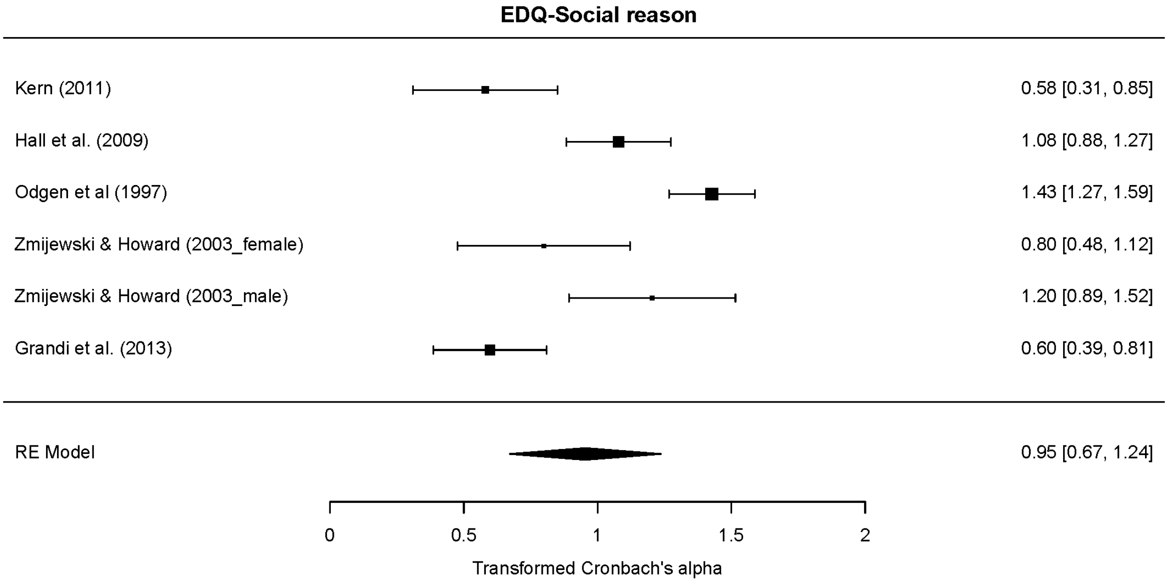

EDQ-Interference
Kern (2011)
Grandi et al. (2013)
Odgen et al (1997)
Zmijewski & Howard (2003_female)
Zmijewski & Howard (2003_male)
Hall et al. (2009)
Forrest et al. (2016)
RE Model
1.17 [0.92, 1.42]
0.92 [0.72, 1.11]
1.66 [1.51, 1.81]
1.39 [1.09, 1.68]
1.39 [1.10, 1.67]
1.20 [1.03, 1.38]
1.83 [1.51, 2.16]
1.36 [1.13, 1.59]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

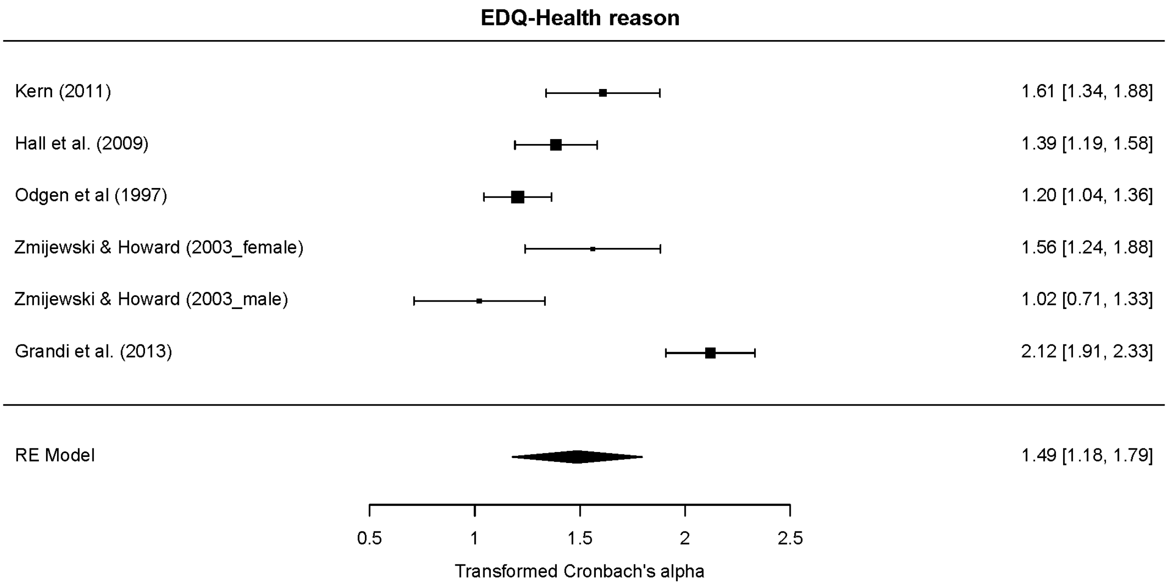

EDQ-Positive reward
Kern (2011)
1.43 [1.17, 1.68]
Odgen et al (1997)
1.61 [1.46, 1.76]
Zmijewski & Howard (2003_male)
0.71 [0.42, 1.01]
Zmijewski & Howard (2003_female)
1.83 [1.53, 2.14]
Grandi et al. (2013)
2.21 [2.01, 2.41]
Hall et al. (2009)
1.51 [1.33, 1.70]
RE Model
1.56 [1.16, 1.95]
0
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

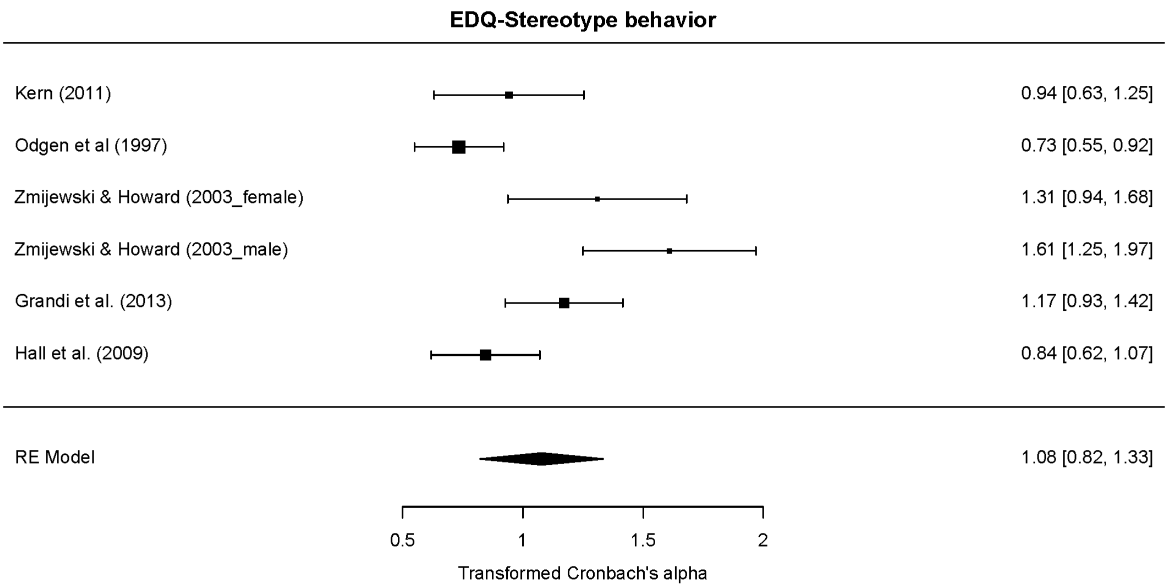

EDQ-Withdrawal
Kern (2011)
1.08 [0.82, 1.33]
Grandi et al. (2013)
1.97 [1.77, 2.17]
Hall et al. (2009)
1.39 [1.20, 1.57]
Forrest et al. (2016)
1.43 [1.09, 1.76]
Odgen et al (1997)
1.61 [1.46, 1.76]
Zmijewski & Howard (2003_female)
1.43 [1.12, 1.73]
Zmijewski & Howard (2003_male)
1.39 [1.09, 1.68]
RE Model
1.48 [1.27, 1.69]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha


EDQ-Weigth control
Kern (2011)
1.24 [0.98, 1.49]
Odgen et al (1997)
1.51 [1.36, 1.67]
Zmijewski & Howard (2003_female)
1.56 [1.26, 1.86]
Zmijewski & Howard (2003_male)
1.05 [0.76, 1.34]
Grandi et al. (2013)
1.14 [0.94, 1.34]
Hall et al. (2009)
1.14 [0.95, 1.32]
RE Model
1.27 [1.11, 1.44]
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Transformed Cronbach's alpha

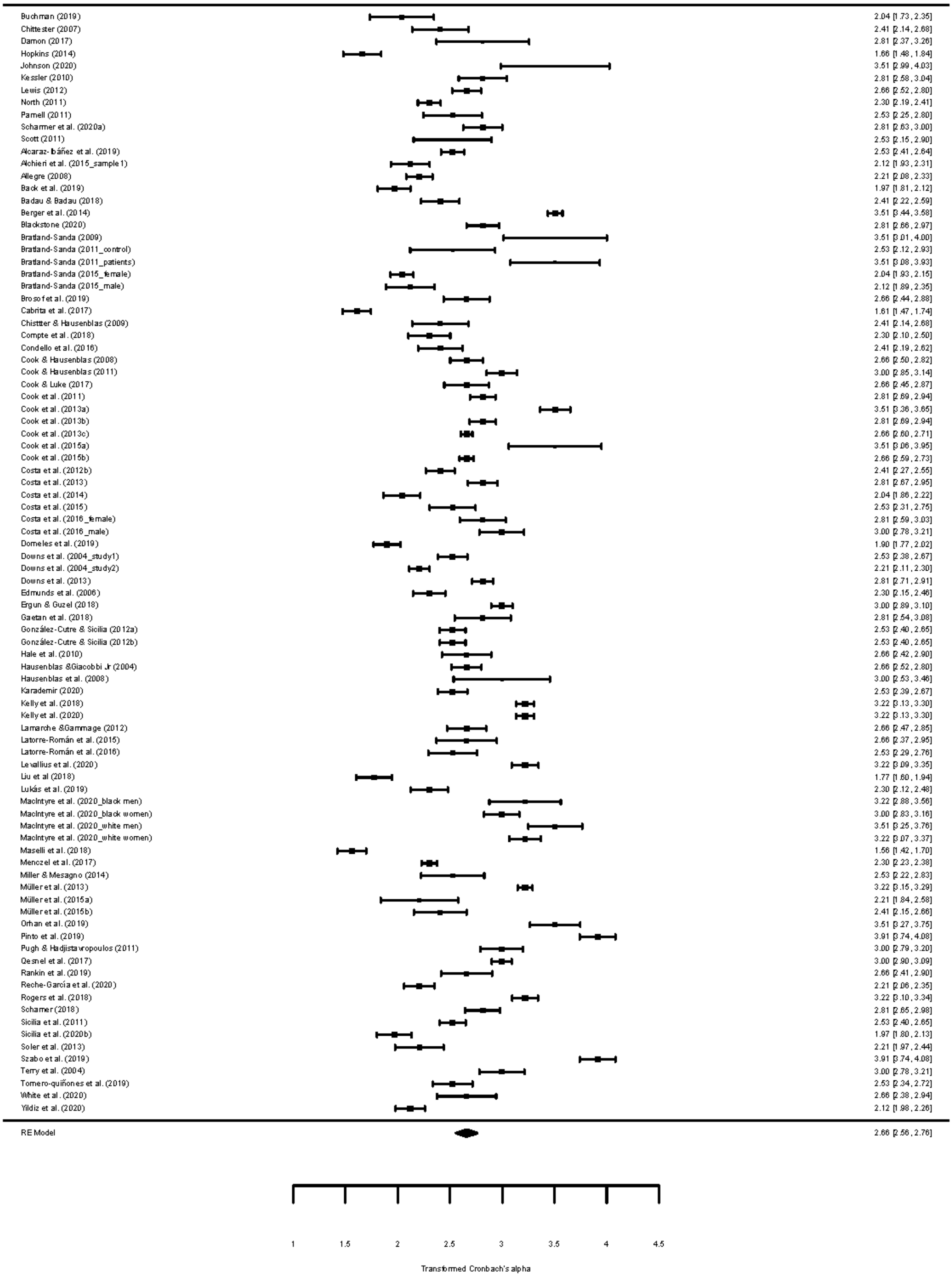

EDQ-Insight in to problem
Kern (2011)
1.14 [0.88, 1.39]
Odgen et al (1997)
1.43 [1.28, 1.58]
Zmijewski & Howard (2003_female)
0.99 [0.69, 1.30]
Zmijewski & Howard (2003_male)
1.51 [1.22, 1.81]
Grandi et al. (2013)
0.97 [0.77, 1.17]
Hall et al. (2009)
0.99 [0.81, 1.18]
RE Model
1.17 [0.98, 1.36]
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Transformed Cronbach's alpha


EDQ-Social reason
Kern (2011)
Hall et al. (2009)
Odgen et al (1997)
Zmijewski & Howard (2003_female)
Zmijewski & Howard (2003_male)
Grandi et al. (2013)
RE Model
0.58 [0.31, 0.85]
1.08 [0.88, 1.27]
1.43 [1.27, 1.59]
0.80 [0.48, 1.12]
1.20 [0.89, 1.52]
0.60 [0.39, 0.81]
0.95 [0.67, 1.24]
0
0.5
1
1.5
2
Transformed Cronbach's alpha

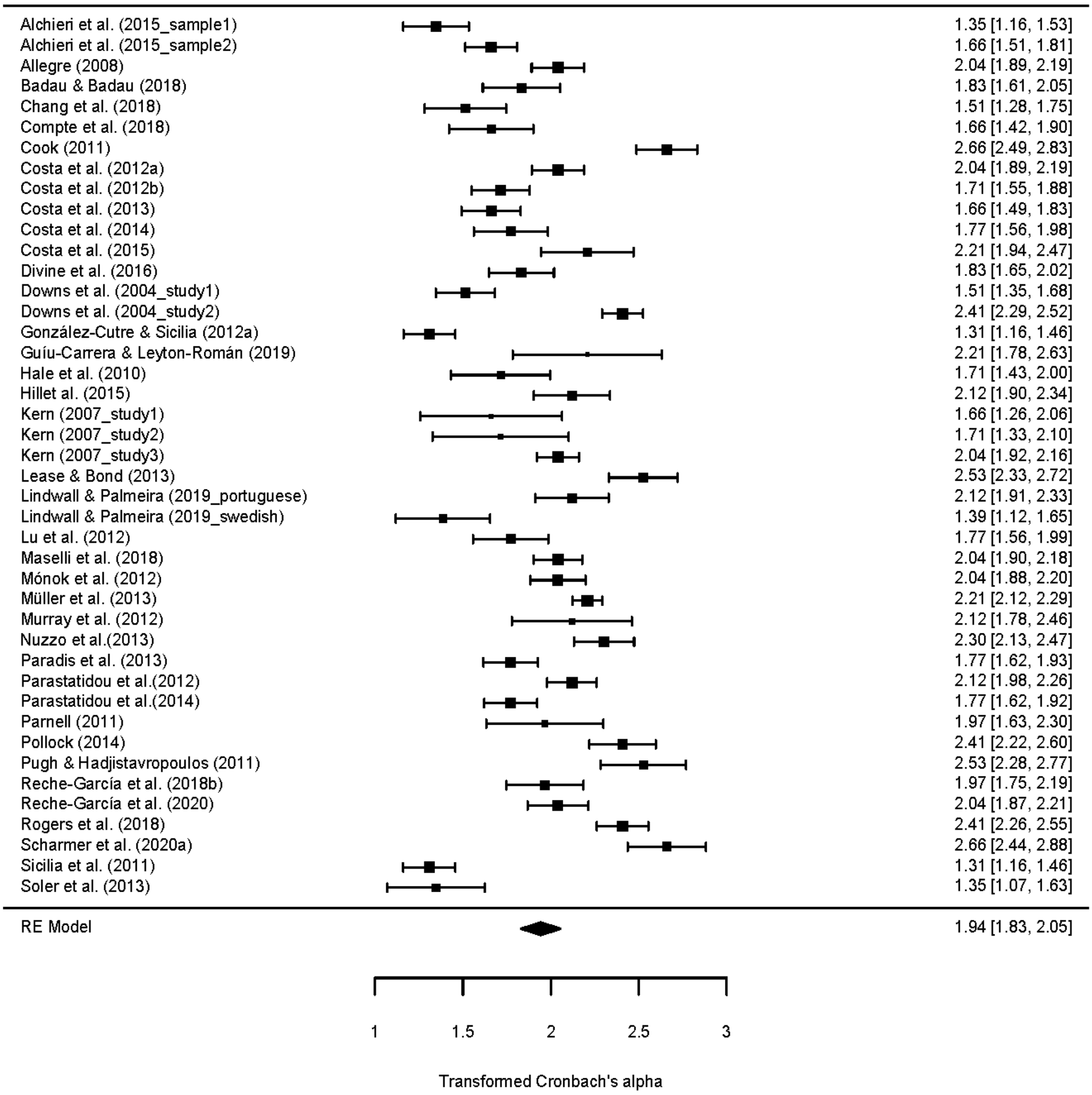

EDQ-Health reason
Kern (2011)
Hall et al. (2009)
Odgen et al (1997)
Zmijewski & Howard (2003_female)
Zmijewski & Howard (2003_male)
Grandi et al. (2013)
RE Model
1.61 [1.34, 1.88]
1.39 [1.19, 1.58]
1.20 [1.04, 1.36]
1.56 [1.24, 1.88]
1.02 [0.71, 1.33]
2.12 [1.91, 2.33]
1.49 [1.18, 1.79]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha


EDQ-Stereotype behavior
Kern (2011)
0.94 [0.63, 1.25]
Odgen et al (1997)
0.73 [0.55, 0.92]
Zmijewski & Howard (2003_female)
1.31 [0.94, 1.68]
Zmijewski & Howard (2003_male)
1.61 [1.25, 1.97]
Grandi et al. (2013)
1.17 [0.93, 1.42]
Hall et al. (2009)
0.84 [0.62, 1.07]
RE Model
1.08 [0.82, 1.33]
0.5
1
1.5
2
Transformed Cronbach's alpha

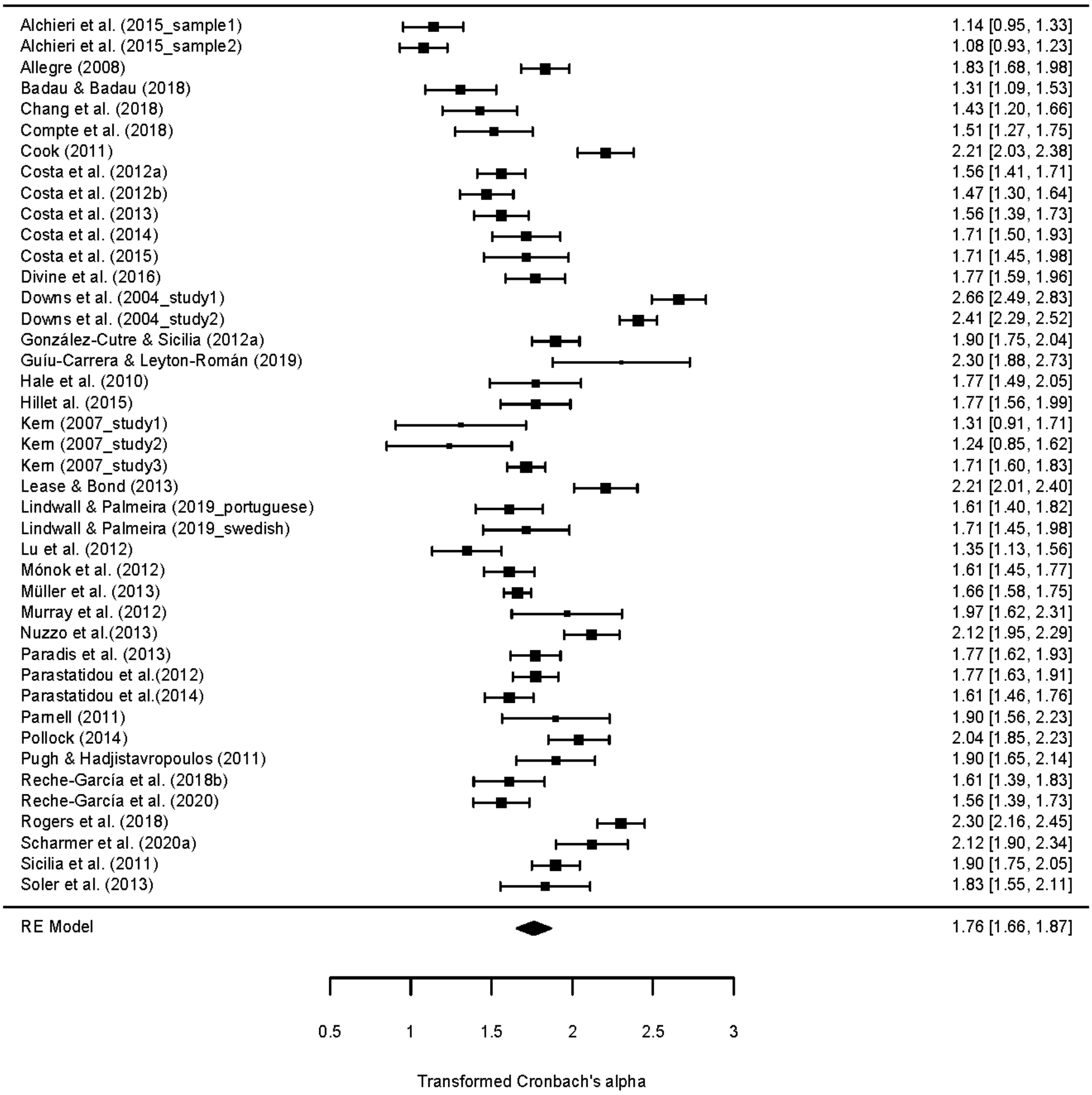
EDS-21 global score

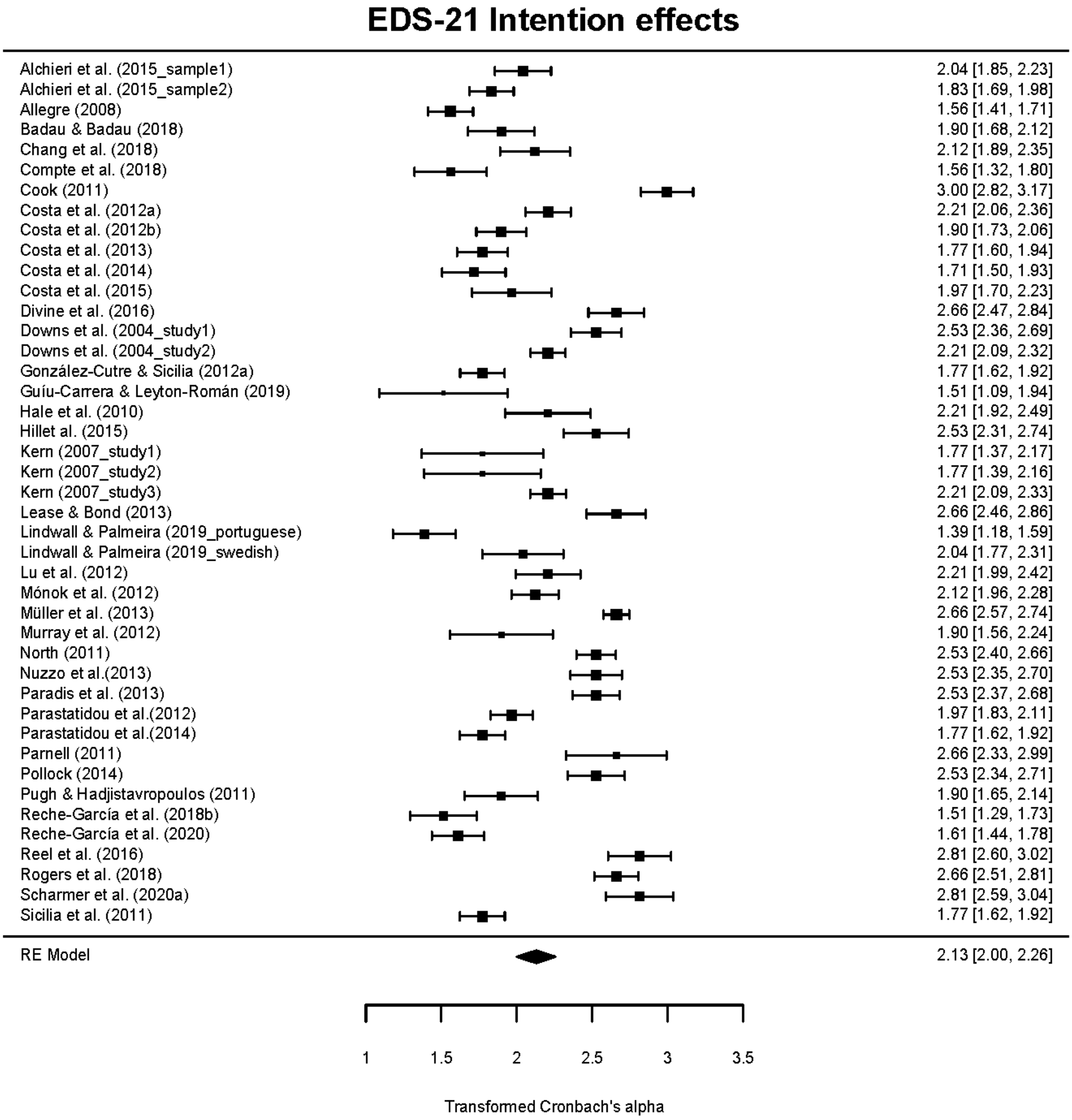


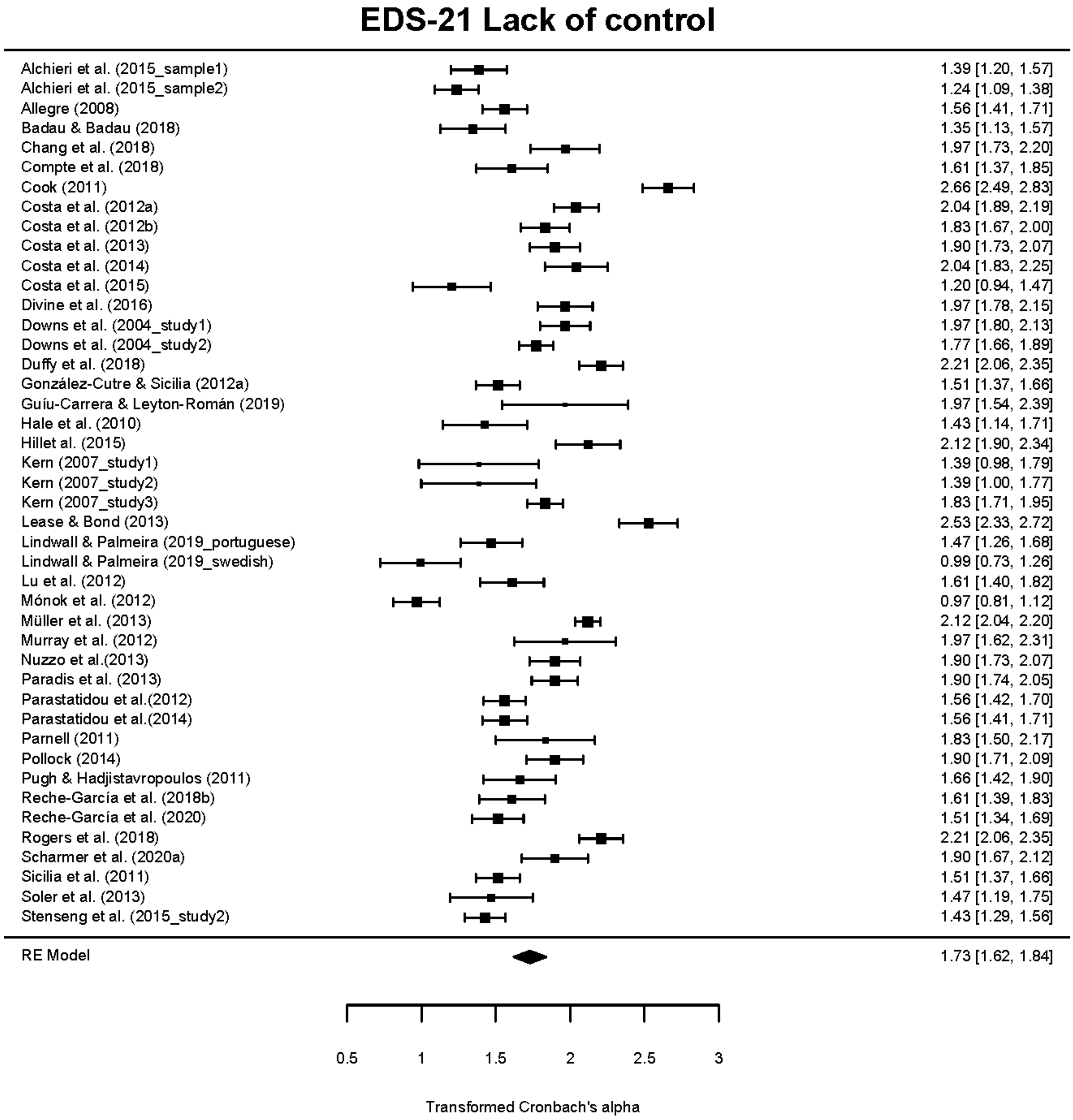
EDS-21 Tolerance



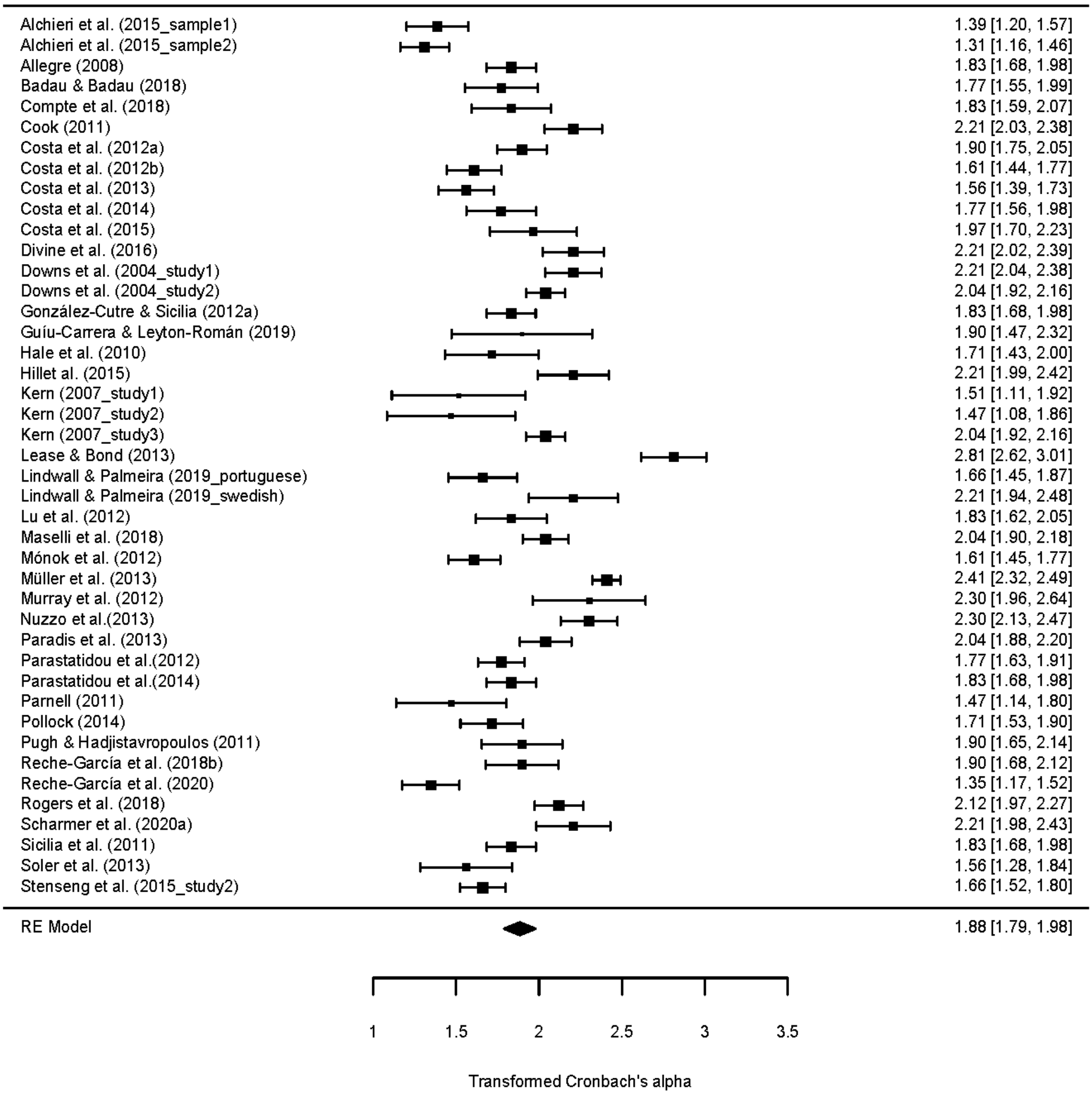
EDS 21-Withdrawal



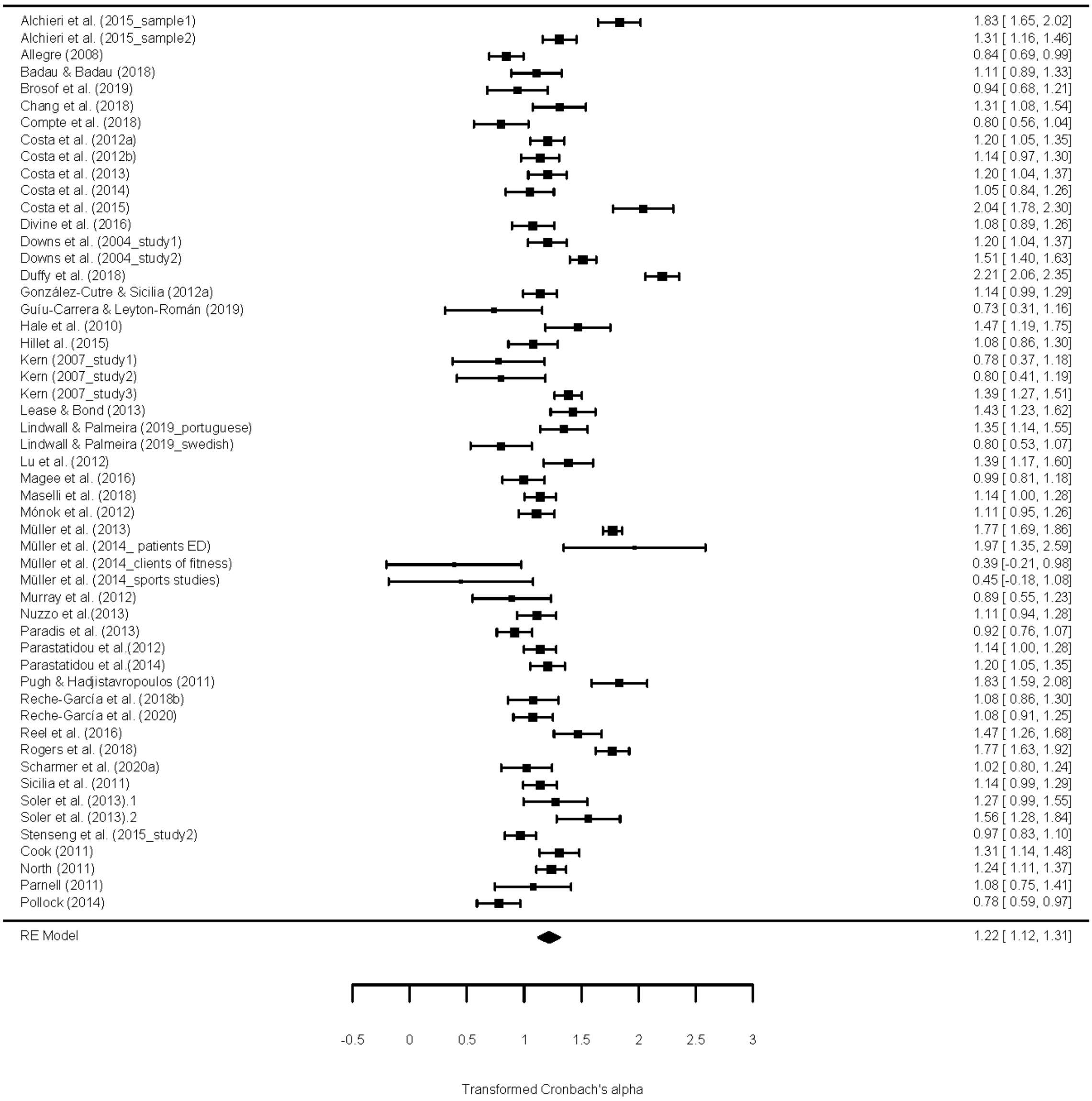

EDS-21 Intention effects
Alchieri et al. (2015_sample1) 2.04 [1.85, 2.23]
Alchieri et al. (2015_sample2) 1.83 [1.69, 1.98]
Allegre (2008) 1.56 [1.41, 1.71]
Badau & Badau (2018) 1.90 [1.68, 2.12]
Chang et al. (2018) 2.12 [1.89, 2.35]
Compte et al. (2018) 1.56 [1.32, 1.80]
Cook (2011) 3.00 [2.82, 3.17]
Costa et al. (2012a) 2.21 [2.06, 2.36]
Costa et al. (2012b) 1.90 [1.73, 2.06]
Costa et al. (2013) 1.77 [1.60, 1.94]
Costa et al. (2014) 1.71 [1.50, 1.93]
Costa et al. (2015) 1.97 [1.70, 2.23]
Divine et al. (2016) 2.66 [2.47, 2.84]
Downs et al. (2004_study1) 2.53 [2.36, 2.69]
Downs et al. (2004_study2) 2.21 [2.09, 2.32]
González-Cutre & Sicilia (2012a) 1.77 [1.62, 1.92]
Guíu-Carrera & Leyton-Román (2019) 1.51 [1.09, 1.94]
Hale et al. (2010) 2.21 [1.92, 2.49]
Hillet al. (2015) 2.53 [2.31, 2.74]
Kern (2007_study1) 1.77 [1.37, 2.17]
Kern (2007_study2) 1.77 [1.39, 2.16]
Kern (2007_study3) 2.21 [2.09, 2.33]
Lease & Bond (2013) 2.66 [2.46, 2.86]
Lindwall & Palmeira (2019_portuguese) 1.39 [1.18, 1.59]
Lindwall & Palmeira (2019_swedish) 2.04 [1.77, 2.31]
Lu et al. (2012) 2.21 [1.99, 2.42]
Mónok et al. (2012) 2.12 [1.96, 2.28]
Müller et al. (2013) 2.66 [2.57, 2.74]
Murray et al. (2012) 1.90 [1.56, 2.24]
North (2011) 2.53 [2.40, 2.66]
Nuzzo et al.(2013) 2.53 [2.35, 2.70]
Paradis et al. (2013) 2.53 [2.37, 2.68]
Parastatidou et al.(2012) 1.97 [1.83, 2.11]
Parastatidou et al.(2014) 1.77 [1.62, 1.92]
Parnell (2011) 2.66 [2.33, 2.99]
Pollock (2014) 2.53 [2.34, 2.71]
Pugh & Hadjistavropoulos (2011) 1.90 [1.65, 2.14]
Reche-García et al. (2018b) 1.51 [1.29, 1.73]
Reche-García et al. (2020) 1.61 [1.44, 1.78]
Reel et al. (2016) 2.81 [2.60, 3.02]
Rogers et al. (2018) 2.66 [2.51, 2.81]
Scharmer et al. (2020a) 2.81 [2.59, 3.04]
Sicilia et al. (2011) 1.77 [1.62, 1.92]
RE Model 2.13 [2.00, 2.26]
1 1.5 2 2.5 3 3.5
Transformed Cronbach's alpha


EDS-21 Lack of control
Alchieri et al. (2015_sample1) 1.39 [1.20, 1.57]
Alchieri et al. (2015_sample2) 1.24 [1.09, 1.38]
Allegre (2008) 1.56 [1.41, 1.71]
Badau & Badau (2018) 1.35 [1.13, 1.57]
Chang et al. (2018) 1.97 [1.73, 2.20]
Compte et al. (2018) 1.61 [1.37, 1.85]
Cook (2011) 2.66 [2.49, 2.83]
Costa et al. (2012a) 2.04 [1.89, 2.19]
Costa et al. (2012b) 1.83 [1.67, 2.00]
Costa et al. (2013) 1.90 [1.73, 2.07]
Costa et al. (2014) 2.04 [1.83, 2.25]
Costa et al. (2015) 1.20 [0.94, 1.47]
Divine et al. (2016) 1.97 [1.78, 2.15]
Downs et al. (2004_study1) 1.97 [1.80, 2.13]
Downs et al. (2004_study2) 1.77 [1.66, 1.89]
Duffy et al. (2018) 2.21 [2.06, 2.35]
González-Cutre & Sicilia (2012a) 1.51 [1.37, 1.66]
Guíu-Carrera & Leyton-Román (2019) 1.97 [1.54, 2.39]
Hale et al. (2010) 1.43 [1.14, 1.71]
Hillet al. (2015) 2.12 [1.90, 2.34]
Kern (2007_study1) 1.39 [0.98, 1.79]
Kern (2007_study2) 1.39 [1.00, 1.77]
Kern (2007_study3) 1.83 [1.71, 1.95]
Lease & Bond (2013) 2.53 [2.33, 2.72]
Lindwall & Palmeira (2019_portuguese) 1.47 [1.26, 1.68]
Lindwall & Palmeira (2019_swedish) 0.99 [0.73, 1.26]
Lu et al. (2012) 1.61 [1.40, 1.82]
Mónok et al. (2012) 0.97 [0.81, 1.12]
Müller et al. (2013) 2.12 [2.04, 2.20]
Murray et al. (2012) 1.97 [1.62, 2.31]
Nuzzo et al.(2013) 1.90 [1.73, 2.07]
Paradis et al. (2013) 1.90 [1.74, 2.05]
Parastatidou et al.(2012) 1.56 [1.42, 1.70]
Parastatidou et al.(2014) 1.56 [1.41, 1.71]
Parnell (2011) 1.83 [1.50, 2.17]
Pollock (2014) 1.90 [1.71, 2.09]
Pugh & Hadjistavropoulos (2011) 1.66 [1.42, 1.90]
Reche-García et al. (2018b) 1.61 [1.39, 1.83]
Reche-García et al. (2020) 1.51 [1.34, 1.69]
Rogers et al. (2018) 2.21 [2.06, 2.35]
Scharmer et al. (2020a) 1.90 [1.67, 2.12]
Sicilia et al. (2011) 1.51 [1.37, 1.66]
Soler et al. (2013) 1.47 [1.19, 1.75]
Stenseng et al. (2015_study2) 1.43 [1.29, 1.56]
RE Model 1.73 [1.62, 1.84]
0.5
1
1.5
2
2.5
3
Transformed Cronbach's alpha

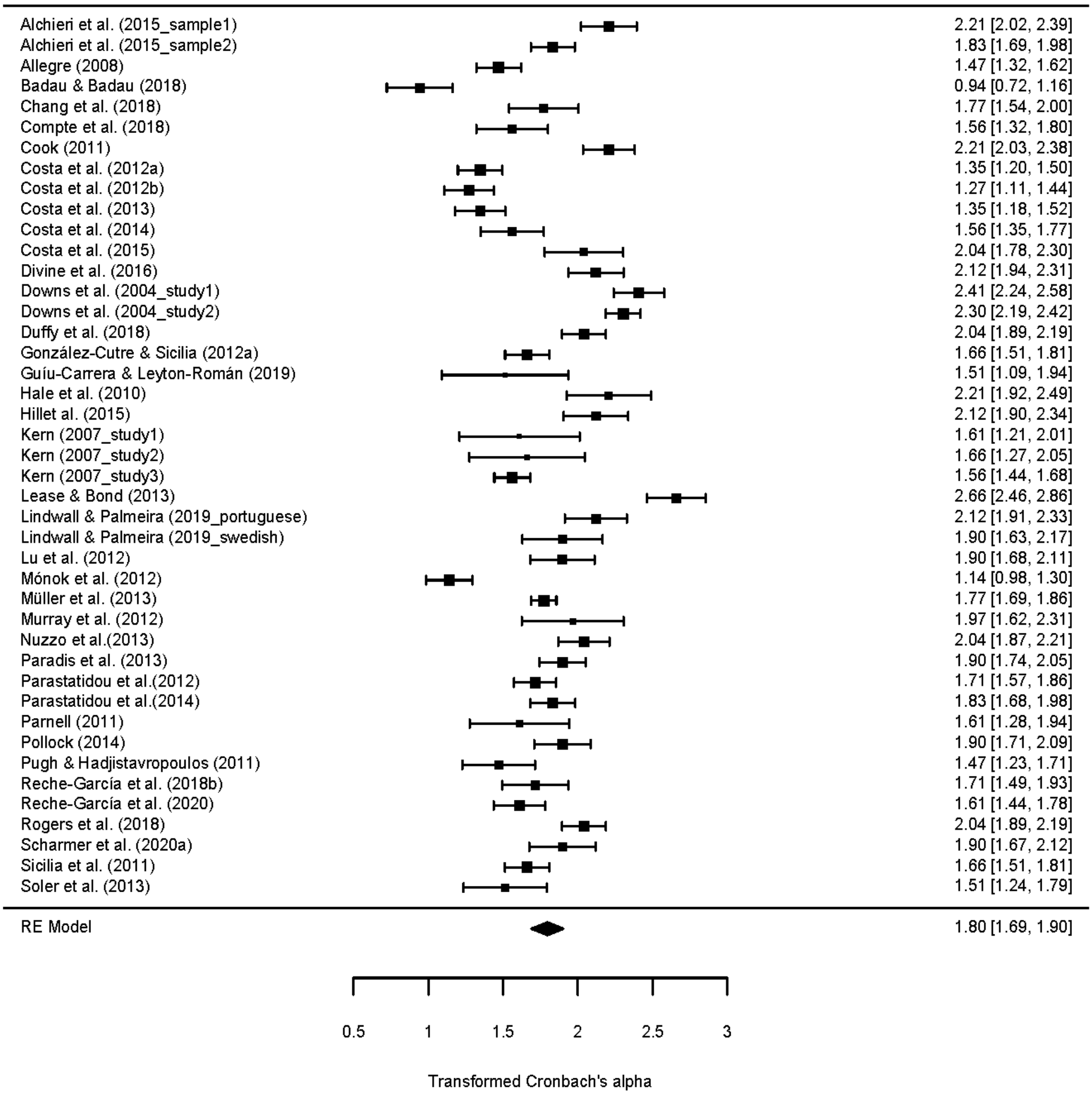
EDS-21 Time


Alchieri et al. (2015_sample1) 1.39 [1.20, 1.57]
Alchieri et al. (2015_sample2) 1.31 [1.16, 1.46]
Allegre (2008) 1.83 [1.68, 1.98]
Badau & Badau (2018) 1.77 [1.55, 1.99]
Compte et al. (2018) 1.83 [1.59, 2.07]
Cook (2011) 2.21 [2.03, 2.38]
Costa et al. (2012a) 1.90 [1.75, 2.05]
Costa et al. (2012b) 1.61 [1.44, 1.77]
Costa et al. (2013) 1.56 [1.39, 1.73]
Costa et al. (2014) 1.77 [1.56, 1.98]
Costa et al. (2015) 1.97 [1.70, 2.23]
Divine et al. (2016) 2.21 [2.02, 2.39]
Downs et al. (2004_study1) 2.21 [2.04, 2.38]
Downs et al. (2004_study2) 2.04 [1.92, 2.16]
González-Cutre & Sicilia (2012a) 1.83 [1.68, 1.98]
Guíu-Carrera & Leyton-Román (2019) 1.90 [1.47, 2.32]
Hale et al. (2010) 1.71 [1.43, 2.00]
Hillet al. (2015) 2.21 [1.99, 2.42]
Kern (2007_study1) 1.51 [1.11, 1.92]
Kern (2007_study2) 1.47 [1.08, 1.86]
Kern (2007_study3) 2.04 [1.92, 2.16]
Lease & Bond (2013) 2.81 [2.62, 3.01]
Lindwall & Palmeira (2019_portuguese) 1.66 [1.45, 1.87]
Lindwall & Palmeira (2019_swedish) 2.21 [1.94, 2.48]
Lu et al. (2012) 1.83 [1.62, 2.05]
Maselli et al. (2018) 2.04 [1.90, 2.18]
Mónok et al. (2012) 1.61 [1.45, 1.77]
Müller et al. (2013) 2.41 [2.32, 2.49]
Murray et al. (2012) 2.30 [1.96, 2.64]
Nuzzo et al.(2013) 2.30 [2.13, 2.47]
Paradis et al. (2013) 2.04 [1.88, 2.20]
Parastatidou et al.(2012) 1.77 [1.63, 1.91]
Parastatidou et al.(2014) 1.83 [1.68, 1.98]
Parnell (2011) 1.47 [1.14, 1.80]
Pollock (2014) 1.71 [1.53, 1.90]
Pugh & Hadjistavropoulos (2011) 1.90 [1.65, 2.14]
Reche-García et al. (2018b) 1.90 [1.68, 2.12]
Reche-García et al. (2020) 1.35 [1.17, 1.52]
Rogers et al. (2018) 2.12 [1.97, 2.27]
Scharmer et al. (2020a) 2.21 [1.98, 2.43]
Sicilia et al. (2011) 1.83 [1.68, 1.98]
Soler et al. (2013) 1.56 [1.28, 1.84]
Stenseng et al. (2015_study2) 1.66 [1.52, 1.80]
RE Model 1.88 [1.79, 1.98]
1
1.5
2
2.5
3
3.5
Transformed Cronbach's alpha

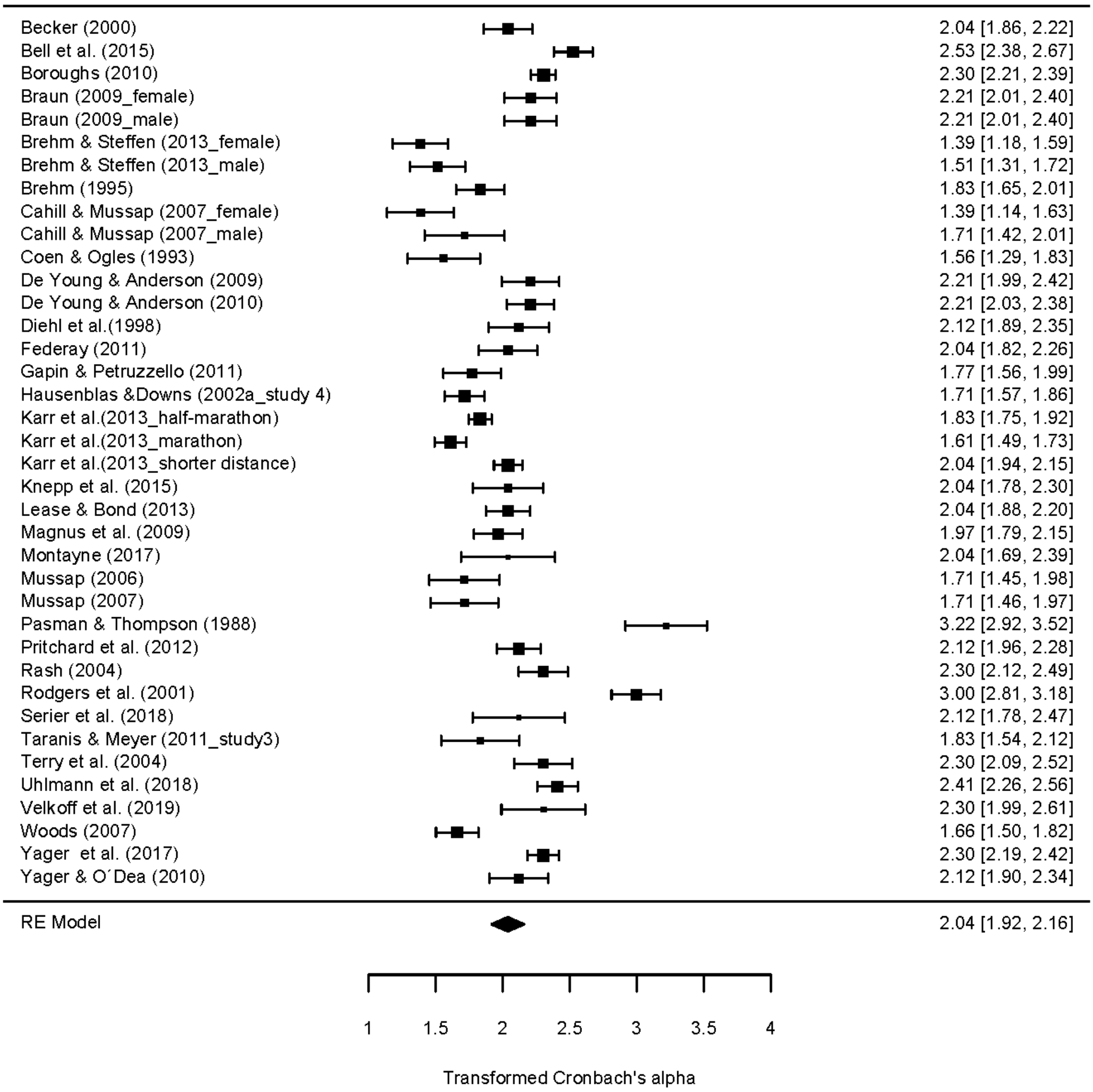
EDS-21 Reduction in other activities



EDS-21 Continuance



OEQ global score



Appendix F: Meta-Analysis Coding Sheet

Citation and year of publication

Insert citation and year of study

Sample size

N used to compute α

Exercise modality

1. Unknown (e.g., undergraduate)
2. Unclear (e.g., gym users)
3. Power disciplines
4. Non-endurance
5. Multiple sports
6. Fitness & health
7. Endurance

Eating disorders

1. Unknown
2. At-risk
3. Not at-risk
4. Mixed
5. Clinical

Report of Leisure Time Exercise (Report of LTE)

1. Yes
2. No

Regular exercisers

1. Unknown
2. Yes (i.e., exercise at least once a week)

Region

1. Unknown
2. South America
3. Oceania
4. North America
5. Mixed
6. Europe
7. Asia

Test version

1. Original
2. Linguistically adapted

Study design

1. Psychometric
2. Applied

Type of survey

1. Unknown
2. Paper-pencil
3. On-line
4. Both

Publication status

1. Published
2. Unpublished

Problematic Exercise measure

1. Commitment Exercise Scale (CES-Likert)
2. Commitment Exercise Scale (CES- VAS)
3. Compulsive Exercise Test (CET)
 3.1. Avoidance subscale of Compulsive Exercise Test
 3.2. Weight control subscale of Compulsive Exercise Test
 3.3. Mood improvement subscale of Compulsive Exercise Test
 3.4. Lack of enjoyment subscale of Compulsive Exercise Test
 3.5. Rigidity subscale of Compulsive Exercise Test
4. Exercise Addiction Inventory (EAI)
5. Exercise Dependence Questionnaire (EDQ)
 5.1. Interference subscale of Exercise Dependence Questionnaire
 5.2. Positive reward subscale of Exercise Dependence Questionnaire
 5.3. Withdrawal subscale of Exercise Dependence Questionnaire
 5.4. Weight control subscale of Exercise Dependence Questionnaire
 5.5. Insight into problem subscale of Exercise Dependence Questionnaire
 5.6. Social reasons subscale of Exercise Dependence Questionnaire
 5.7. Health reasons subscale of Exercise Dependence Questionnaire
 5.8. Stereotyped behaviour subscale of Exercise Dependence Questionnaire
6. Exercise Dependence Scale-21 (EDS-21)
 6.1. Tolerance subscale of Exercise Dependence Scale-21
 6.2. Withdrawal of Exercise Dependence Scale-21
 6.3. Intention effects of Exercise Dependence Scale-21
 6.4. Lack of control of Exercise Dependence Scale-21
 6.5. Time of Exercise Dependence Scale-21
 6.6. Reduction in other activities of Exercise Dependence Scale-21
 6.7. Continuance of Exercise Dependence Scale-21
7. Obligatory Exercise Questionnaire (OEQ)

Mean PE
Insert mean total scores of Problematic Exercise measure

Standard deviation PE
Insert mean *SD* of Problematic Exercise measure

Mean age
Insert mean age

Standard deviation age
Insert *SD* age

Percentage of whites
Insert % of whites

Percentage of females
Insert % of females

Appendix G: Studies included in meta-analysis and systematic review

Adkins, E. C., & Keel, P. K. (2005). Does "excessive" or "compulsive" best describe exercise as a symptom of bulimia nervosa? *International Journal of Eating Disorders*, *38*(1), 24–29. https://doi.org/10.1002/eat.20140

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Badau, D., & Badau, A. (2018). Identifying the incidence of exercise dependence attitudes, levels of body perception, and preferences for use of fitness technology monitoring. *International Journal of Environmental Research and Public Health*, *15*(12), 1–20. https://doi.org/10.3390/ijerph15112614

Bamber, D., Cockerill, I. M., & Carroll, D. (2000). The pathological status of exercise dependence. *British Journal of Sports Medicine*, *34*(2), 125–132. https://doi.org/10.1136/bjsm.34.2.125

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AKADÉMIAI KIADÓ

Theoretical conceptualisations of problematic exercise in psychometric assessment instruments: A systematic review

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REVIEW ARTICLE

ABSTRACT

Background and aims: The aim of the present systematic review was to identify psychometric tools developed to assess problematic exercise in order to identify and compare their theoretical conceptualisations on which they are based. *Methods:* A systematic literature search was conducted in the electronic databases Web of Science, Scielo, PsychINFO, PsycTEST and SCOPUS from their inception to January 2020. *Results:* Seventeen assessment instruments met the eligibility criteria to be included in the present review. The instruments were classified according to their conceptualisation into five groups: (i) problematic exercise as an end of an exercise continuum, (ii) problematic exercise as a means of regulating body size and weight, (iii) problematic exercise as dependence, (iv) problematic exercise as a behavioural addiction and (v) no clear conceptualisation. *Discussion:* The results suggest that the conceptualisations of the assessment instruments have resulted in a strong dichotomy in relation to the primary or secondary character of the problematic exercise that might be limiting the capacity of the instruments to adequately capture the multidimensionality of this construct. *Conclusions:* Given the interest in understanding the complexity surrounding the problematic exercise, future research should develop more comprehensive definitions of this construct. This would allow a greater conceptual consensus to be reached that would allow progress to be made in the study of the problematic exercise.

KEYWORDS

exercise addiction, exercise dependence, compulsive exercise, commitment to exercise, excessive exercise, obligatory exercise, morbid exercise

Despite the proven health benefits of exercise, research has repeatedly reported that some individuals continue to exercise despite physical, psychological, social and emotional problems that arise as a result of this behaviour (Chamberlain & Grant, 2020; Lichtenstein, Nielsen, Gudex, Hinze, & Jørgensen, 2018). Examples of this may be seen among individuals who spend such a large amount of time in their lives exercising that they neglect other obligations (such as their occupation or education) and/or come into conflict with family members (Griffiths, 1997; Kotbagi, Muller, Romo, & Kern, 2014; Morgan, 1979). It can also include cases where exercise becomes an obsession in the individual's life, and which comes to dominate thoughts and actions for much of their daily life (Griffiths, 1997; Veale, 1995; Yates, Leehey, & Shisslak, 1983).

Although the possible negative effects of over-exercising were first indicated more than 50 years ago (Adams, 2009; Carmack & Martens, 1979; Estok & Rudy, 1986), it has never received formal recognition as a mental disorder in leading clinical manuals (e.g. American Psychiatric Association, 2013; World Health Organization, 2018). In 2013, the American Psychiatric Association incorporated gambling disorder along with substance-related disorders, while another group of repetitive behaviours, including exercise, were not included because of the lack of scientific evidence to establish the diagnostic criteria and

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course descriptions needed to identify these behaviours as mental disorders (American Psychiatric Association, 2013). Contributing to this paucity of evidence has been the lack of consensus on central issues in understanding when and why exercise may become problematic. In the context of problematic exercise, two debates have characterised the historical evolution of the definition of the construct and its assessment.

The first debate began in the 1970s, and raised the issue of whether a behaviour such as exercise, which was perceived as inherently healthy, when engaged in excessively, might lead to health problems and what kind of associated problems there might be. At the centre of this debate is the work of Glasser (1976) who used the term ‘positive addiction’ to highlight the beneficial effects of running, and by extension exercise, as opposed to addiction to other behaviours that might have negative consequences. Since Glasser’s conceptualisation, there has been a continuous attempt to delimit the negative aspects of exercise as opposed to its more well-known positive effects (Adams, 2009; Estok & Rudy, 1986; Leedy, 2000). This debate raised awareness of what has been called ‘the exercise paradox’ (Egorov & Szabo, 2013) that is, the fact that an initial healthy and therapeutic activity such as exercise can lead, when control over it is lost, to pathogenic behaviour with negative consequences for the individual.

A second major debate, initiated in the 1980s, was whether the problems caused by problematic exercise are due to the exercise behaviour itself or to other associated disorders (Veale, 1995; Yates et al., 1983). Crucial to this debate was the differentiation that Veale (1987) made between problematic exercise in itself, which he called primary exercise dependence, and problematic exercise as a consequence of the existence of an associated disorder, which he called a secondary exercise dependence. Although some authors do not hesitate to state that exercise may be a primary source of problem for the individual (e.g. Griffiths, 1997), other authors maintain that this phenomenon has rarely been documented and it is difficult to differentiate it from a problematic exercise associated with other disorders (e.g. eating disorders) (Adams, 2009; Bamber, Cockerill, Rodgers, & Carroll, 2003; Blaydon & Lindner, 2002). While the debate initiated in the 1970s reached some consensus on the possible pathological nature that may derive from exercise behaviour, this second debate has not yet been resolved and keeps open the question of the relationship between problematic exercise and other already recognised disorders.

Attempts to explain problematic exercise from theoretical models (Egorov & Szabo, 2013; Freimuth, 2008; Freimuth, Moniz, & Kim, 2011; McNamara & McCabe, 2012; Meyer, Taranis, Goodwin, & Haycraft, 2011; Sussman et al., 2011) reflect to some degree the different ways in which this phenomenon is understood and assessed. Although there are papers summarising the different existing models (Symons-Downs, MacIntyre, & Heron, 2019; Szabo, Demetrovics, & Griffiths, 2018), to date, there have been no efforts that have compared the differences in conceptualisations of problematic exercise despite the fact that the models suggest different conceptualisations. For example, considering the motivation that leads the individual to exercise, the consequences associated with the behaviour, and the frequency and control over the behaviour, Freimuth (2008) proposed a heuristic model comprising four phases: recreational exercise; at-risk exercise; problematic exercise; and exercise addiction. These four phases were proposed as a clinical heuristic to explore when healthy exercise becomes problematic (Freimuth et al., 2011). The conceptualisation underlying Freitmuth’s proposed model positions problematic exercise as the end of an exercise continuum. Under this conceptualisation, problematic exercise would always derive from exercise performed relatively frequently and over a long period of time (Freimuth, 2008; Freimuth et al., 2011). Contrary to Freimuth’s model, Egorov and Szabo (2013) proposed an interactional model where the emphasis is placed on the determinants of the choice of exercise as a means of escape from hardship. Therefore, Egorov and Szabo emphasise the interaction between personal factors (i.e. personal values, past experience) and situational factors (i.e. social image, life situation) in determining whether the individual will use exercise for coping or resort to other means of dealing with stress (Egorov & Szabo, 2013; Szabo et al., 2018). What is noteworthy here, is that in contrast to the model proposed by Freimuth (2008), Egorov and Szabo’s model delineates problematic exercise as something revolutionary, that is, that can suddenly surface. Consequently, Egorov and Szabo do not necessarily appear to conceptualise problematic exercise as a continuum that would be represented by an evolution or progression from healthy (or recreational) exercise to problematic exercise.

The variety of perspectives and theoretical models explaining problematic exercise has resulted in a broad set of terms used to refer to and assess this phenomenon. Terms used include commitment to exercise (Corbin, Nielsen, Borsdorf, & Laurie, 1987; Davis, Brewer, & Ratusny, 1993), exercise addiction (Szabo, Pinto, Griffiths, Kovácsik, & Demetrovics, 2019; Terry, Szabo, & Griffiths, 2004), compulsive exercise (Meyer et al., 2016; Taranis, Touyz, & Meyer, 2011), obligatory exercise (Duncan et al., 2012; Pasman & Thompson, 1988), excessive exercise (McCabe & Vincent, 2002), problematic exercise (Chamberlain & Grant, 2020; Kotbagi, Kern, Romo, & Pathare, 2015), exercise dependence (Hausenblas & Symons-Downs, 2002a, 2002b), and morbid exercise (Alcaraz-Ibáñez, Paterna, Sicilia, & Griffiths, 2020; Szabo et al., 2018). In this paper, we use the term ‘problematic exercise’ for two main reasons. First, it serves as a generic term that covers (in a general way) the common characteristic of all these different denominations. Second, with this term we adopt an exploratory approach, so that far from positioning ourselves on any of the perspectives or theoretical models existing to date, we start only from the consensus reached in the 1970s that exercise, despite its clear positive consequences for health, can become a pathogenic behaviour with negative consequences for a minority of individuals.

However, the future incorporation of exercise behaviour as a mental health disorder appears to be contingent on the scientific community reaching some consensus on a conceptualisation of the phenomenon of problematic exercise, in such a way as to enable a clear rationale, supported by sufficient scientific evidence, that explains the mechanism by which healthy exercise can become problematic. Recent reviews and meta-analyses have highlighted the difficulty of comparing the results of different studies when they use instruments to assess problematic exercise with weak and/or different conceptualisations (Alcaraz-Ibáñez et al., 2020; Colledge, Buchner, Schmidt, & Walter, 2019), which might be seen as a clear limitation to further research in this field. Therefore, an exploration of the conceptualisations of problematic exercise underlying the psychometric assessment instruments appears necessary insofar as the scientific value of research will only be as good as the tools employed in the assessment of the constructs of interest.

While previous studies have reviewed the psychometric properties of problematic exercise assessment instruments (Hausenblas & Symons-Downs, 2002b), to date there are no known studies that have examined the conceptualisations of problematic exercise underlying psychometric assessment instruments. This is a gap in the literature, as knowing how many conceptualisations of problematic exercise underlie the psychometric assessment instruments and how these conceptualisations complement or differ from each other is a first step towards a necessary consensus. A consensus on the definition of problematic exercise would allow progress to be made in the assessment and research of this phenomenon. However, before any consensus can be reached, a prior step would be to map the different conceptualisations of problematic exercise underlying the psychometric assessment instruments. Therefore, the objectives of the present systematic review were to (i) identify psychometric tools developed to assess problematic exercise and (ii) identify and compare the theoretical conceptualisations on which the assessment instruments for problematic exercise are based. Given the exploratory nature of the present study, conceptualisations of problematic exercise were analysed in psychometric assessment instruments that were developed to be applied to any individual practising any type of exercise. This ensures that similarities or differences in the conceptualisations of problematic exercise in the assessment instruments are not due to the specifics of the type of exercise, but to different perspectives or view on the same phenomenon.

METHOD

The systematic review was conducted in accordance with the checklist from the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009) (see Appendix A in supplementary material).

Identifying studies

A systematic literature search was conducted in the electronic databases Web of Science, Scielo, PsycINFO, PsycTEST and SCOPUS from their inception to August 2020. A combination of the following search terms was used: ‘problematic exercise’, ‘morbid exercise’, ‘exercise addiction’, ‘exercise dependence’, ‘compulsive exercise’, ‘compulsive physical activity’, ‘obligatory exercise’, ‘commitment to exercise’, ‘excessive exercise’, ‘questionnaire’, ‘validation’, ‘validity’, ‘psychometrics’, ‘scale’ (see full search strategy in Appendix B in supplementary material). All references were checked and duplicate studies were removed using *EndNote X9* software. The second and third authors reviewed and selected the studies included in the review in two phases: (i) through visualisation of studies’ title and abstract and (ii) by reviewing the studies’ full-text in view of the eligibility criteria. Disagreements between reviewers were resolved by consensus and, when needed, by consulting with the first author. In addition, reference lists of all the retrieved studies were checked for possible eligible studies.

Eligibility criteria

The review gathered data from studies proposing psychometric instruments assessing symptoms of problematic exercise, that is, exercising to the point where the individual loses control over the behaviour such that the latter becomes obligatory and may lead to physical, mental and/or social damage (Szabo et al., 2018). In addition, psychometric studies proposing a modified factor structure of previously validated instruments were also considered (e.g. Exercise Salience Scale, Kline, Franken, & Rowland, 1994; Obligatory Exercise Questionnaire, Steffen & Brehm, 1999).

Inclusion criteria. Studies were considered eligible when the following three criteria were met: (a) studies proposed a self-reported instrument assessing a potential form of problematic exercise; (b) studies were written in English or Spanish (the two languages of the review authors); and (c) studies were published in a peer-reviewed journal.

Exclusion criteria. Studies were excluded on the basis of the following criteria: (a) the proposed instrument examined a potential form of problematic exercise in specific exercise or sport contexts; examples of the latter are the Exercise Dependence in Bodybuilders (Smith & Hale, 2004) or the Commitment to Running (CR, Carmack & Martens, 1979) and (b) the goal was to adapt a pre-existing self-reported instruments assessing a potential form of problematic exercise into a new language/culture (e.g. Sicilia & González-Cutre, 2011), exercise context (e.g. Dance Addiction Inventory, Maraz, Urbán, Griffiths, & Demetrovics, 2015), or subpopulation (e.g. youth version of the Exercise Addiction Inventory [EAI-Y], Lichtenstein, Griffiths, Hemmingsen, & Støving, 2018) and (c) the provided information did not allow the qualitative evaluation of the content (e.g. Excessive Exercise Scale [EES], Long, Smith, Midgley, & Cassidy, 1993).

Coding procedure

A preliminary search was conducted, and a coding sheet was developed based on the common characteristics of the studies found. The first and third authors systematically coded the data for all the retrieved studies using this coding sheet (see Appendix C in supplementary material). Disagreements in the data coding procedure were resolved by discussion between the two authors. Data from the studies were classified into the following categories: (i) instrument; (ii) author; (iii) sample size; (iv) conceptualisation; (v) item generation and (vi) factor structure.

RESULTS

The search conducted systematically identified 1,543 papers of which 65 were reviewed utilizing the full text. Finally, 17 papers met the eligibility criteria to be included in this review (see Fig. 1). Each of the 17 papers presents either the development of an instrument to assess problematic exercise or new versions of an existing one (e.g. by introducing modifications concerning the number of items and/or the factor structure). The instruments included in the present systematic review (see Table 1) were classified into five groups according to their underlying theoretical perspectives (i.e., problematic exercise as end of a continuum of exercise, problematic exercise as a behaviour to regulate body shape and weight, problematic exercise as a dependence/behavioural addiction, and no clear conceptualisation).

Problematic exercise as an end of an exercise continuum

Of the 17 instruments, three of them (i.e., Commitment to Physical Activity Scale, CPAS, Corbin et al., 1987;

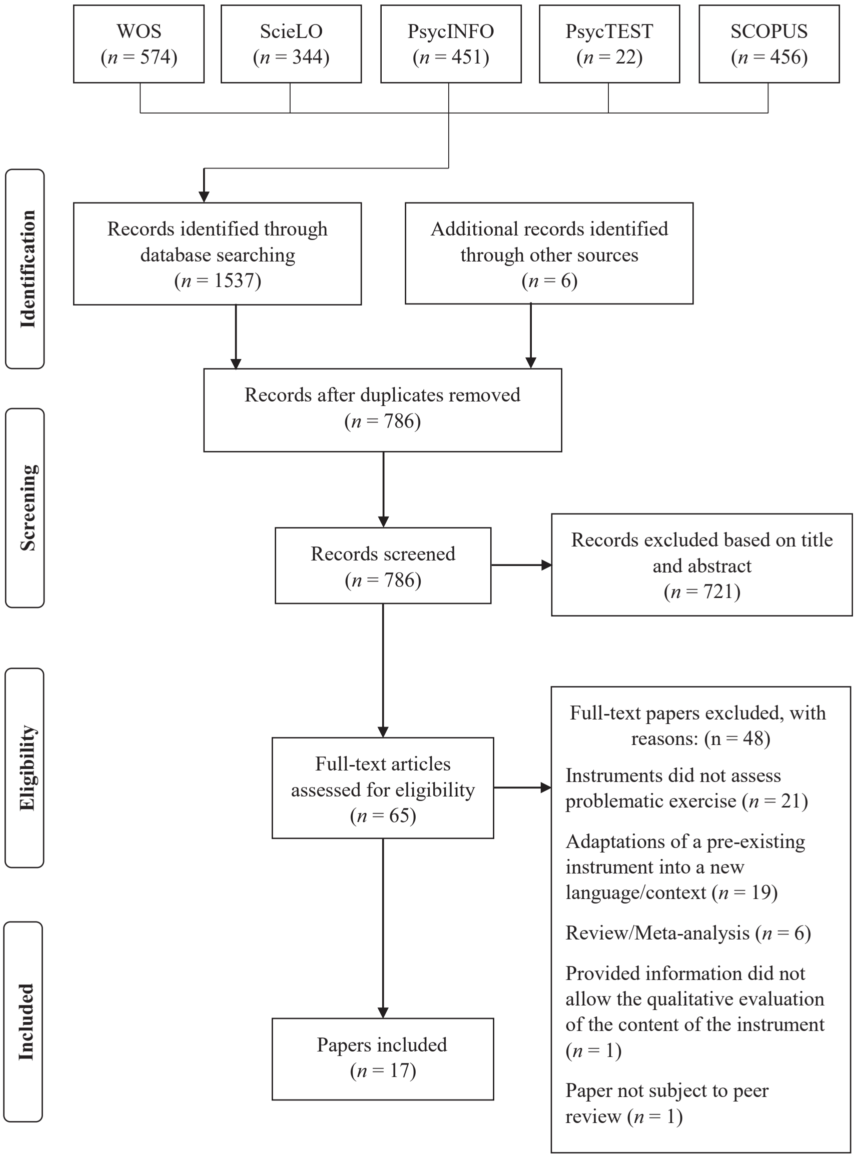

Fig. 1. PRISMA-based flow diagram of study selection

Table 1. Characteristics and conceptualisation of psychometric instruments assessing problematic exercise

Instrument	Authors	Sample size (characteristics)	Conceptualisation	Items Generation	Factor structure
Commitment to exercise scale (CES)	Davis et al. (1993)	185 Exercisers recruited from recreational facilities at University, health and fitness clubs and associations in Canada Men (*N* = 88; mean age = 28.93; SD = 9.42) Women (*N* = 97; mean age = 26.71; SD = 8.81)	Problematic exercise as end of a continuum of exercise	Examination of published case studies	8 items (visual analogue scale) with 2 factors: Obligatory; Pathological
Commitment to Physical Activity questionnaire (CPA)	Corbin et al. (1987)	450 College students enrolled in PE classes at an USA University (Men = 238; Women = 212)	Problematic exercise as end of a continuum of exercise	Adaptation of the items of Commitment to Running Scale	12 items (5-point scale) with unidimensional structure
Commitment to Physical Activity Scale -Revised (CPA-R)	DeBate et al. (2009)	937 Girls, aged 8 to 13, from different locations across USA taking part in an PA intervention program	Problematic exercise as end of a continuum of exercise	Review of the 12-item CPA structure	12 items (4-point scale) with 3 factors: Value of PA; Attitudes toward PA; Motivation regarding PA
Compulsive Exercise Test (CET)	Taranis et al. (2011)	367 young women (Mage = 20.76, SD = 2.39, range = 18–30), recruited from a UK university (68,8%) and Australian university (28,1%) engaged in regular exercise or sport over the last 4 weeks (M = 4.27 h/w). BMI = 21.86 (SD = 2.77; range = 16.3–38.2)	Problematic exercise as a behaviour to regulate body shape and weight	Pool of 31 items derived from the proposed theoretical model	24 items (5-point scale) with 5 factors: Avoidance and rule-driven behaviour; Weight control exercise; Mood improvement; Lack of exercise enjoyment; Exercise rigidity
Excessive Exercise Scale (EES)	McCabe and Vincent (2002)	413 secondary schools' students (*Boys* = 221; Mage = 13.76, SD = 1.07; Girls = 192; Mage = 13.81, SD = 1.10)	Problematic exercise as a behaviour to regulate body shape and weight	Pool of 10 items adapted from the Excessive Exercise Scale (Long et al., 1993)	8 items (5-point scale) with 2 factors: Need for exercise; Focus on exercise
Exercise Addiction Inventory (EAI)	Terry et al. (2004)	200 university students, (102 sport science students; 98 psychology students), age from 18 to 40, who reported regular participation in exercise. (Mage = 21.24, SD = 3.77); Men = 111 (Mage = 20.82); Women = 189 (Mage = 21.75)	Problematic exercise as a behavioural addiction	Pool of 6 items based on a modified version of the components of behavioural addictions (Griffiths, 1997)	6 items (5-point scale) with unidimensional structure

(continued)

Table 1. Continued

Instrument	Authors	Sample size (characteristics)	Conceptualisation	Items Generation	Factor structure
Exercise Addiction Inventory (EAI-R)	Szabo et al. (2019)	277 young and adult individuals (Men = 243; Women = 34; aged from 22 to 45) recruited on social media and exercised regularly at least three times per week	Problematic exercise as a behavioural addiction	Pool of 6 items from EAI	6 items (6-point scale) with unidimensional structure
Exercise Beliefs Questionnaire (EBQ)	Loumidis and Wells (1998)	13 exercisers (Male = 7; Female = 6; aged from 21 to 40) recruited from a university sports centre and who reported exercised over three times a week.	Problematic exercise as a dependence	Pool of 28 items based on beliefs elicited from interviews to 13 exercisers to examine psychological factors associated with being unable to exercise	21 items with 4 factors: Social desirability; Physical appearance; Mental and emotional functioning; Vulnerability to disease and ageing
Exercise Dependence Questionnaire (EDQ)	Ogden et al. (1997)	449 young and adult participants (Male = 161; Mage = 32.85; Female = 288; Mage = 31.26) recruited from sports clubs, leisure centres, and ads in magazines, reported exercising more than 4 hours/ week.	Problematic exercise as a dependence	Initial pool of 86 items from unstructured self-report questionnaires to subjects who considered themselves to be addicted to exercise	29 items (7-point scale) with 8 factors: Interference with social/family/work life; Positive reward; Withdrawal symptoms; Exercise for weight control; Insight into problem; Exercise for social reasons; Exercise for health reason; Stereotyped behaviour.
Exercise Dependence Scale (EDS)	Hausenblas and Symons-Downs (2002)	266 university students (57,7% men; Mage = 21.72, SD = 2.89	Problematic exercise as a dependence	Based on the DSM-IV criteria for substance dependence, an initial pool of 35 items from interviews and reviewing existing measures	31 items (6-point scale) with 7 factors: Tolerance; Withdrawal; Intention effects; Lack of control; Time; Reduction in other activities; Continuance.
Exercise Dependence Scale-Revised (EDS-R)	Symons-Downs et al. (2004)	408 university students (65.7% women; Mage = 20.2 years, SD = 2.5) participating in fitness classes at least three times per week	Problematic exercise as a dependence	Pool of 28 items from EDS	21 items (6-point scale) with 7 factors: Tolerance; Withdrawal; Intention Effects; Lack of Control; Time; Reduction in Other Activities; Continuance.
Exercise Salience Scale (ESS) (a)	Kline, Franken, and Rowland (1994)	74 university students (Men = 32, Women = 42) enrolled in undergraduate psychology courses (Mage = 23.17; SD = 6.31).	No clear conceptualisation	Pool of 40 items proposed by Morrow and Harvey (1990) in a popular fitness magazine	40 items (5-point scale) with 2 major factors (Response Omission Anxiety, and Response Persistence) and 4 minor factors (undefined)

(continued)

Table 1. Continued

Instrument	Authors	Sample size (characteristics)	Conceptualisation	Items Generation	Factor structure
Obligatory Exercise Questionnaire (OEQ)	Pasman and Thompson (1988)	90 volunteers, aged 18–60, 15 men and 15 women in each of the three following groups: obligatory runners (Mage women = 33.1, Mage men = 37.2); obligatory weightlifters (Mage women = 27.4, Mage men = 26.7); sedentary group (Mage women = 29.1; Mage men = 32.3).	Problematic exercise as a behaviour to regulate body shape and weight	Items adapted from the Obligatory Running Questionnaire	20 items (4-point scale) with one factor
Obligatory Exercise Questionnaire (OEQ-1)	Steffen and Brehm (1999)	250 high school students (Women = 133; Men = 117)	Problematic exercise as a behaviour to regulate body shape and weight	Review of the 20-item structure of OEQ	10 items (4-point scale) with 3 factors: Emotional element of exercise; Exercise frequency and intensity; Exercise preoccupation
Obligatory Exercise Questionnaire (OEQ-2)	Ackard et al., (2002)	586 female university students (Mage = 20.61; SD = 3.09). Actual BMI = 22.79; SD = 4.51. Ideal BMI = 20.31; SD = 2.17.	Problematic exercise as a behaviour to regulate body shape and weight	Review of the 20-item structure of OEQ	11 items (4-point scale) with 3 factors: Exercise fixation; Exercise frequency; Exercise commitment
Obligatory Exercise Questionnaire – Revised (OEQ-R)	Duncan et al. (2012)	241 exercisers (Men = 143 Mage = 29.95 SD = 11.12; Women = 97, Mage = 32.89, SD = 12.47; 1 case did not report gender).	Problematic exercise as a behaviour to regulate body shape and weight	Review of the 20-item structure of OEQ	10 items (4-point scale) with 3 factors: Preoccupation with exercise; Exercise behaviour; Exercise emotionally
Problematic Practice of Physical Exercise Scale (PPPE)	Kotbagi et al. (2015)	341 leisure exercisers (Men = 232; Women = 109) involved in activities such as yoga, cricket, soccer, gymnastics, swimming, tennis and dancing (Mage = 28.26; SD = 10.83)	No clear conceptualisation	Pool of 50 items that groups the 29 items of the EDQ (Ogden et al., 1997) and the 21 items of the EDS-R (Symons-Downs et al., 2004).	25 items (6-point scale) with 6 factors and 4 subfactors: Lack of control; Stereotypical behaviour (intention, and continuity); Motivation for health (physical health, and psychological health); Withdrawal; Interference with social life; Tolerance

Note: PE = Physical Education; USA = United States of America; UK = United Kingdom; BMI = Body Mass Index; PA = Physical Activity; DSM = Diagnostic and Statistical Manual of Mental Disorders.

Commitment to Exercise Scale, CES, Davis et al., 1993; Commitment to Physical Activity Scale Revised, CPAS-R, DeBate, Huberty, & Pettee, 2009) used the notion of a strong commitment to activity, or over-exercising, to conceptualise the problematic exercise. This term was adapted from the more specific term 'running commitment' (Carmack & Martens, 1979), which was one of the first labels used by the instruments to examine the speculations that had emerged institutionally and based upon years of personal running experience about the positively addictive nature of this activity (Glasser, 1976).

Out of the three instruments that use the term 'commitment to exercise', two of them were adaptations of the Commitment to Running Scale (CRS; Carmack & Martens, 1979), to the general scope of exercise. More specifically, the CPAS (Corbin et al., 1987) was the first adaptation of the CRS to the general scope of exercise, and maintains the one-dimensional structure of 12 items of the original instrument, only modifying the direction and wording of the items slightly (e.g. replacing the term 'running' with 'physical activity'). The revision of the CPAS (CPAS-R) by DeBate et al. (2009) maintains the original 12 items, only slightly altering the wording of the items in order to adapt them to school-age adolescents. However, instead of maintaining the original one-dimensional structure, DeBate et al. proposed a three-factor structure (i.e. value, attitudes, and motivation towards physical activity), although they did not offer a definition of each of these factors.

Unlike the CPA and CPA-R, the Commitment to Exercise Scale (CES; Davis et al., 1993) consists of eight items that were developed from the examination of a number of published case studies that collected the testimonies of men and women with clear pathological or excessive exercise habits (e.g. Morgan, 1979; Yates, 1991; Yates et al., 1983). Therefore, the CES moves even further away from the idea of exercise as a positive addiction, and takes the concept of problematic exercise a little closer to the end of a continuum, where excessive or over-exercising would be found to have negative consequences for the individual. The instrument was designed with the idea of evaluating the degree to which feelings of wellbeing are influenced by exercising, the degree to which exercise is performed despite the presence of adverse conditions to continue it, and the extent to which the exercise interferes with the individual's social commitments. As with the aforementioned two instruments, the instruments that conceptualise problematic exercise based on the exerciser's level of commitment focus on questioning the original concept of positive addiction suggested by Glasser (1976). However, apart from this general objective, the instruments within this group suffer from the absence of a conceptual basis and, in this sense, lack an organized and systematic representation of this construct.

Problematic exercise as a means of regulating body size and weight

The instruments grouped in this conceptualisation adopt different names to refer to problematic exercise, although they often use the terms compulsory, excessive and compulsive exercise interchangeably. This group includes the Obligatory Exercise Questionnaire (OEQ, Pasman & Thompson, 1988), and its subsequent revisions (Ackard, Brehm, & Steffen, 2002; Duncan et al., 2012; Steffen & Brehm, 1999), the Excessive Exercise Scale (EES, McCabe & Vincent, 2002) and the Compulsive Exercise Test (CET, Taranis et al., 2011). In all of these instruments, there is a shared idea that the problematic exercise is associated with the phenomenon of body image disturbance. Therefore, it is considered that problematic exercise may be associated with elevated dissatisfaction with appearance and, consequently, engage in excessive exercise and dieting in order to modify their figure. Thus, the instruments are mainly oriented to assess common elements between problematic exercise and chronic dieters. In fact, in the development of each instrument, along with the items that assess the problematic character of the exercise, are included measures that assess constructs related to body image and eating disorders (e.g. eating disorders, drive for thinness, drive for bulimia, body satisfaction). A brief summary of the development of these instruments is outlined below.

Obligatory Exercise Questionnaire. The original version of the OEQ (Pasman & Thompson, 1988) is a modification of the Obligatory Running Questionnaire (ORQ, Blumenthal, Toole, & Jonathan, 1984), which was developed in response to the suggestion that compulsive runners share psychological and behavioural dispositions to patients with anorexia nervosa (Yates et al., 1983). Since the original instrument by Pasman and Thompson (1988) there have been three modifications to the OEQ, all of which have proposed reduced versions of the instrument (Ackard et al., 2002; Duncan et al., 2012; Steffen & Brehm, 1999).

Excessive Exercise Scale. McCabe and Vicent (2002) consider that exercise, together with dieting, are two of the most common ways of modifying body size and shape. However, they understand that excessive exercise should not only be studied in its relationship to eating disorders, but also to other disorders associated with modifying body size and shape. Therefore, whereas dieting appears to be the most common way for females to lose weight, exercise is the most common strategy for males to achieve their ideal body type. The authors modified, through two studies, items contained in the EES, developed by Long et al. (1993), to adapt it to adolescent populations. It should be noted that the ESS is an instrument developed to examine exercise behaviour, attitudes and motivation to exercise among anorexic and normal samples, and is basically an adaptation of three standardized scales existing at that time. Therefore, as in the case of the OEQ, the EES by McCabe and Vicent (2002) is an adaptation of another existing instrument, so beyond identifying with the general idea that problematic exercise is a means of modifying the weight and body shape, there is no theoretical development on the components that define the construct. To our knowledge, there have been no further revisions or new developments of this instrument.

Compulsive Exercise Test. The CET is based on a cognitive behavioural conceptualisation of excessive exercise (Meyer et al., 2011) and was designed to assess the core maintaining factors for excessive exercise. Similar to the other instruments included in this group, the conceptualisation underlying the CET is that excessive exercise is a primarily a weight control behaviour maintained by weight and shape concerns (Taranis et al., 2011). This measure was specifically designed for use within the eating disorders domain. However, while weight and shape concerns remain an essential component of excessive exercise, it considers other key factors, such as negative affect and compulsivity. Consequently, the CET is based on a multidimensional construct that involves 'an association with weight and shape concerns, and persistent continuation in order to: (a) mitigate the experience of extreme guilt and/or negative affect when unable to exercise and (b) avoid the perceived negative consequences of stopping' (Meyer et al., 2011, p. 184). Although it is recognized that negative affect regulation involving withdrawal effects is a recurrent element in other conceptual frameworks, such as those that conceptualise the problematic exercise as a dependence or addiction, Meyer et al. consider that it is unlikely that a primary exercise dependence exists, that is, problematic exercise does not exist in the absence of eating disorders. Therefore, for these authors, withdrawal symptoms are more likely a component of compulsivity, such that it constitutes a primary maintenance factor for exercise.

Unlike the OEQ and EES, for the development of the CET, Taranis et al. (2011) developed a pool of 31 items that were generated through interviews with eating disorder patients, review of literature on eating disorder and exercise, existing scales, and analysis of the construct validity of these scales (see Meyer et al., 2011). With this pool of items, the authors expected to assess the hypothesized maintenance factors for excessive exercise: (i) compulsivity (e.g. rigid adherence to a strict and repetitive exercise routine, continuing to exercise despite illness or injury, lack of exercise enjoyment, extreme guilt when unable to exercise, making up for missed exercise sessions), (ii) affect regulation (e.g. the positive and negative reinforcement properties of exercise) and (iii) weight control exercise (e.g. compensatory exercise). The functioning of the items was examined through three empirical studies with independent samples of women, proposing a final model of 24 items grouped into five factors.

Problematic exercise as a primary dependence/addiction

Of the 17 instruments accounted for in this review, six instruments were oriented towards assessing primary problematic exercise (i.e. problematic exercise regardless of whether other disorders co-occur). Therefore, these are considered together in the "Results" section given that all six instruments were classified according to the conceptualisation of problematic exercise as either dependence or addiction. Of these six instruments, in the development of the Exercise Beliefs Questionnaire (EBQ, Loumidis & Wells, 1998), the terms 'addiction' and 'dependence' are used interchangeably, in the development of the Exercise Dependence Questionnaire (EDQ, Ogden, Veale, & Summers, 1997), the Exercise Dependence Scale (EDS, Hausenblas & Symons-Downs, 2002b), and the Exercise Dependence Scale – Revised (EDS-R, Symons-Downs, Hausenblas, & Nigg, 2004), problematic exercise is conceptualised based on substance dependence criteria (American Psychiatric Association, 2000), while in the Exercise Addiction Inventory (EAI, Terry et al., 2004) and in the Exercise Addiction Inventory–Revised (EAI-R, Szabo et al., 2019) the components model for behavioural addictions (Griffiths, 2005) is used to define and operationalize problematic exercise. The following is a brief summary of each of these six instruments.

General use of dependence/addiction. In developing the Exercise Beliefs Questionnaire (EBQ), Loumidis and Wells (1998) conceptualised problematic exercise in terms of a maladaptive behaviour associated with both physical and psychological risk, which was not secondary to eating disorder. Although they mostly use the term 'exercise dependence', they associated it with the term 'addiction', without establishing a differentiation with the latter. In the attempt to develop an instrument to assess primary exercise dependence, the authors relied on the Beck's schema theory (Beck, 1978) of emotional disorder as a basic framework to develop a cognitive conceptualisation of exercise dependence. In this sense, the instrument attempts to assess beliefs and attitudes that predispose to, and maintain, exercise dependence. Using an imagery technique, beliefs elicited from exercisers associated with being unable to exercise were used to construct a pool of 28 items grouped in four dimensions. Through different empirical studies the factor structure of the instrument was examined and the items were reduced to 21 in the final version of the instrument, although the four-factor structure was maintained.

Assessment instruments based on substance dependence criteria. Three instruments conceptualise problematic exercise in terms of dependence – the Exercise Dependence Questionnaire (EDQ), the Exercise Dependence Scale (EDS), and the revised Exercise Dependence Scale (EDS-R). These are partially or totally based on the clinical criteria for substance dependence listed in the DSM-IV (American Psychiatric Association, 2000). Both instruments assess primary exercise dependence (Veale, 1987, 1995). However, as the authors recognize, the instrument should be used alongside other measures that assess mental disorders that may be associated (e.g. eating disorders), and therefore rule out secondary dependence (i.e. the concern with exercise is not better accounted for by other disorders).

The EDQ (Ogden et al., 1997) adopts a conceptualisation of problematic exercise based on some of the criteria for substance dependence included in the DSM-IV, but also includes other factors based on motivational dimensions (e.g. motivation for physical and psychological health). More specifically, Ogden et al. conceptualise exercise dependence as a combination of problematic elements of exercise (e.g. withdrawal, tolerance, repetitive behaviour, excess), but also incorporate a psychosocial perspective that recognizes psychological consequences and effects on interpersonal relationships. For the development of the EDQ, Ogden et al.'s items are based on unstructured self-report questionnaires that were completed by 131 participants who considered themselves to be addicted to exercise. On the basis of their statements and the commitment themes emerged, a pool of 86 items were developed. After exploratory factor analysis the final EDQ comprised 29 items and eight factors (as described in Table 1).

Unlike the EDQ, the EDS (Hausenblas & Symons-Downs, 2002b) presents a multidimensional conceptualisation of exercise dependence that is based entirely on the seven symptoms for substance dependence listed in the DSM-IV. By operationalizing exercise dependence according to all the criteria established in the DSM-IV, it adopts a conceptual structure that reinforces the rationality of the measure. Consequently, the EDS provides information on the average of each of the symptoms or the average of the total score. Considering the first option, the EDS allows for differentiating individuals into three groups: (i) at-risk for exercise dependence, (ii) symptomatic and (iii) asymptomatic. Since its inception, the factorial structure of EDS has been represented by the seven diagnostic criteria established for substance dependence in the DSM-IV. The number and sensitivity of items that comprise the instrument has varied throughout different studies that have been published in two papers. The revised version of the EDS (EDS-R, Symons-Downs et al., 2004) proposed a total of 21 items (three items per factor).

Assessment instruments based on behavioural addiction components. Both the EAI (Terry et al., 2004) and its subsequent revision (EAI-R, Szabo et al., 2019) are instruments that assess the risk of exercise addiction and utilize the components model for behavioural addictions as its theoretical framework (Griffiths, 2005, 2019). Both instruments represent a one-dimensional latent measure (i.e. exercise addiction) that comprises six items. Each of the six items of the instrument theoretically reflects one of the six criteria that are claimed to be present in all behavioural addictions (i.e. salience, mood modification, tolerance, withdrawal, conflict, and relapse).

No clear conceptualisation

There are two instruments, the Problematic Practice of Physical Exercise Scale (PPPE, Kotbagi et al., 2015), and the Exercise Salience Scale (ESS, Kline et al., 1994) that did not describe any clear operational definition of problematic exercise. Both instruments review previously existing measures without informing the readers how the items already created fit into their own conceptualisation of this construct.

In the PPPE, Kotbagi et al. (2015) started from a pool of items formed by the combination of the 21 items of the EDS-R (Symons-Downs et al., 2004) and the 29 items of the EDQ (Ogden et al., 1997). Although the two instruments used by the authors include partially or totally the criteria established in the DSM-IV for substance dependence (American Psychiatric Association, 2000), the selection that the authors made to group these two instruments lacks any theoretical foundation and, as they themselves recognized, the selection was made because (i) they were instruments applicable to any individual doing exercise, because they are not directed toward one particular physical activity; (ii) they had satisfactory psychometric properties; (iii) they were multidimensional and (iv) they were widely used internationally, which makes cross-cultural comparisons possible (Kotbagi et al., 2015).

The development of the ESS (Kline et al., 1994) reflected the examination of the factor structure of 40 items from the Exercise Involvement Questionnaire (EIQ, Morrow & Harvey, 1990). Morrow and Harvey's (1990) work, which was excluded from the present review because it was published in a magazine that does not meet the criteria of being published in a peer-reviewed journal, does not detail the process of how its items were generated. In addition to modifying the name of the instrument (from 'Exercise Involvement Questionnaire' to 'Exercise Salience Scale'), Kline et al. modified the response range from a three-point scale to a five-point Likert scale without presenting any reason for the change. Through an exploratory factor analysis (EFA), the authors found that many of the 40 items were loaded with factors that were difficult to identify and only two factors were defined: (i) response omission anxiety, which reflects expecting negative consequences if the exercise routine is broken and (ii) response persistence, which reflects a determination to exercise, even when there is adversity.

DISCUSSION

The aim of the present study was to conduct a systematic review of psychometric instruments that assess problematic exercise in order to identify and compare the theoretical conceptualisations on which these instruments are based. Seventeen self-reported psychometric instruments assessing symptoms of problematic exercise were reviewed. Overall, the instruments reviewed show in their development different theoretical conceptualisations about problematic exercise, which highlights the absence of a clear consensus at the time of operationalizing the measure of problematic exercise. The results also show that the course of different conceptualisations has finally resulted in a strong dichotomy concerning the primary or secondary character of problematic exercise that might limit the capacity of the instruments to capture the complete multidimensionality of this construct, as well as the complexity of its process. We address these issues below, and suggest possible alternatives to the way existing instruments conceptualise and assess problematic exercise.

Competing conceptualisations of problematic exercise and the resulting dichotomy

The results of the analysis of the instruments reviewed suggest that, with the exception of two instruments that did not present a clear conceptualisation (i.e. the EES and the PPPE), the remaining 15 instruments fit into three different groups that conceptualised problematic exercise as either (i) the end of an exercise continuum; (ii) a behaviour to modify weight and/or body shape or (iii) an addiction/dependence that implies a disorder in its own right.

The first group of instruments, conceptualising problematic exercise as the end of an exercise continuum, is clearly associated with the debate initiated in the 1970s that attempted to determine whether apparently healthy behaviour, such as exercise, may cause problems for the individual when it is carried out to an excessive degree (Adams, 2009; Estok & Rudy, 1986; Glasser, 1976). In this way, when these instruments include the term ‘excessive exercise’ it is similar to ‘over-exercising’, that is, the point where exercise begins to lose its healthy character and shows damage not only physically, but in other spheres of the individual’s life (Davis et al., 1993). However, even though the use of the term ‘over-exercising’ can be found in the literature that develop these scales (i.e. CES, CPAS, and CPAS-R), the preferred term they adopt in their instrument’s title is ‘commitment’. This term was precisely the one coined by Carmack and Martens (1979) in the development of the Commitment to Running Scale, instead of the traditional term used in the 1970s of ‘positive addiction’ (Glasser, 1976). As Carmack and Martens recognized, with this term they tried to move away from the idea of a positive addiction, and to examine the assumption that running, developed with a strong commitment, might also have symptoms of a negative addiction. Therefore, the three instruments gathered in this group extend the debate on the possibility that the exercise may reflect symptoms of negative addiction and, in this sense, develop instruments that allow this construct to be assessed in the more global scope of exercise.

Unlike the instruments listed in the first group, the instruments included in the other two groups are identified with the debate generated in the 1980s as to whether the problems caused by problematic exercise are due to the exercise behaviour itself or to other associated disorders (Veale, 1987, 1995; Yates et al., 1983). This debate is partly the result of the debate that began a decade earlier, so that, assuming the problematic nature that exercise may have, the question of debate advanced to determine the problematic nature of this activity. However, the debate generated in the 1980s produced a strong dichotomy in the conceptualisation of problematic exercise on which the assessment instruments are based. This dichotomy becomes evident in view of the similar effort that appears to be made in the development of instruments under each of the theoretical positions identified.

Six of the 17 instruments included in the present review conceptualise problematic exercise as a behaviour that individuals use to modify weight and/or body shape and, in this sense, understand problematic exercise as a possible disorder associated with other types of primary disorders, such as eating disorder or body distortion. Although in the literature where these instruments are developed reference can be found to the term ‘excessive exercise’, unlike the instruments included in the first group, here the term is assimilated to the use that the main clinical manuals use to describe the exercise associated with feeding and eating disorders (i.e. anorexia and bulimia nervosa) (American Psychiatric Association, 2013; World Health Organization, 2018). Within this conceptualisation, the instruments contain the terms ‘obligatory’ (OEQ, OEQ-1, OEQ-2 and OEQ-R), ‘excessive’ (EES) and ‘compulsive’ (CET) in the names of their scales. Although the term ‘excessive’ is somewhat more generic and has also been used to develop instruments under the first conceptualisation (Davis et al., 1993), the terms ‘obligatory’ and ‘compulsive’ are specific to this conceptualisation, and refer to the forced nature and, generally, the lack of attraction that the individual feels for exercising. As acknowledged by Yates (1991), ‘obligatory runners’ was the term chosen by a group of researchers after interviews with hundreds of long-distance runners. As Yates recognizes, with this term, the researchers wanted to highlight the inability of runners to stop exercising. In turn, the term ‘obligatory’ was associated with the term ‘compulsive’, since the extreme form of exercise of the runners was assimilated to the compulsive character that many women with eating disorders presented (Yates et al., 1983).

In a similar number to the previous conceptualisation group, six instruments have been developed utilizing a problematic exercise conceptualisation in terms of dependence/addiction. The authors who developed this group of instruments consider that a problematic exercise by itself, without being associated with another type of disorder, can occur. Three of the instruments included in this group (i.e. EDQ, EDS and EDS-R) base their items on the criteria of substance dependence established in the DSM-IV (American Psychiatric Association, 2000) and, consequently, use the term ‘dependence’ in the name of their scale. In contrast, two instruments (i.e. EAI, EAI-R) developed their items based on the addiction components model for behavioural addictions (Griffiths, 2005), and use the term ’addiction’ in the name of their scales.

Some authors assimilated the use of ‘dependence’ and ‘addiction’ during the development of their scales (Loumidis & Wells, 1998). However, the confusion and undifferentiated use that has existed in recent decades between dependence and addiction appears to lean towards the use of the latter term, at least in the latest edition of the DSM (American Psychiatric Association, 2013). In the DSM-5, the categories of substance abuse and substance dependence were eliminated and replaced by a new category named substance-related and addictive disorders. The grouping of behavioural addictions together with substance-related disorders appears to be based on the idea that an excessively performed behaviour can produce, as with specific substances, the general direct activation of the brain’s reward system, which is involved in behavioural reinforcement and memory production (American Psychiatric Association, 2013). Therefore, problematic or pathological behaviours appear to activate the reward systems in a similar way to psychoactive drugs of abuse, and produce behavioural symptoms similar to those of substance use disorders (e.g.

family conflicts, work conflicts, etc.). In this way, the working group in charge of this section of the DSM-5 highlights the similarities between repetitive behaviours, among which exercise is cited, and substance use disorders in clinical expression, aetiology, comorbidities, physiology and treatment (Petry et al., 2014). From the new category of DSM-5, authors are likely to begin using the term ‘addiction’ more frequently. In any case, the research used to develop this group of instruments, even though they were developed prior to the DSM-5 proposal, do not devote space to the task of differentiating the terms ‘dependence’ and ‘addiction’, but rather to the common task of developing an instrument that is sensitive to the assessment of a problematic exercise by itself (i.e. independently of other possible associated disorders).

Despite the efforts to look for similarities between substances and addictive behaviours, the strong conceptual dichotomy existing around the primary or secondary character of problematic exercise is striking, which has affected the development of the instruments to assess this construct. From this dichotomous position it is assumed that either the origin of the problem in the exercise behaviour lies in the specific properties of the behaviour itself or, conversely, the problem must be sought in the properties associated with another disorder (e.g. eating disorder). Therefore, although today there is a consensus concerning the multidimensional character of problematic exercise, each perspective attempts to define its specific components (Griffiths, 2005; Hausenblas & Symons-Downs, 2002b; Taranis et al., 2011). However, the strong dichotomy in the conceptualisation of problematic exercise shown by the development of assessment instruments may bring about some drawbacks that should be pointed out.

Limitations associated with a dichotomous conceptualisation of problematic exercise

A dichotomous view of the problematic exercise encourages those in the field to treat problematic exercise behaviour differently according to its possible aetiology and, in this way, accentuates the differences more than its potential similarities. In the same way that a debate is beginning in defence of a broader perspective of behavioural addictions, which considers that in addictions and dependence similarities should be given precedence over the differences (Griffiths, 2017; Petry et al., 2014), conceptualisations could also be thought of that are far from the dichotomization that defines the problematic exercise based on the existence or not of an associated disorder. In other words, a broad perspective of problematic exercise would not discard the possibility that so-called ‘excessive exercise’, referenced in the major mental disorder manuals to refer to exercise associated with eating disorders (e.g. anorexia and bulimia nervosa) (American Psychiatric Association, 2013; World Health Organization, 2018), might actually be an expression of an underlying addiction syndrome. There is some evidence in the literature that would support such a perspective (Chamberlain & Grant, 2020; Davis et al., 1993; Klein et al., 2004; Oberle, Watkins, & Burkot, 2018; Scharmer, Gorrell, Schaumberg, & Anderson, 2020).

For instance, Klein et al. (Klein et al., 2004) adapted the Substance Dependence Severity Scale (SDSS), an instrument that assesses the severity of substance use disorders according to the DSM-IV (American Psychiatric Association, 2000) and ICD-10 (World Health Organization, 1993), in order to assess symptoms of exercise dependence amomg a group of women with anorexia nervosa. The results of Klein et al.‘s study showed that 48% of the women assessed in the study endorsed symptoms consistent with exercise dependence during the past month. In the same vein as Klein et al.‘s study, Scharmer et al. (2020) showed that eating disorder pathology was associated with qualities of pathological exercise assessed using both the CET and the EDS. Chamberlain and Grant (2020), using the EAI measure, found that individuals with eating disorder traits shared defined symptoms for behavioural addictions (Griffiths, 2005). Finally, Oberle et al. (2018) showed that university students with high scores in orthorexia symptomatology (i.e. obsessive fixation on eating healthy that includes compulsive behaviour and concern with restrictive eating practices), had higher problematic exercise scores assessed with both the EAI and CET. In part, findings of the aforementioned studies appear to have been corroborated in a recent meta-analysis by Alcaraz et al. (2020), which evaluated the relationship between self-reported symptoms of problematic exercise as assessed by different instruments (i.e. CES, CET, EAI, EDS-R and OEQ) and eating disorders. The results of this meta-analysis showed medium-sized relationships between eating disorders and problematic exercise assessed by all instruments, although larger effect sizes were observed with problematic exercise assessed using the CET. All these studies suggest that exercise performed by individuals with eating disorder symptoms and compulsive-obsessive behaviour traits would maintain defined properties in instruments under a different theoretical conceptualisation, including instruments that conceptualise problematic exercise under models of addiction/dependence.

On the other hand, a dichotomous approach to problematic exercise may be limited in capturing the idea that the different components or symptoms that define the problematic exercise may actually emerge in a wide and varied combination of components. Therefore, each approach usually describes the emergence of problematic exercise as a process, understanding the phenomenon as a unit or global construct (Freimuth et al., 2011; Meyer et al., 2011). Most of the research on problematic exercise may have been driven by the orientation of the instruments used, so that, within each perspective, studies often report the value of each symptom in isolation or the aggregated or mean scores of the whole set of symptoms (Griffiths et al., 2015; Mónok et al., 2012; Terry et al., 2004). However, scholars have also suggested that the different symptoms caused by problematic exercise may not necessarily emerge simultaneously and symptoms may not be equally relevant in terms of their contribution to explaining the problematic exercise (Blaydon, Lindner, & Kerr, 2004; Magee, Buchanan, & Barrie, 2016; Paradis, Cooke, Martin, & Hall, 2013; Szabo et al., 2018).

Little research has so far examined clusters of individuals based on their problematic exercise symptom profiles (Blaydon et al., 2004; Blaydon & Lindner, 2002; Magee et al., 2016; Maraz et al., 2015; Sicilia, Alcaraz-Ibáñez, Chiminazzo, & Fernandes, 2020). However, the results of these investigations suggest that individuals may present simultaneously high and low levels of the symptoms that form a set of criteria, which appears to challenge the conceptual division that implicitly or explicitly dominates the assessment instruments (i.e. individuals with greater or lesser symptoms of problematic exercise). The results of these studies suggest that the symptoms or components assessed utilizing these instruments not only reflect quantitative differences in problematic exercise, but may indicate qualitative differences depending on how these symptoms or components being assessed are combined in different individuals. In addition, these results show that the associations of problematic exercise with health-related correlates may be better explained by the complex association formed by its components. Despite this evidence, the instruments developed so far are limited in studying a combination of patterns derived from components from different perspectives. Therefore, it is likely that the dichotomy of problematic exercise (i.e. primary and secondary problematic exercise) does not adequately capture the multidimensionality and complex process that underlies problematic exercise.

Outlining comprehensive alternatives and its implications

Some authors suggest that problematic exercise can have different aetiologies (e.g. primary and secondary addiction) (Veale, 1987, 1995). However, research has also shown overlaps between these ways of defining problematic exercise (Klein et al., 2004; Scharmer et al., 2020). Despite evidence of these overlaps, the authors emphasize component differences and there are no alternative proposals to the dichotomous view that dominates instrument development and validation to date. The suggestion pointed out by Shaffer et al. (2004), of considering addiction as a syndrome containing different expressions, may be a useful idea to transfer to the study of problematic exercise, and perhaps may serve as inspiration to develop and test new instruments with a broader conceptualisation. As Shaffer et al. recognize, a syndrome should be seen as a cluster of symptoms, signals or components related to an abnormal underlying condition. In this way, just as not all symptoms or components will be present in every expression of the syndrome, and some manifestations of a syndrome will have a unique combination of symptoms and components, it is likely that the different symptom of problematic exercise will form a different combination depending on whether the exercise is associated with another type of disorder. The idea of considering problematic exercise as a syndrome provides an alternative way of thinking about this reality and allows for a broader conceptualisation that considers problematic exercise as a broad family of different expressions that are individually distinguished by the specific combination of their factors. Therefore, although different expressions of problematic exercise would have different symptoms (i.e. primary and secondary problematic exercise), these manifestations of problematic exercise could also share common elements.

Based on the findings of the present study, some future lines of research are proposed. Case studies may assist in the identification of common patterns in problematic exercise. However, there have been very few such studies to date compared to studies using psychometric assessment instruments. The few case studies carried out to date indicated that characteristics such as the salience of exercise in the individual's life or unpleasant feeling states when exercise is reduced or stopped appear to be criteria or components present in problematic exercise (Griffiths, 1997; Kotbagi et al., 2014; Morgan, 1979; Veale, 1995; Yates et al., 1983). Further evidence from qualitative studies could corroborate whether these identified criteria hold for problematic exercise among individuals with different backgrounds and aetiology. Along with the proliferation of more qualitative studies, future research could address comparative analyses of the components or criteria covered in the psychometric assessment instruments to examine which components of problematic exercise are shared by instruments with different theoretical conceptualisations and which components differ. Such analyses have recently been conducted on instruments assessing other problematic behaviours, such as gaming and pornography use (Fernandez & Griffiths, 2019; King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013). An identification of common and specific components in psychometric assessment instruments with different conceptualisations of problematic exercise may help to interpret the results when using different instruments. In addition, identifying common and different criteria or components of problematic exercise among instruments with different conceptualisations could serve to further examine how different combinations of components relate to different variables, and to explain qualitative differences among groups or individuals.

With better assessment instruments under broader conceptualisations of problematic exercise, clinicians could advance a diagnostic aetiological classification that would help intervention programs for this problematic behaviour, in addition to treating other associated disorders. Therefore, conceptualising problematic exercise as a syndrome may have implications for treatment. Individuals who are treated for eating disorders are sometimes neglected from problematic exercise because it is thought that this problem will disappear when the primary disorder (e.g. eating disorder) is resolved. This type of treatment focuses on the specific secondary character of the problematic exercise and does not take into account the addictive component that may co-occur with the primary disorder. From a syndrome perspective, effective treatment would encompass a multimodal approach that includes both treatment specific to the primary disorder (e.g. eating disorder) and more general treatment of the addictive nature of the associated exercise. This conceptualisation requires clinicians to develop multidimensional treatment plans and to repeatedly assess the impact of these relationships. This aetiological strategy is different from the current multidimensional consensus approach that tends to identify the common elements of primary and secondary problematic exercise, and, within each, tends to give equal weight to the diagnostic criteria that have been defined. In addition, a multimodal perspective might contemplate components that are shared, but also characteristic of other forms of problematic exercise associated with disorders other than eating disorders (e.g. body dysmorphic disorder) (Foster, Shorter, & Griffiths, 2015).

Limitations

The present systematic review had strict selection criteria and only covered self-report scales that assess some type of problematic exercise, without considering instruments developed for a specific exercise (e.g. running) or sport contexts (e.g. bodybuilders). Therefore, instruments developed to assess problematic exercise in specific exercise were not evaluated in the present review. Second, the electronic databases used for the search and the languages selected (i.e. English and Spanish) may not have identified studies published in other languages. Third, to the best of our knowledge, the lack of criteria to assess the risk of bias in conceptual reviews prevented the evaluation in terms of methodological quality of the studies in which such definitions are presented. Finally, the fact that we were unable to assess the risk of bias in studies that could have been of very low quality led us to opt for not including the grey literature (e.g. dissertations, conference abstracts). It is therefore possible that some other existing instruments would not have been included in the review.

CONCLUSION

The results of the present systematic review show different theoretical conceptualisations in the assessment instruments that evidence a lack of consensus on the definition of problematic exercise, resulting in a strong dichotomy around the primary or secondary character of the problematic exercise. The existing dichotomous conceptualisation may limit the possibility of adequately capturing the complex process that underlies this potential disorder. Given the interest in investigating the problematic exercise in all its forms, it is critical for future research to develop a comprehensive definition of problematic exercise that enables advances to the study and assessment of the multidimensionality and complexity of this construct.

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APPENDIX A: SUPPLEMENTARY MATERIAL

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A Review of the Components of Problematic Exercise in Psychometric Assessment Instruments

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Backgrounds: The range of theoretical conceptualizations of problematic exercise in psychometric assessment instruments makes it difficult to identify the components that define this phenomenon. A better understanding of the underlying components of problematic exercise may contribute to progress toward providing scientific evidence that allows for deciding whether problematic exercise should be considered a substantive mental health disorder. The objective of the present review was to examine and compare, through a content analysis of their items, the components of problematic exercise in psychometric assessment instruments identified in a recent systematic review.

Methods: A total of 33 components of problematic exercise were identified in the 17 assessment instruments included in the present review.

Results: The results show that, despite the lack of consensus in the operational definition of their factors and the variety of ways of wording their items, the instruments reflect some common components that might indicate core criteria (i.e., salience, withdrawal, and mood modification) or candidate components (i.e., conflict, and continuance despite problems) of problematic exercise. However, other components of different nature were shown to be specific to some of the problematic exercise conceptualizations on which the assessment instruments are based.

Conclusion: In the interest of reaching a consensus that allows to advance in this research field, further studies are needed to resolve which components are inherently problematic.

Keywords: exercise addiction, exercise dependence, compulsive exercise, excessive exercise, obligatory exercise, commitment to exercise

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Q2 Q1 Q3 Q4 Q5 Q6 Q7 Q10

INTRODUCTION

Problematic exercise broadly refers to exercising in a way that the individual loses control over the behavior, so that it begins to have negative physical, psychological, and social consequences (1). Despite the possible negative effects that problematic exercise can have (2), this behavior has not been recognized to date as a mental health disorder in leading clinical manuals (3, 4). One of the main causes behind this lack of recognition is the insufficient scientific evidence to establish the diagnostic criteria and course descriptions needed to identify this behavior as mental health disorder (3).

Most survey research examining problematic exercise has been conducted using psychometric assessment instruments (5). However, the fact that the instruments for problematic exercise utilize different terminology and theoretical conceptualizations (6) makes it difficult to identify the essential components that should define this phenomenon. Without a clear consensus on the components that should define problematic exercise, it is difficult to compare the results of the studies and, therefore, to show scientific evidence that helps to establish the diagnostic criteria and course description need to identify problematic exercise as a disorder (3). Determining core components that define problematic exercise is a central task for its description as a disorder, but also for its subsequent prevention and treatment. In addition, psychometric assessment instruments form the basis of evidence reported in prevalence studies of problematic exercise, so when these instruments vary in their definitions and operational components it becomes difficult to understand the nature of this phenomenon (7). Examination of the components of problematic exercise in the assessment instruments would allow comparisons to be made between them and a future consensus to be established on the definition of problematic exercise.

Colledge et al. (7) conducted a brief review of the assessment instruments for problematic exercise currently in use, showing the existence of a variety of instruments with different theoretical conceptualizations. The three most widely used instruments were the Exercise Dependence Scale [EDS, (8)], which defines the problematic exercise based on criteria for substance dependence provided by the DSM-IV (9), the Exercise Addiction Inventory [EAI, (10)], that operationalizes the problematic exercise based on the components for behavioral addictions (11), and the Compulsive Exercise Test [CET, (12)], where problematic exercise is defined as a means of regulating body size and weight based on a cognitive behavioral conceptualization (13).

Recently, Sicilia et al. (6) conducted a systematic review to examine the theoretical conceptualizations of problematic exercise in psychometric assessment instruments. The findings from this study also showed a variety of theoretical conceptualizations of problematic exercise and demonstrated a lack of consensus concerning its definition. The authors classified the instruments according to their conceptualization into five groups: (i) problematic exercise as an end of an exercise continuum, (ii) problematic exercise as a behavioral addiction, (iii) problematic exercise as a dependence, (iv) problematic exercise as a means of regulating body size and weight, and (v) no clear conceptualization. However, the authors highlighted a strong dichotomy in relation to the primary nature (i.e., a problematic exercise irrespective of whether other disorders may occur) or secondary nature (i.e., the concern with exercise is not better accounted for by other disorders) of problematic exercise, which could limit the ability of the instruments to adequately capture the dimensionality of this construct. Therefore, although it has been suggested that problematic exercise may have different etiologies (14, 15), research has also shown overlaps between these ways of defining problematic exercise (16, 17). Consequently, Sicilia et al. (6) recommended that, in addition to qualitative studies, future research should undertake comparative analyses of the components or criteria covered in the psychometric assessment instruments of problematic exercise, such as has been carried out on other potentially problematic behaviors, such as gaming and pornography use (18, 19).

An examination of the items included in the instruments assessing problematic exercise would provide greater insight on the nature of the components proposed for such deleterious behavior. Furthermore, the identification of common and specific components in instruments with different theoretical conceptualizations would help to interpret the results derived from different instruments. Therefore, taking up the recommendation made in the systematic review by Sicilia et al. (6), the present study significantly extends that review and, using content analysis, aims to identify, examine, and compare the components of problematic exercise proposed in the psychometric assessment instruments identified in that review. The present study assumes the generic term "problematic exercise" in the form used by Sicilia et al. (6), in such a way that the authors do not intend to position themselves a priori on any of the perspectives or theoretical models on which the instruments are based, but rather to examine and compare, in an exploratory manner, the components assessed by those instruments.

METHOD

In the present study, we examined the items included in the 17 instruments assessing problematic exercise identified in a recent systematic review conducted by the present authors (for more detail see 6). The first and third authors coded the data on the characteristics of the studies identified by Sicilia et al. (6) using a coding sheet (see **Appendix A**). Disagreements in the data coding procedure were resolved by discussion between the two authors. Data from the studies were classified into the following categories: (i) instrument; (ii) author(s); (iii) sample characteristics; (iv) conceptualization; (v) instrument structure; and (vi) factors and definition (see **Appendix B**).

Second, based on similar methodology to that used by King et al. (18) and Fernández and Griffiths (2), the psychometric instruments included in the study selection were compared on their ability to assess different components utilizing a coding procedure of their items (20). This analysis entailed moving from the text included in the items to their common thematic elements. This procedure was developed through different phases. In the first phase, the items of the assessment instruments for problematic exercise were collected and a previous immersion with repeated reading of the items was performed. Subsequently, the research team proceeded to search for, identify, and label the components according to the thematic content represented in each of the items (20). This was achieved by combining two methods: deductively considering criteria from the already established theory or manual, and inductively observing the components that emerged in the items in those cases that their wording expressed a concept that did not match with any established criteria in literature. In the latter case, the theme that emerged from the analysis of the item's content was observed and a new component or element was proposed. Enough items were coded by first and second authors until the emerging components of problematic exercise instruments were agreed and defined (see **Appendix C**). Following this, the first and second authors coded all items of the instruments according to the components established previously by agreement using an Excel spreadsheet. Likewise, some items were coded on more than one addiction component when it appeared to be assessing more than one component. Disagreements in the content analysis of items were resolved by discussion between the first two authors. In addition, all items were independently coded by the fourth author. Discrepancies were reconciled by revisiting the wording of items and reaching a consensus among authors. Finally, the results were ordered in the form of a table (see **Table 2**), designed to show the problematic exercise components that emerged in each of the assessment instruments considered in the present review.

RESULTS

The assessed components, definitions and example of item are shown in **Appendix C**. The comparison of instruments utilizing the same definition to each component provides a consistent base on which to examine similarities and differences between the instruments in terms of their assessed components. A comparison of the components assessed in the three instruments most frequently used in the recent literature (7, 21) is shown in **Table 1**.

As shown in **Table 2**, a total of 33 different components of problematic exercise were identified from the 17 assessment instruments considered in the present study. Fifteen of 33 components were defined based on the six components of addiction (i.e., salience, mood modification, withdrawal, conflict, tolerance, and relapse) proposed by Griffiths (11). Nevertheless, in the present study the salience, mood modification, and withdrawal components were further broken across three domains, while the conflict component was further broken down across four domains.

Other core components of addiction such as impaired control, craving, and cross-tolerance, not explicitly covered by Griffiths' model (11), but referred in other works for behavioral addictions (3, 18, 19, 22), were also identified. Traditional criteria such as the modality or type of exercise, duration of exercise, and frequency of exercise emerged and were grouped together with time to identify the characteristics of exercise that the instruments outlined. In addition, along with time, continuance despite problems was another component identified primarily in the instruments that were based on substance dependence criteria to define problematic exercise. In addition to body-image-related withdrawal, there were five components (i.e., catching up on missed exercise, exercise as a compensatory behavior, body image-related exercise reasons, lack of enjoyment, and rigid exercise pattern) that were mostly identified from instruments which conceptualized exercise as a means to modify weight and body shape. Nevertheless, body image reasons were grouped together with other less frequent components that appeared from items assessing reasons or motives for exercise, such as social relatedness reasons (e.g., "I exercise to meet other people") or health reasons (e.g., "I exercise to be healthy, feel fit, or prevent heart disease and other illness"). Finally, other components that also had a very low frequency were body image comparison, social norms, and striving for control.

In terms of breadth of coverage, the instruments varied from three to 16 of the 33 identified components (see **Table 2**). The component most frequently assessed across the instruments in the present review was psychological withdrawal, being more assessed than any other two domains of this component considered in this study: body image-related withdrawal and physical withdrawal. The second most assessed component across the instruments was cognitive salience, which showed a higher presence than general salience, and behavioral salience. The mood modification component, in any of its types, was assessed across 11 instruments. Conflict, in any of its types, was assessed in 10 instruments, although conflict with other activities and interpersonal conflict were assessed more than intrapersonal conflict and general conflict. Among the components common to other behavioral addictions, tolerance, impaired control, overall craving, cross-tolerance, and relapse, were assessed less frequently than any of the aforementioned addiction component groups.

Within the traditional components assessing exercise characteristics, exercise frequency was more assessed in the instruments than exercise time, exercise type, and exercise duration components. However, the continuance despite problems component was more assessed than time within the criteria that were based on substance dependence. There were six components which were presented to a greater or lesser extent in instruments highlighting an obligatory or compulsive character of exercise, being in descending order: body image-related withdrawal, exercise as compensatory behavior, rigid exercise pattern, body image reasons, lack of enjoyment, and catching up on missed exercise. Considered as a whole, 10 of the 17 instruments in the present review assessed one or more of the six aforementioned components. Of these 10 instruments, only the CET (12) assessed all these six components.

DISCUSSION

Utilizing content analysis, the objective of the present study was to identify, examine, and compare the components of problematic exercise in psychometric instruments assessing problematic exercise identified in a recent systematic review (6). Despite the different theoretical conceptualization, the divergence in the operational definition of their factors, and the variety of ways of wording their items, the instruments reflected some common components that might indicate core criteria when defining and operationalizing problematic exercise.

TABLE 1 | Comparison of components assessed by the EDS, EAI and CET.

	EDS		EAI		CET	
Assessed component/s	**Instrument factor**	**Item example/s**	**Instrument factor**	**Item example/s**	**Instrument factor**	**Item example/s**
Withdrawal: psychological	Withdrawal	*I feel stressed if I cannot exercise*	Withdrawal symptoms	*If I have to miss an exercise session, I feel moody and irritable*	Avoidance and rule-driven behavior	*If I cannot exercise, I feel low or depressed*
Mood modification (negative state, general, positive state)	Withdrawal	*I exercise to avoid feeling irritable*	Mood modification	*I use exercise as a way of changing my mood (e.g., to get a buzz, to escape etc.)*	Mood improvement	*I feel happier and/or more positive after I exercise*
Conflict (Interpersonal, other activities)	Reduction in other activities	*My exercise interferes with family responsibilities / My exercise interferes with work/school responsibilities*	Conflict	*Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do*	-	-
Salience: cognitive	Reduction in other activities	*I am consumed with thoughts of exercise at home, work, or school*	-	-	-	-
Salience: general & behavior	Time	*I organize my life around exercise / I spend a great deal of time in exercise related activities*	Salience		-	-
Tolerance	Tolerance	*I continually increase my exercise duration to achieve the desire effects/benefits*	Tolerance	*Over time I have increased the amount of exercise I do in a day*	-	-
Continuance despite problems	Continuance	*I exercise despite persistent physical problems*	-	-	Avoidance and rule-drive behavior	*I usually continue to exercise despite injury or illness, unless I am very ill or too injured*
Impaired control	Lack of control	*I am unable to reduce how often I exercise*	-	-	-	-
Impaired control	Intention effects	*I often exercise longer than I intend*	-	-	-	-
Relapse	-	-	Relapse	*If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before*	-	-
Catching up on missed exercise	-	-	-	-	Avoidance and rule-driven behavior	*If I miss an exercise session, I will try and make up for it when I next exercise*
Reason: Body image	-	-	-	-	Weight and control exercise	*I exercise to burn calories and lose weight*
Withdrawal: Body image	-	-	-	-	Weight and control exercise	*If I cannot exercise, I worry that I will gain weight*
Exercise as a compensatory behavior	-	-	-	-	Weight and control exercise	*If I feel I have eaten too much, I will do more exercise*
Lack of enjoyment	-	-	-	-	Lack of exercise enjoyment	*I do not enjoy exercising*
Rigid exercise pattern	-	-	-	-	Exercise rigidity	*My weekly pattern of exercise is repetitive*

EDS, Exercise Dependence Scale; EAI, Exercise Addiction Inventory; CET, Compulsive Exercise Test.

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TABLE 2 | Components assessed by psychometric instruments.

Instrument	Body image comparison	Catching up on missed exercise	Conflict: general	Conflict: interpersonal	Conflict: intrapersonal	Conflict: other activities	Continuance despite problems	Craving	Cross tolerance	Exercise as a compensatory behav.	Exercise characteristic:: duration	Exercise characteristic: frequency	Exercise characteristic: type	Exercise characteristic: time	Exercise reason: affiliation	Exercise reason: body image	Exercise reason: health	Impaired control	Lack of enjoyment	Mood modification:: unspecified	Mood modification: neg. state	Mood modification: pos. state	Relapse	Rigid exercise pattern	Salience: behavior	Salience: cognitive	Salience: general	Social norms	Striving for control	Tolerance	Withdrawal: physical	Withdrawal: psychological	Withdrawal: body image	N° components assessed by the instruments
CES (Davis et al., 1993)	○	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	●	○	○	○	○	○	○	○	●	○	6
CPA (23)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	●	○	○	○	○	○	○	4
CPA-R (25)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	●	●	●	○	○	○	○	○	○	5
CET (12)	○	●	○	○	○	○	●	○	○	●	○	○	○	○	○	●	○	○	●	○	○	●	○	●	○	○	○	○	○	○	○	●	●	9
EES (26)	○	○	○	○	○	○	●	●	○	●	●	●	○	○	○	○	○	○	○	○	○	○	○	●	○	●	●	○	○	○	○	●	○	9
EAI (10)	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	●	○	○	●	○	●	○	6
EAI-R (1)	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	●	○	○	●	○	●	○	7
EBQ (Loumidis & Wells, 1998)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	3
EDQ (27)	○	○	●	●	●	●	○	○	○	○	○	○	○	○	●	●	●	●	○	○	●	●	○	●	○	○	●	○	○	○	○	●	○	13
EDS (8)	○	○	○	●	○	●	●	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	●	●	●	○	○	●	○	●	○	10
EDS-R (Symons-Downs et al., 2004)	○	○	○	●	○	●	●	○	○	○	○	○	○	●	○	○	○	●	○	○	●	○	○	○	○	●	○	○	○	●	○	○	○	8
ESS (Kline et al., 1994)	●	○	○	●	○	●	●	○	○	○	○	●	○	○	○	●	○	○	○	○	●	●	○	●	○	●	○	○	○	●	●	●	●	14

(Continued)

TABLE 2 | Continued

Instrument	Body image comparison	Catching up on missed exercise	Conflict: general	Conflict: interpersonal	Conflict: intrapersonal	Conflict: other activities	Continuance despite problems	Craving	Cross tolerance	Exercise as a compensatory behav.	Exercise characteristic.: duration	Exercise characteristic: frequency	Exercise characteristic: type	Exercise characteristic: time	Exercise reason: affiliation	Exercise reason: body image	Exercise reason: health	Impaired control	Lack of enjoyment	Mood modification.: unspecified	Mood modification: neg. state	Mood modification: pos. state	Relapse	Rigid exercise pattern	Salience: behavior	Salience: cognitive	Salience: general	Social norms	Striving for control	Tolerance	Withdrawal: physical	Withdrawal: psychological	Withdrawal: body image	N° components assessed by the instruments
OEQ (Passman & Thompson, 1988)	○	●	○	○	○	●	●	●	●	●	○	●	●	○	○	○	○	○	●	○	○	●	○	○	●	●	○	●	●	○	○	●	●	16
OEQ-1 (Steffen & Brehm, 1999)	○	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	●	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	6
OEQ-2 (Ackard et al., 2002)	○	○	○	○	○	●	○	○	○	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	6
OEQ-R (28)	○	○	○	○	○	○	○	○	●	○	○	●	●	○	○	●	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	●	○	6
PPPE (Kotbagi et al., 2015)	○	○	●	●	●	●	●	○	○	○	○	○	○	●	○	○	○	●	○	○	●	●	○	○	○	○	○	○	○	●	○	○	○	10
Number of instruments assessing the component	1	3	2	7	2	8	8	2	2	5	1	6	2	2	1	4	1	5	4	3	5	6	2	5	4	10	7	1	1	6	2	13	6	

CES, Commitment to Exercise Scale; CPA, Commitment Physical Activity; CPA-R, Commitment to Physical Activity Scale Revised; CET, Compulsive Exercise Test; EES, Excessive Exercise Scale; EAI, Exercise Addiction Inventory; EAI-R, Exercise Addiction Inventory Revised; EBQ, Exercise Beliefs Questionnaire; EDQ, Exercise Dependence Questionnaire; EDS, Exercise Dependence Scale; EDS-R, Exercise Dependence Scale Revised; ESS, Exercise Salience Scale; OEQ, Obligatory Exercise Questionnaire; OEQ-R, Obligatory Exercise Questionnaire Revised; PPPES, Problematic Practice of Physical Exercise Scale.

● Assessed; ○ not assessed.

Establishing an Operational Definition That Allows the Comparison of Instruments Under the Same and Between Different Theoretical Perspectives

Seventeen self-reported psychometric instruments assessing at least some potential aspect of problematic exercise were reviewed. Prior to the comparison between instruments in terms of their assessed components, a coding and interpretation task was required by the researchers to identify and define the components assessed through the items collected in the instruments. This task did not (in most cases) involve a direct identification of the exercise components, since there are instruments, such as the Commitment to Physical Activity Questionnaire [CPA, (23)] and the Obligatory Exercise Questionnaire (OEQ, 24) that contain a large number of items with diverse content but are encompassed in a one-dimensional structure not defined in the study description (see **Appendix B**). In other instruments, such as the Commitment to Physical Activity Scale Revised [CPA-R, (25)], the Excessive Exercise Scale [EES, (26)], the Exercise Dependence Questionnaire [EDQ, (27)], and the OEQ-revised [OEQ-R, (28)], the items are grouped into factors, but these are also not defined anywhere in the study description. Finally, in the rest of the instruments, where the items are grouped into factors defined in the study description, inconsistencies were shown between the operational definition of the factors and the wording of the items that assesses the construct in question.

Looking at the comparison between the EDS, EAI, and CET (see **Table 1**), with a few exceptions (for example, the tolerance component), inconsistencies can be observed between the definition of the factors and the wording of the items intended to assess them. On the one hand, there are factors that in different instruments use the same term, but on further inspection their items assess different components. For example, the EDS and EAI contain a factor assessing withdrawal wich, however, show variation in its operational definition (see **Appendix B**). Thus, some of the items contained in the EDS for withdrawal (i.e., "I feel stressed if I cannot exercise") reflect the same component defined in the EAI. However, the wording of other items of the EDS included in withdrawal (i.e., "I exercise to avoid feeling irritable") would reflect the mood modification component defined for the EAI. On the other hand, some factors that are named in the instruments with different terms, actually assess the same component. For example, the time factor in the EDS is defined in a similar way to the salience factor in the EAI. Both factors refer to the dominant role that the exercise plays in the individual's life. These inconsistencies show that instruments that assess problematic exercise utilizing different theoretical conceptualizations, also maintain a lack of consensus when denominating and operationalizing the components of problematic exercise. Therefore, a clear contribution of the present study is to identify the components that assess the items of the instruments, in order to be able to compare the different instruments under the same operational definition of components. In addition, the components and their definitions in the **Appendix C** represent a code necessary to reproduce or replicate the results of this study.

Core Components of Problematic Exercise in the Psychometric Assessment Instruments

The components that were most frequently assessed across the items of the instruments reviewed were some of the identified forms of withdrawal (i.e., physical, psychological, and body image), salience (behavioral, cognitive, and general), and mood modification (unspecified, negative state, and positive state). Although no component was assessed by all of the instruments reviewed, this reduced set of components were present in all instrument groups according to the theoretical conceptualization of problematic exercise on which they are based. Despite the use of different terms, there appears to be consensus around these three major components. Therefore, based on the instruments reviewed, it appears that these three components reflect the "core" criteria for problematic exercise. This fact is not surprising because these components are core features of addiction models (10, 11) and have been defined, although sometimes with variations in their terminology, in instruments based on the criteria for substance dependence (8), and in instruments that conceptualize problematic exercise as a means to modify weight and/or body shape (12, 13).

Regarding the withdrawal component, most instruments ($n =$ 13) assess the psychological effects of withdrawal, and only two instruments (EES and the Exercise Beliefs Questionnaire [EBQ]) additionally assess the physical effects of exercise cessation. Not surprisingly, psychological withdrawal appears as a core component in problematic exercise instruments, since research has shown that this component is present in other clinically recognized behavioral addictions (i.e., gambling, video gaming) (29–31). However, the low frequency of the physical withdrawal component could be viewed as surprising, especially because (i) some instruments are based on substance dependence criteria, where the physical effects of withdrawal is a defined component, and (ii) literature has previously indicated physical withdrawal effects (e.g., fatigue, heart rate, pain) for potential behavioral addictions, including exercise addiction (2). However, it should be noted that while research has shown the existence of some psychological effects, such as depression or anxiety, resulting from exercise withdrawal (32), the physical effects of withdrawal in the context of exercise have been less studied and is an avenue for future research.

On the other hand, body image-related withdrawal symptoms had a higher frequency in these particular instruments than physical withdrawal, and was assessed primarily in instruments that conceptualized exercise as a means of modifying body shape and weight. Therefore, even though the withdrawal symptoms associated with body image also reflect exercising to avoid negative affect and could reflect this feature as psychological withdrawal, it might well be a common element with others mental disorders (e.g., eating disorders). Consequently, it would be interesting to incorporate its assessment in instruments that in a comprehensive way evaluate different forms of problematic exercise. In this regard, a differentiation of this type of withdrawal could help to identify different profiles of individuals who present a problematic exercise according to the combination of their symptoms or components (33).

Cognitive salience was the second most assessed component by the problematic exercise instruments ($n = 10$). Some of them, in addition to assessing the cognitive aspect, assess the behavioral aspect of this component, while a few instruments, grouped under a conceptualization of addiction/dependence, assess this component only in a general way (i.e., EAI, EAI-R, and EDQ). In any case, it should be noted that overall salience, referring to strong presence of exercise in the individual's life, was assessed by a number of instruments similar to the withdrawal component ($n = 13$). However, one of the few instruments that does not assess any type of salience is the CET, despite the fact that other instruments grouped under a conceptualization of problematic exercise as a means of modifying the weight and/or body shape assess this component. Future research should examine the role that salience may have in problematic exercise associated with eating and body image disorders.

With respect to the mood modification component, 11 instruments assessed one of the three mood modification forms that emerged, which highlights different definitions of this component. More specifically, instruments that define problematic exercise in terms of behavioral addiction (i.e., EAI and EAI-R) assess this component without going into detail regarding the positive or negative character of the changes in the emotional states experienced as a consequence of exercising. Instruments conceptualizing problematic exercise based on substance dependence criteria (i.e., EDQ, EDS, and EDS-R) assess mood modification in terms of getting relief from a negative emotional state. Finally, instruments conceptualizing problematic exercise as a means of modifying body weight and/or shape (i.e., CET and OEQ) tend to reflect the positive subjective experience in the mood modification component. Based on these results, future research should examine under what circumstances mood modification should be considered a component of problematic exercise. For example, in circumstances where exercise contributes to the relief of a negative state without major significance to individual, it might not be problematic, since the problem would be more what produces the negative subjective experience in individual. However, in those circumstances where exercise behavior is adopted as an almost unique and disproportionate way of dealing with these negative states, this might clearly indicate a problem because this behavior may lead to the exacerbation of other symptoms, such as social isolation or withdrawal. Therefore, future research should determine whether it is valuable to discern between these three components when assessing them in a problematic exercise instrument.

Candidate Components of Problematic Exercise

Two components, conflict (in some of its forms) and continuance despite problems had a high presence of assessment in the instruments reviewed. However, unlike the three aforementioned core components, these do not appear to be core criteria in the problematic exercise instruments because they are absent in some of the developed instruments according to their conceptualization of problematic exercise.

The conflict component (in its different forms) was assessed in 10 of the 17 instruments reviewed, and was the fourth most frequently assessed component. However, it cannot be considered a "core component" of the instruments because it was absent from assessment instruments that conceptualized problematic exercise as a means of modifying body shape and/or weight (i.e., CET, EES, OEQ and some of the OEQ modifications). In the development of these specific instruments, no form of conflict (i.e., interpersonal, intrapersonal, with other activities) is mentioned as a component of the problematic exercise. Not even in the work that theoretically underpins and develops the CET, the instrument within this conceptualization group that presents a clearer theoretical foundation, can any reference to conflict be found (12, 13).

However, it is surprising that conflict is not assessed in this group of instruments, since recent research suggests the need to consider this component, given that conflict appears to be associated to a greater extent than other components with unhealthy variables associated with eating disorders. For example, Chamberlain and Grant (34) analyzed the symptoms of problematic exercise among individuals with eating disorder traits. Overall, the results of the study showed that the EAI showed a positive association with disordered eating. However, conflict assessed by EAI was the only component associated with emotional dysregulation and obsessive-compulsive personality disorder traits, characteristics that have been attributed to problematic exercise associated with eating disorders (3, 13).

Similarly, Sicilia et al. (35) identified profiles of adolescent exercisers based on exercise addition symptoms assessed with the EAI and examined differences in several health-related variables across these profiles. The results of the Sicilia et al.'s study suggest that conflict may somehow play a key role in differentiating problematic exercise profiles associated with eating disorders (e.g., an eating disorder associated with an emotional state generated by depression or derived from excessive concern for body image). Future research should investigate the role that the conflict component may have in understanding problematic exercise associated with eating disorders.

Continuance despite problems is a relatively frequently assessed component in problematic exercise instruments based on substance dependence criteria (EDQ, EDS, EDS-R) and models that define problematic exercise as a means to modify body shape and/or weight (CET, EES, OEQ). However, this component is not assessed in instruments based on addiction components (e.g., EAI and EAI-R). The continuance despite problems component refers to when an individual continues engaging in exercise despite drawbacks or contraindications to do it, and was highlighted as a consequence of problematic exercise in a case study applying a behavioral addition conceptualization (22). Therefore, along with the conflict component, future studies should analyze the role of continuance despite problems as a possible core symptom of problematic exercise.

Components Differentiating the Psychometric Assessment Instruments

Except for the three global core components (i.e., withdrawal, salience, and mood modification) and the two candidate components (i.e., conflict, and continuance despite problems), the remaining components had a lesser presence in the assessment instruments reviewed. Tolerance and relapse were two components within the component model for behavioral addictions (11) that had the least presence in the instruments assessing problematic exercise. However, items assessing tolerance were greater than for those assessing relapse, which could be explained by the fact that while tolerance is a component that has been defined both in models of behavioral addictions (11) and substance dependence (3, 8), relapse has only been defined within the first model. In fact, the relapse component was only assessed in the EAI and EAI-R. Both components relate to the body's capacity to adapt to exercise (e.g., need to increase the amount of exercise), so it has been indicated that they may not necessarily reflect a real problem in exercise-specific behavior, especially for elite athletes (1, 36).

Apart from the six core components defined by Griffiths (11) for behavioral addictions, other common addiction components had some inclusion in the instruments (i.e., impaired control, craving, and cross-tolerance). The lower frequency of these components is surprising given that they have all been observed in case study accounts and considered as possible components of behavioral addictions (22), but they have also been considered as criteria for substance dependence in the latest (fifth) edition of the DSM (3). Therefore, it is surprising that impaired control, although assessed in the instruments based on criteria of substance dependence, is not assessed by the EAI and EAI-R, which is limited only to the six core components of behavioral addictions defined by Griffiths (11). However, Griffiths also argued that impaired control was subsumed in the "conflict" component. Even scarcer is the assessment of craving and cross-tolerance which is not assessed in any of the problematic exercise instruments based on either behavioral addiction or substance dependence.

The results show that a relatively small group of instruments assess components that are related to the characteristics of exercise (i.e., types, duration, frequency, time). Among these components, exercise frequency is the most assessed by the instruments, with a greater presence than the duration and time components. The presence of these components is noteworthy, given that literature has repeatedly indicated that the amount of time spent or the form of exercise itself is not a distinctive feature of problematic exercise (1, 37). Therefore, the assessment of these components appears to reflect the initial influence that physical components (i.e., form and mode of exercise) had on the definition of problematic exercise. In fact, the instruments that include the assessment of these components (e.g., time, duration, frequency, etc.) are either instruments based on conceptualizations developed several decades ago (24) or studies that build on the instruments originally proposed in those decades (Kline et al., 1994; McCabe & Vincent, 2002) where, along with the assessment of psychological factors, the behavioral components that describe the activity itself are maintained.

However, it is noteworthy that an instrument with a conceptualization of problematic exercise such as the EDS-R includes a time component, restricted to the amount of time the individual spends exercising. This is explained by the fact that the wording of the time component items in the EDS-R do not really capture the operational definition of the construct. More specifically, Hausenblas and Symons-Downs (8) in developing the EDS defined the time factor in line with the criteria defined in the DSM-IV for substance dependence, that is, as "great deal of time is spent in activities necessary to obtain exercise". In this sense, time is operationalized in the EDS similar to a type of salience (e.g., "I organize my life around exercise"), as defined by the components of behavioral addictions (10, 11). However, the wording of the items in the EDS-R for this factor was changed from the original version (EDS, 8), so that the latter wording, far from capturing the operational definition of the component, reflects more the time that the individual spends on exercise itself (e.g., "I spend a lot of time exercising").

The DSM considers the criterion of time for substance use disorders, referring to the great deal of time that the individual may spend in obtaining the substance, using the substance, or recovering from its effects (3, 9). Therefore, an adaptation of this criterion, as specified for substance use disorders, to the context of the problematic exercise should be operationalized in relation to the large amount of time per day that the individual spends around exercise (i.e., before, during, and after exercise), and not focus exclusively on the time of exercise performance. A definition in this line is more like a type of behavioral salience than a characteristic of the exercise itself. In fact, exercise time, assessed through frequency or duration, is more concerned with exercise involvement than problematic exercise (37).

In addition to exercise characteristics, reasons or motives for exercise (i.e., social relatedness, body image, and health) are also assessed in some instruments for problematic exercise. The EDQ is the only instrument that assesses these three exercise reasons. As has been indicated for exercise characteristics (i.e., frequency, intensity, type or modality of exercise), research needs to examine whether the motives may themselves reflect characteristics of problematic exercise (37). For example, the motive of exercising for body image reasons was evaluated more frequently than the other two motives, because it was also considered in the instruments that conceptualized problematic exercise as a means of modifying body weight and/or size (i.e., CET, OEQ, OEQ-R). As indicated above, although this group of instruments share components of problematic exercise (i.e., withdrawal, salience, mood modification, continuance despite problems) with other groups of instruments, they nevertheless show clear differences in the assessment of some components. More specifically, catching up on missed exercise, rigid exercise pattern, and lack of enjoyment are components defined in the instruments with a problematic exercise conceptualization as a means to modify body weight and size but has a low frequency of assessment in other instruments with different conceptualization. Moreover, there are clear components (i.e., withdrawal: body image, exercise as a compensatory behavior) that were only present in the instruments that conceptualize problematic exercise associated with body image.

Instruments that conceptualize problematic exercise as a means of modifying body shape and/or weight capture the assessment of components related to concern about body weight and appearance (e.g., withdrawal: body appearance, exercise reason: body image). In addition, these components are absent in the other groups of instruments with different theoretical conceptualizations. Therefore, it is logical to expect that the size of the effect of the relationship found between problematic exercise and eating disorders is larger when it is assessed with instruments that conceptualize problematic exercise as a means to modify the weight and body shape, such as CET, than with instruments under other theoretical conceptualizations (e.g., EAI, EDS), as recent research has found (17, 38). Nevertheless, the assessment instruments for problematic exercise, regardless of their conceptualization of problematic exercise, share assessed components with each other (i.e., withdrawal, salience, mood modification), so it is not surprising to find addictive components present in individuals with eating disorders (16, 34).

Implications for a Future Consensus on Problematic Exercise Components

The results of the present study reveal a lack of consensus in the operational definition of the components of problematic exercise and a variety of ways of wording their items. This variety of ways of defining problematic exercise makes it difficult to compare results from different assessment instruments. Therefore, a consensus on the components of problematic exercise appears necessary for the advancement of research. The present study contributes, as a first step, in this direction, since the results identify some common components, despite the wide variety of components identified in the instruments. However, although the degree of presence of specific components in the assessment instruments may help to move toward a greater consensus on the operational components of problematic exercise, this should not be the only criterion to be considered. There are several issues that should be taken into account in the future.

First, there is a need for specific criteria, based on empirical and/or clinical research (e.g., medical case studies), to support the components to be evaluated through the items in psychometric assessment instruments. The development of some of the instruments reviewed in the present study show no clear theoretical conceptualization, while other instruments have proposed components of problematic exercise considering features in other behavioral addictions and substance use disorders, but also in other disorders that could be associated with problematic exercise (6). However, it should be noted that the screening of problematic exercise through psychometric assessment instruments is limited without the definition of diagnostic criteria.

Second, those components that showed lower frequencies in the assessment instruments reviewed in the present study should not be classified *a priori* as peripheral components of problematic exercise. It should be noted that some of them may well reflect the variety of conceptualizations used in the instruments. On the other hand, it must be assumed that problematic exercise is a complex phenomenon, because it may involve various forms of expression and can occur in individuals who exercise in different ways and for different reasons. This diversity could be approached from different theoretical perspectives. Therefore, an approach that highlights the differences will be directed to the development of instruments that assess a specific manifestation of problematic exercise. An approach that highlights the similarities between the different manifestations of problematic exercise will focus on assessing only the core components of this phenomenon [see for example the model of common components to behavioral addictions proposed by Griffiths, (11, 39)]. Far from somewhat antagonistic proposals, a third possibility would be to propose comprehensive conceptualizations that contemplate the development of instruments that include both core components of the various manifestations of problematic exercise and some of its differentiated components. Along these lines, Sicilia et al. (6), based on the proposal of Shaffer et al. (33), suggested a broader conceptualization that considers problematic exercise as a broad family of different expressions that are individually distinguished by the specific contribution of their factors. Although none of these three approaches should be considered as better than the others, nevertheless, each of them illuminates the development of problematic exercise instruments and the components that should be included.

Third, there is a wide consensus that a behavior becomes problematic when it is harmful or has negative consequences for individual (1, 6, 8, 40). Therefore, taking into account the aforementioned considerations, a key issue in selecting the components that should define problematic exercise is that they should reflect the pathological nature of the behavior, and therefore include components that are necessarily negative (39, 41). A practice that includes a large number of components without sufficient evidence would fall into the risk of overpathologizing exercise behavior. Components that do not express a functional impairment, psychological distress, or a clear separation from normative behavior in context should not be components to be included in instruments of assessment for problematic exercise (42). For example, the time component, referring to the amount of time an individual spends exercising, has been indicated as a characteristic that in the specific exercise behavior probably does not reflect a problem in itself, and produces confusion when differentiating problematic exercise from high exercise involvement (37).

Finally, in the development of instruments, authors should take special care in the wording of the items in order to capture, as precisely as possible, the operational definition of the problematic exercise component they are trying to assess. Therefore, test developers should prevent the opposite practice described in the previous paragraph whereby components, reflecting some potential damage of the exercise, nevertheless in the wording of the items that assess this component do not capture this quality. As Griffiths (39) pointed out, some components that he adopted from Brown (43) for his model of behavioral addictions clearly reflect the negative aspect. However, this aspect may not have been reflected in some of the items used in the assessment instruments for behavioral addictions. For example, as Griffiths points out, the original concept of salience offered by Brown refers to “when the particular activity becomes the most important activity in the person’s life and dominates their thinking (preoccupations and cognitive distortions), feeling (cravings) and behavior (deterioration of socialized behavior)...even if the person is not actually engaged in the behavior they will be thinking about the next time they will be” [(39), p. 180]. In this sense, the original concept clearly focuses on the negative aspects of behavior, through experiencing cognitive distortions, and a total cognitive preoccupation, along with a deterioration of the individual’s socialization.

However, the content analysis of the items in the instruments that assess this component for problematic exercise, as suggested by Griffiths, does not always reflect a negative element of the behavior for the individual.

Focusing on the instruments analyzed in the present review, we found wording of items such as “I look forward to physical activity” (e.g., CPA, CPA-R), “How often do you think about exercise?” (e.g., EES), “Exercise is the most important thing in my life” (e.g., EAI, EAI-R), “I organize my life around exercise” (e.g., EDS), “Exercise is frequently on my mind” (e.g., ESS), and “I have had daydreams about exercising” (e.g., OEQ, OEQ-1, OEQ-2, OEQ-R). Although all of these items may reflect the salience component, they clearly are not reflecting the negative character that Griffiths (11, 39) refers to.

Therefore, a re-evaluation is needed when reviewing the instruments in order to reach consensus on the inclusion of components that should define the problematic exercise in all its different manifestations. On the one hand, based on further empirical and clinical evidence, components that do not reflect the problematic nature of the behavior should be excluded from future instruments by assessing this construct. On the other hand, the items should be written in such a way that they clearly reflect the negative component of this construct, therefore avoiding either the instrument overpathologizing individuals who exercise, or clearly harmful components being omitted by inappropriate wording of the items assessing the components.

LIMITATIONS

This review addresses for the first time a compilation and comparison of the components present in the psychometric instruments currently available that assess problematic exercise. Non-etheless, several limitations of the present study should be highlighted. First, following the approach adopted in the systematic review previously conducted by the present authors (6), instruments assessing problematic exercise in specific exercise or sport contexts (e.g., dance, running, bodybuilders) or adaptations of existing instruments in a new language or culture were not included. Consequently, the possibility exists that some other components specifically proposed for these contexts may not have been captured in the present study. Second, the components emerged from studies that, in some cases, were developed among samples that might have included some proportion of non-exercising individuals (e.g., university students, secondary school students). Finally, the review of instruments was limited to studies written in languages spoken by the authors of the present study (i.e., English and Spanish).

CONCLUSIONS

Despite the disparity of operational definitions and instruments proposed for the assessment of problematic exercise, components such as withdrawal, salience, and mood modification appear to be present in all the groups of instruments considered. Consequently, these might well form the “core” group of components of problematic exercise. Despite being present in many of the instruments, components such as conflict and continuance despite problems are clearly absent in one of the groups of instruments That is, conflict is absent in the group of instruments than concern body image, while continuance despite problems is absent in those that are based on addiction criteria. Finally, a wider number of components of differing nature appears to be specific to the variety of conceptualizations used in the currently available instruments. In view of the disparity of potential components of problematic exercise identified in the present study, and in the interest of reaching a consensus that allows to advance in this research field, further studies are needed to resolve which of those components could be considered to be inherently problematic.

AUTHOR CONTRIBUTIONS

AS designed the study, conducted the content analysis, and performed initial drafts of the manuscript. MA-I conducted the content analysis and contributed to the drafting of the manuscript and revisions. AP contributed to the drafting of the manuscript and revisions. MG designed the study, conducted the content analysis, and contributed to the drafting of the manuscript and revisions. All authors assisted with drafting of the final version of the manuscript, including critical revisions for intellectual content and contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.839902/full#supplementary-material

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Q19 **Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Examining the reliability of the scores of self-report instruments assessing problematic exercise: A systematic review and meta-analysis

Abstract

Background and aims: Problematic exercise (PE) has mainly been assessed with self-report instruments. However, summarized evidence on the reliability of the scores derived from such instruments has yet to be provided. The present study reports a reliability generalization meta-analysis of six well-known self-report measures of PE (Commitment to Exercise Scale, Compulsive Exercise Test, Exercise Addiction Inventory, Exercise Dependence Questionnaire, Exercise Dependence Scale, and Obligatory Exercise Questionnaire). *Methods:* Pooled effect sizes were computed using a random-effect model employing a restricted maximum likelihood estimation method. Univariable and multivariable meta-regressions analyses were employed for testing moderator variables. *Results:* Data retrieved from 255 studies (741 independent samples, N=254,174) identified three main groups of findings: (i) pooled alpha values that, ranging from .768 to .930 for global scores and from .615 to .907 for subscale scores, were found to be sensitive to sociodemographic and methodological characteristics; (ii) reliability induction rates of 47.58%; and (iii) the virtually non-existent testing of the assumptions required for the proper applicability of alpha. Data unavailability prevented the provision of summarized reliability estimates in terms of temporal stability. *Discussion:* These findings highlight the need to improve reliability reporting of the scores of self-reported instruments of PE in primary studies. This implies providing both prior justification for the appropriateness of the index employed and reliability data for all the subpopulation of interest. The values presented could be used as a reference both for comparisons with those obtained in future primary studies and for correcting measurement-related artefacts in quantitative meta-analytic research concerning PE.

Keywords: internal consistency; alpha; psychometric properties; morbid exercise; exercise dependence

Introduction

Promotion of regular physical activity has been proposed as a comprehensive and valid strategy to reduce cardiovascular risk (Ding et al., 2016). One of the domains in which physical activity is more frequently undertaken is leisure time, in particular, throughout recreational participation in sports activities or by engaging in exercise conditioning/training (Bull et al., 2020). However, a small proportion of the population may develop a potentially dysfunctional pattern of exercise behaviour (Marques et al., 2019). This is a complex and multifaceted phenomenon that, irrespective of the different umbrella terms used to refer to it (e.g., problematic exercise; Scharmer et al., 2020; or morbid exercise behaviour; Szabo et al., 2018) implies losing control over exercise behaviour to the point of experiencing harm at a physical level (e.g., injuries or immune problems), psychological level (e.g., altered mood states or inability to concentrate), or social level (e.g., loss of social relationships or job) (Juwono & Szabo, 2020; Szabo et al., 2018).

Existing research on the phenomenon – hereafter referred to as 'problematic exercise' (PE) – has been mainly approached using quantitative techniques and, more specifically, self-report instruments (Marques et al., 2019; Szabo et al., 2015). To date, much research has been devoted to examining the psychometric properties of scores obtained from translations of the original English versions of such instruments in non-English speaking countries from Europe (Mónok et al., 2012; Sauchelli et al., 2016; Sicilia et al., 2013; Zeeck et al., 2017), South America (Alchieri et al., 2015; Sicilia et al., 2017), and Asia (Li et al., 2016; Shin & You, 2015). However, much less effort has been spent on examining the psychometric properties of these PE scores among specific populations (e.g., in terms of their clinical condition [Formby et al., 2014] or the exercise modality practised [Lichtenstein & Jensen, 2016]), as well as whether these properties can be generalized across different countries or languages (Griffiths et al., 2015). This is an important limitation in the case of a psychometric property that, such as reliability (i.e., measurement precision), is highly dependent on both the test application conditions and the characteristics of the sample under consideration (Slaney, 2017). A main practical implication of the extant literature concerns cross-group comparisons, because unequal reliability between groups can lead to wrong conclusions when comparing their respective scores (Graham & Unterschute, 2015). This is a matter of relevance in PE research because sample characteristics (e.g., exercise modality practised or being at-risk of an eating disorder) are frequently used for comparison purposes (Di Lodovico et al., 2019; Trott et al., 2020). Having a comprehensive understanding of the effect of the sample and application characteristics on the score reliability of self-report instruments assessing PE is likely to contribute to advancing the science in this field. For example, this knowledge may assist practitioners and researchers in choosing an assessment tool capable of producing reliable scores across a range of circumstances. However, there is no summarized evidence on the reliability of scores derived from self-report instruments assessing PE across populations and application conditions.

Reliability Generalization (RG) meta-analysis provides cumulative evidence on elements contributing to the variability of test score reliability across studies (Vacha-Haase et al., 2000, 2002). Despite many reliability indices being available (Cho, 2016), it is often the case that RG meta-analysis only presents information concerning Cronbach´s alpha coefficients (e.g., Graham & Unterschute, 2015; Vicent et al., 2019). This is due to an overwhelming use of alpha in primary studies (Hoekstra et al., 2019). However, it has been suggested that this prevalent use of alpha is more due to compliance reasons such as it being perceived as a common and required practice (Hoekstra et al., 2019) rather than to its superiority over other reliability indexes or, as it would be methodologically sound, its adequacy according to the nature of the data (Cho, 2016). Indeed, the fact that alpha functions as an unbiased reliability estimator is dependent on the fulfilment of three main assumptions:

(i) the unidimensionality of the test, (ii) the equality of the factor loadings of the items (i.e., tau-equivalence; if not met, alpha will underestimate reliability), and (iii) the independency of the error terms of the items (if not met, alpha will overestimate reliability) (Cho & Kim, 2015).

Based on these considerations, it follows that providing evidence on whether reported alpha values have been obtained after testing the assumptions required for the unbiased use of such a coefficient may be of interest from the perspective of RG meta-analysis. Similar ways of proceeding are common in RG meta-analysis (e.g., Graham & Unterschute, 2015; Vicent et al., 2019) with regard to another questionable reporting practice that may also influence the scope of the results, namely, *reliability induction* (i.e., the fact of not reporting reliability estimates for the data at hand; Vacha-Haase et al., 2000). Moreover, almost no attention has been paid to date in RG meta-analysis to alpha reporting practices in terms of their application assumptions (Vacha-Haase & Thompson, 2011). In view of these considerations, it is reasonable to suggest that examining both the rate of reliability induction and the extent to which the assumptions underlying the unbiased performance of alpha may lead to a more accurate and comprehensive interpretation of the results provided in RG meta-analysis.

Within this context, the present RG meta-analysis addresses three objectives concerning several widely used instruments proposed in the self-reported assessment of PE. More specifically, these are to (i) estimate the average reliability of the test scores under consideration; (ii) examine the sociodemographic and methodological characteristics that may affect the reliability estimates of the test scores of interest; and (iii) examine the reliability reporting practices of studies employing these instruments. The latter will be done (a) by examining the reliability induction rates; and (b) in view of the very likely possibility that alpha will be the most frequently reported index (Cho, 2016), by examining the extent to which the assumptions for unbiased estimates of such coefficient are tested and met.

Method

The systematic review and meta-analysis was conducted in accordance with the checklist from Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) (Moher et al., 2009) and was registered on PROSPERO (CRD42021237100) (see Appendix A).

Locating studies

Electronic bibliographic databases MEDLINE, PsycINFO, Web of Science, Current Contents Connect, SciELO, and Dissertations & Theses Global were searched for eligible studies from inception to January 30, 2020 (see Appendix B for the full search strategy). No geographical or cultural restrictions were applied. Reference lists of all retrieved studies were hand-searched to identify further potentially eligible studies.

The references of the retrieved studies were managed in EndnoteX9. Studies were independently selected by two of the authors in two stages by examining (a) their titles and abstracts, and (b) their full-texts. Disagreements were discussed and resolved on a consensual basis with the assistance of a third author if needed.

Eligibility criteria

The review collated data from studies employing the most widely used self-report instruments for the assessment of symptoms of PE (i.e., exercising to the point of losing the control over such a behaviour, so that it may leads to physical, psychological, or social damage; Szabo et al., 2018). According to the findings from previous reviews conducted in the field of PE (e.g., Alcaraz-Ibáñez et al., 2020, 2021), the following six key instruments were considered eligible: *Commitment to Exercise Scale* (CES), that assesses the extent to which (i) individuals' well-being are influenced by exercising, (ii) adherence to exercise is maintained in the face of adverse conditions, and (iii) exercise regimen interferes with social commitments (Davis et al., 1993); *Compulsive Exercise Test* (CET), which assesses the primary factors operating in the maintenance of excessive exercise within the eating disorders domain (Taranis et al., 2011); *Exercise Addiction Inventory* (EAI), which assesses six common criteria proposed for behavioural addictions (Terry et al., 2004); *Exercise Dependence Questionnaire* (EDQ), which assesses elements employed in traditional models of addiction and both psychologically-related and socially-related consequences of exercise behaviour (Ogden et al., 1997); *Exercise Dependence Scale* (EDS-21), which assesses seven criteria adapted from substance abuse defined in the *Diagnostic and Statistical Manual for Mental Disorders* (American Psychiatric Association, 1994) applied to the exercise domain (Downs et al., 2004); and *Obligatory Exercise Questionnaire* (OEQ), which assesses the subjective need to engage in repetitive exercise behaviours (Pasman & Thompson, 1988). The eligibility of these instruments was also supported by the findings derived from a search on *Google Scholar* performed by the present authors for all the 17 measures previously identified within the field (Sicilia et al., 2020). In particular, these instruments were shown to be the ones with the highest number of citations (see Appendix C).

Inclusion criteria

Studies were considered eligible if the following criteria were met: (a) at least one of the following six self-report instrument of PE was used: CES, CET, EAI, EDQ, EDS-21, OEQ; (b) they were written in English, Spanish, French, or Portuguese (the working languages of the review team); and (c) some estimate of reliability was provided (e.g., Cronbach's alpha [α], intra-class correlation index [ICC], or Pearson's correlation index [*r*]).

Exclusion criteria

Studies were excluded on the basis of the following criteria: (a) only composite scores comprising two or more instruments assessing PE were provided so that individual scores were not available; (b) specific items were excluded when obtaining global scores of PE and sub-domains scores were not available; (c) specific items were excluded when obtaining subscale scores of PE; (d) the scores of PE were obtained using a partially/completely altered factorial structure from the one originally proposed for the instrument; and (e) studies with less than 30 participants. The first four exclusion criteria were implemented with the aim of fulfilling one of the main assumptions of meta-analytic research (i.e., the application of a similar statistical configuration) (Lipsey & Wilson, 2001). The final exclusion criterion was implemented on the basis of the increased sampling error and variations in the assessment of heterogeneity likely introduced by studies with small sample sizes (Lin, 2018).

Coding procedure

A coding frame was developed taking into account the common features of the studies retrieved in a preliminary search. After being pilot-tested, the coding sheet was used by two of the present authors when extracting the relevant data from the retrieved studies (see Appendix D). Disagreements between the reviewers were discussed and resolved on a consensual basis with the assistance of a third author if necessary. The following coding categories were considered: (i) citation and year of publication; (ii) sample size; (iii) exercise modality; (iv) eating disorders (EDs); (v) report of leisure time exercise; (vi) regular exercisers; (vii) region (geographic location); (viii) test version; (ix) type of survey; (x) publication status; (xi) study design; (xii) mean and standard deviation (*SD*) of test scores; (xiii) mean and *SD* of age; (xiv) % of Whites; (xv) % of females; and (xvi) PE measure. These coded features were considered for descriptive purposes and – where appropriate – as potential moderator variables (Rosenthal, 1995).

Statistical analysis

Effect size calculations

Cronbach´s alpha (α) was employed as the effect size index. In order to normalize their distributions and stabilize their variances, the reliability coefficients were (α)-to-($\bar{\alpha}$) transformed by applying the formula proposed by Bonett (2002) before conducting the statistical analyses. In the interest of facilitating interpretation of the results, effect sizes and their 95% confidence intervals (CIs) were subsequently ($\bar{\alpha}$)-to-(α) transformed (Sánchez-Meca et al., 2013).

Due to the expected heterogeneity between studies in terms of participants' characteristics, and assuming that variations in the distribution and sampling errors of effect sizes may contribute to explain differences between them, the pooled effect sizes were computed using a random-effect model using an estimation method robust to the normality (i.e., restricted maximum likelihood, REML) (Pigott, 2012). The I^2 statistic was used to assess statistical heterogeneity, with values of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively (Higgins, Thompson, Deeks, & Altman, 2003). The robustness of the summarized estimates was examined through sensitivity analyses (i.e., by conducting systematic reanalysis while removing studies one at a time). Results from sensitivity analyses (see Appendix E) were considered meaningful when corrected estimates were beyond the 95% CI of the original ones.

Consistent with previous RG meta-analyses (Rubio-Aparicio, Badenes-Ribera, Sánchez-Meca, Fabris, & Longobardi, 2020), moderator analyses for categorical and continuous variables were conducted provided that at least 15 effect sizes were available. Meta-regression analyses employed for testing moderator variables were conducted in two stages. Firstly, by employing univariable models (i.e., considering each potential moderator in isolation). Secondly, by employing multivariable models in which all significant moderators identified in the first stage were simultaneously introduced. For a better control of Type I error rate, meta-regressions were conducted using the method proposed by Knapp and Hartung (2003). Given constraints due to available sample size, non-significant categorical predictors were sequentially dropped from the full starting multivariable models in order to obtain the most parsimonious and accurate representation of the data. The tenability of the reduced vs. the full model was judged through a likelihood ratio test (LRT). Explained variance by the moderators was quantified as a percentage and expressed by R^2. Provided that at least 10 effect sizes were available (Page et al., 2019), publication bias was examined by visual inspection of funnel plot symmetry, Egger´s test, and the 'trim and fill' procedure (See Appendix F). The statistical analyses described in this section were conducted in R using the *metafor* package.

Results

Selection of studies

A total of 3852 studies were identified from multiple database searches. The study selection procedure was conducted in two stages. Firstly, the eligibility criteria were applied to the studies considered for full text assessment (see Figure 1). Secondly, the report of reliability indices was examined. Despite the intention of including data on temporal stability (e.g., Pearson's correlation), the number of studies reporting this information was too low to meta-analytical techniques to be applied (i.e., EAI, Griffiths et al., 2005; Li et al., 2016; EDQ, Kern & Baudin, 2011; EDS-21, Downs et al., 2004; Kern, 2007). As a result of this process, 255 studies that reported reliability in terms of alpha coefficient were included in the RG meta-analysis. The study characteristics and their corresponding effect sizes were grouped according to PE measures. Consequently, 741 effect sizes from 255 studies (N= 254,174) were examined in 27 different meta-analyses (see Table 1).

[Insert Figure 1 around here]

Commitment to Exercise Scale

Two different response procedures were employed in the retrieved studies using the CES (i.e., Likert scales or visual analogue scales [VAS]). Given that the homogeneity of statistical configuration across studies is one of the main underlying assumptions of meta-analysis (Lipsey & Wilson, 2001), the scores of the CES (Likert) and CES (VAS) were examined independently.

Commitment to Exercise Scale using Likert scales

The analysis examining alpha estimates for the global score on the CES-Likert (see Forest plot in Appendix G) included 10 effect sizes from nine studies involving a total (N_{total}) of 2,891 participants. Results from the random effects model showed a pooled alpha estimate of .872 (p<.001; 95%CI=.853 to .889, I^2=81.29). Since the number of effect sizes retrieved was <15, moderation analyses were not conducted.

Commitment to Exercise Scale using visual analogue scales

The analysis examining alpha estimates for the global score on the CES-VAS (see Forest plot in Appendix G) included 30 effect sizes from 23 studies (N_{total} = 6,529). Results from the random effects model showed a pooled alpha estimate of .842 (p<.001; 95%CI=.816 to .864, I^2=93.60). Results from the univariate meta-regression analysis for categorical variables (see Table 2) identified the following significant moderators: (a) eating disorders (omnibus-test [2, 27]=7.451; p=.003; R^2=33.59); (b) report of leisure time exercise (omnibus-test [1, 28]=6.096; p=.020; R^2=16.93); (c) region (omnibus-test [4, 25]=3.850; p=.014; R^2=28.21); (d) test version (omnibus-test [1, 28]=5.621; p=.025; R^2=13.48); and (e) type of survey (omnibus-test [3, 26]=3.990; p=.018; R^2=25.87). Results from the univariate meta-regression analysis for continuous variables (see Table 3) did not identify any significant moderator. Results from the multivariate meta-regression analysis showed that eating disorders, report of leisure time exercise, test version, and type of survey explained together 68.73% of variance in pooled alpha estimate (see Table 4).

Compulsive Exercise Test

The analysis examining the alpha estimates for the global score on the CET (see Forest plot in Appendix G) included 48 effect sizes from 42 studies (N_{total}=14,675). Results from the random effects model showed a pooled alpha estimate of .880 (p<.001; 95%CI=.868 to .891, I^2=92.99). Results from the univariate meta-regression analysis for continuous categorical variables (see Table 2) identified the following significant moderators: (a) eating disorders (omnibus-test [4, 43]=8.737; p<.001; R^2=43.48); (b) regular exercisers (omnibus-test [1, 46] =6.482; p=.014; R^2=11.63); and (c) study design (omnibus-test [1, 46]=4.723; p=.035; R^2=7.47). Results from the univariate meta-regression analysis for continuous variables (see Table 3) did not identify any significant moderators. Results from the multivariate meta-regression analysis showed that eating disorders and regular exercisers together explained 57.55% of variance in pooled alpha estimate (see Table 4).

Compulsive Exercise Test subscales

The analysis examining the alpha estimates for the subscale scores on the CET (see Forest plot in Appendix G) included 109 effect sizes. Considering the different subscales, the effect sizes available ranged from 18 (lack of exercise enjoyment, N_{total}=4,302) to 27 (avoidance, N_{total}=6,888). Findings from the random effects model showed pooled alpha estimates ranging from .771 (exercise rigidity; p<.001; 95%CI=.748 to .793, I^2=76.36) to .907 (avoidance; p<.001; 95%CI=.888 to .923, I^2=95.98). Results from the univariate meta-regression analysis for categorical variables (see Table 5) identified the following significant moderators: (a) avoidance: exercise modality (omnibus-test [3, 23] =3.222, p=.041, R^2=20.10), eating disorders (omnibus-test [2, 24]=33.606, $p<.001$, R^2=75.04), report of leisure time exercise (omnibus-test [1, 25]=5.833, p=.023, R^2=16.40), regular exercisers (omnibus-test [1, 25]=5.429, p=.028, R^2=14.24), and test version (omnibus-test [1, 25]=5.455, p=.028, R^2=16.21); (b) weight control: (type of survey, omnibus-test [2, 18]=5.322, p=.015, R^2=35.20); and (c) exercise rigidity: region (omnibus-test [4, 18]=4.535, p=.010, R^2=41.51), and study design (omnibus-test [1, 21]=5.334, p=.031, R^2=17.36). The results of the univariate meta-regression analysis for continuous variables (see Table 6) identified the following significant moderators: (a) mean of test score (avoidance and mood improvement); (b) age (avoidance); (c) *SD* of age (avoidance and mood improvement); (d) year of publication (avoidance and weight control; and percentage of females (weight control and exercise rigidity). However, the results of the multivariate meta-regression analysis (see Table 7) supported the moderating role of the variables under examination just for the following cases: (a) eating disorders and *SD* of test score (avoidance); (b) percentage of females and year of publication (weight control); (c) *SD* of test score and *SD* of age (mood improvement); and (d) region and percentage of females (exercise rigidity). The amount of variance in pooled alpha estimates explained by the retained models in the multivariate meta-regression analyses ranged from 63.26% (weight control) to 86.08% (avoidance).

Exercise Addiction Inventory

The retrieved studies included multiple versions of the EAI. Since only one study reported alpha scores for the EAI-R (Szabo et al., 2019) (α=.90), this was excluded from the analyses. The analysis examining the alpha estimates for the global score on the EAI (see Forest plot in Appendix G) included 42 effect sizes from 40 studies (N_{total}=26,565). Results from the random effects model showed a pooled alpha estimate of .768 (p<.001; 95%CI=.739 to .810, I^2=97.27). Results from the univariate meta-regression analysis for categorical variables (see Table 2) identified the following significant moderators: (a) region (omnibus-test [5, 36]=5.182; p=.001; R^2=35.78); (b) test version (omnibus-test [1, 40]=4.264; p=.046; R^2=7.46); and (c) publication status (omnibus-test [1, 40]=4.720; p=.036; R^2=8.50). Results from the univariate meta-regression analysis for continuous variables (see Table 3) identified the mean of test score as a significant moderator. Results from the multivariate meta-regression analysis (see Table 4) showed that region, test version, and mean of test score together explained 59.22% of variance in pooled alpha estimate.

Exercise Dependence Questionnaire

The analysis examining the alpha estimates for the global score on the EDQ (see Forest plot in Appendix G) included 12 effect sizes from 11 studies (N_{total}=2,961). Results from the random effects model showed a pooled alpha estimate of .862 (p<.001; 95%CI=.842 to .879, I^2=84.26). Since the number of effect sizes available was <15, moderation analyses were not performed.

Exercise Dependence Questionnaire subscales

The analyses examining the alpha estimates for the subscale scores on the EDQ (see Forest plot in Appendix G) included 50 single alpha scores. The effect sizes available ranged from six (positive reward, N_{total}=1,405) to seven (interference, N_{total}=1,498). Findings from the random effects model showed pooled alpha estimates ranging from .615 (social reasons; p<.001; 95%CI=.489 to .710, I^2=88.86) to .789 (positive reward; p<.001; 95%CI=.688 to .857, I^2=94.89). Since the number of effect sizes available was <15, moderation analyses were not performed.

Exercise Dependence Scale-21

The analysis examining the reliability estimates for the global score on the EDS-21 (see Forest plot in Appendix G) included 90 effect sizes from 84 studies (N_{total} = 35,918). Results from the random effects model showed a pooled alpha estimate of .930 (p<.001; 95% CI=.923 to .937, I^2=97.96). Results from the univariate meta-regression analysis for categorical variables (see Table 2) identified both exercise modality (omnibus-test [6, 83]= 4.100; p=.001; R^2=18.00) and test version (omnibus-test [1, 88]=5.930; p=.017; R^2=5.24) as significant moderators. Results from the univariate meta-regression analysis for continuous variables (see Table 3) identified both mean test score and SD of test score as significant moderators. Results from the multivariate meta-regression analysis showed that exercise modality, test version, and mean test score and SD of these scores together explained 38.02% of variance in pooled alpha estimates (see Table 4).

Exercise Dependence Scale-21 subscales

The analyses examining the reliability estimates for the subscale scores on the EDS-21 (see Forest plot in Appendix G) included a total of 311 effect sizes. The effect sizes available ranged from 42 (withdrawal, N_{total}=15,457) to 53 (reduction in other activities, N_{total}=18,755). Findings from the random effects model showed pooled alpha estimates ranging from .704 (reduction in other activities; p<.001; 95%CI=.675 to .730, I^2=92.53) to .881 (intention effects; p<.001; 95%CI=.865 to .895, I^2=95.48). Results from the univariate meta-regression analysis for categorical variables (see Table 8) identified the following significant moderators: (a) tolerance: region (omnibus-test [5, 37]=4.528, p=.003, R^2=31.52), test version (omnibus-test [1, 41]=6.763, p=.013, R^2=13.49), and publication status (omnibus-test [1, 41] =4.440, p=.041, R^2=8.69); (b) withdrawal: region (omnibus-test [5, 36]=10.317, p<.001, R^2=61.22), and test version (omnibus-test [1, 40]=18.992, p<.001, R^2=34.95); (c) intention: report of leisure time (omnibus-test [1, 41]=4.465, p=.041, R^2 = 7.92), regular exercisers (omnibus-test [1, 41]=5.434, p=.025, R^2=10.36), region (omnibus-test [5, 37] =10.661, p<.001, R^2=55.86), test version (omnibus-test [1, 41]=28.574, p<.001, R^2=42.29), and publication status (omnibus-test [1, 41]=8.651, p=.005, R^2=16.05); (d) lack of control: region (omnibus-test [5, 37]=10.661, p<.001, R^2=54.87), test version (omnibus-test [1, 42] =28.574, p<.001, R^2=42.99), publication status (omnibus-test [1, 42]=4.475, p=.040, R^2=8.40), and study design (omnibus-test [1, 42]=5.792, p=.021, R^2=9.99); (e) time: region (omnibus-test [5, 37]=5.849, p<.001, R^2=41.55), and test version (omnibus-test [1, 41]=7.396, p=.010, R^2=15.06); (f) continuance: region (omnibus-test [5, 37]=6.759, p<.001, R^2=45.41), and test version (omnibus-test [1, 41]=7.716, p=.008, R^2=15.95). The results of the univariate meta-regression analysis for continuous variables (see Table 9) identified of the following significant moderators: (a) test mean score (lack of control); (b) *SD* of test score (tolerance); and (c) percentage of females (tolerance, intention effects, lack of control, time, and continuance).

The results of the multivariate meta-regression analysis (see Table 10) supported the moderating role of the following variables: (a) *SD* of test scores and percentage of females, (tolerance); (b) region and percentage of females (intention effects); (c) region and percentage of females (lack of control); (d) test version and percentage of females (Time); and (e) region, test version, and percentage of females (continuance). The amount of variance in pooled alpha estimates explained by the retained models the multivariate meta-regression analyses ranged from 27.97% (tolerance) to 67.73% (intention effects).

Obligatory Exercise Questionnaire

The analysis examining the reliability estimates for the global score on the OEQ (see Forest plot in Appendix G) included 38 effect sizes from 33 primary studies (N_{total}=10,548). Results from the random effects model showed a pooled alpha estimate of .870 (p<.001; 95%CI=.853 to .885, I^2=84.43). Results from the univariate meta-regression analysis for categorical variables (see Table 2) identified both exercise modality (omnibus test [3, 34] =9.568; p<.001; R^2=43.48) and (b) regular exercisers (omnibus-test [1, 36]=10.087; p=.003; R^2=22.55) as significant moderators. Results from the univariate meta-regression analysis for continuous variables (see Table 3) did not identify any significant moderators. Results from the multivariate meta-regression analysis showed that exercise modality and regular exercisers together explained 68.55% of variance in pooled alpha estimates (see Table 4).

Reliability reporting practices

A total of 118 studies reported induced reliability (e.g., based on other studies), eleven studies reported unusable reliability indices (i.e., reliability ranges), and eight studies did not report alpha or Pearson's correlation but other reliability indices (i.e., ω, Meule et al., 2020; ρ, Alcaraz-Ibáñez et al., 2018; Sicilia et al., 2018; *ave*, Egan et al., 2017; or *ICC*, Parastatidou et al., 2012; Sicilia et al., 2013, 2017; Sicilia & González-Cutre, 2011). A global reliability induction rate of 47.58% was found. This ranged from 18.64% to 57.14% in the case of the global scores and from 14.93% to 66.67% in the case of subscale scores (see Table 11).

Concerning the assumptions required for the unbiased performance of alpha, the first one (i.e., the unidimensionality of the test) was in no case used as an argument to justify the employment of alpha against other reliability indices. Despite the theoretically multidimensional nature of three of the instruments under consideration (CET, EDQ, EDS-21), alpha was frequently used as the reliability index of their global scores (see Table 1). The second assumption (the equality of the factor loadings of the items) was not examined in any of the retrieved studies. The third assumption (i.e., the independency of the error terms), was found to be tested just in the context of improving model fit (e.g.; Zeeck et al., 2017) but in no case to justify the use of alpha or to comment on the implications of using it in such circumstances.

Discussion

The present RG meta-analysis provides summarized evidence on the reliability scores in terms of coefficient alpha of six of the most commonly used self-report instruments assessing PE. Data retrieved from 255 studies (741 independent samples) showed alpha values that ranged from .768 to .930 for global scores and from .615 to .907 for subscale scores. The alpha estimates of both global and subscales test scores were affected by several sociodemographic and methodological characteristics. The main implications of these findings are discussed in detail below.

Alpha estimates for total and subscale scores

Interpretation of alpha values has generally been carried out adopting a *more is better* and cut-off-based approach. This implies that the level of reliability of the scores of a given instrument in terms of alpha would dictate the use for which it may be recommended (Cicchetti, 1994; Nunnally & Bernstein, 1994). According to this approach, the alpha estimates found for the global scores of the instruments under consideration may lead to judging them as suitable for (a) exploratory research (EAI), (b) basic research purposes (CES, CET, EDQ, and OEQ), and (c) applied research and clinical practice (EDS-21). In the case of the subscale scores, applying this same criterion implies considering them as (a) unacceptable for research purposes (insight into problem, social reasons, and stereotyped subscales of the EDQ), (b) acceptable for exploratory research (lack of control and rigidity subscales of the CET; interference, positive reward, withdrawal, weight control, and health reasons subscales of the EDQ; and reduction in other activities subscale of the EDS), (c) suitable for basic research purposes (weight control and mood subscales of the CET; and tolerance, withdrawal, intention effects, lack of control, time, and continuance subscales of the EDS-21), and (d) suitable for applied research and clinical practice (avoidance subscale of the CET). However, the automatic application of cut-off points inherent to this purely quantitative approach of interpreting alpha has been strongly criticised by arguing that they do not emerge as a result of empirical evidence but from researchers' intuition (Cho & Kim, 2015; Hoekstra et al., 2019; Panayides, 2013). Alternatively, it has been suggested that alpha values should be interpreted also taking into account both instrument length and complexity of the construct being assessed (Cho & Kim, 2015). The implications derived from the latter are discussed separately below for the scores with particularly high or low alpha values.

The fact that high alpha values were obtained for some of the scores under consideration (i.e., those near to .90 and above) may not necessarily indicate that these are highly reliable. Indeed, high alpha values may also be due to redundancy in the content of the items, particularly, the greater the number of items used (Cho & Kim, 2015). This redundancy is nevertheless undesirable since it could compromise coverage of the construct being assessed. Moreover, the greater its theoretical complexity, the more potentially relevant content is excluded (Hoekstra et al., 2019; Panayides, 2013). Such redundancy may also imply leaving a considerable proportion of individuals' estimates outside the items targeting range, which could result in a decreased reliability (Cho & Kim, 2015; Panayides, 2013). Furthermore, it is worth noting that the instruments whose scores were found to have particularly high alpha values do not appear to have been developed with particular attention to their content validity (e.g., almost none of those studies reported that content validity had been evaluated by a panel of experts). Indeed, it was only in the case of a preliminary version of the EDS-21 that the latter was somewhat indicated, although just in terms of "appropriateness" and providing no other further details on the procedure being followed (Hausenblas & Downs, 2002). Additionally, none of the validation studies reported having examined an aspect of content validity, such as comprehensiveness (i.e., no key aspects of the construct are missed), that is particularly relevant in avoiding content redundancy (Mokkink et al., 2010). Consequently, further research is needed that provide evidence on whether the particularly high alpha values obtained in the present study are due to the true high reliability scores or content validity-related shortcomings.

A second important consideration regarding scores that showed the highest levels of alpha concerns the CET, EDS, and EDQ. More specifically, none of these three scales were proposed as being either unidimensional or higher-order instruments (i.e., including a number of first-order factors and one second-order factor). Indeed, evidence exists supporting the multidimensional versus the unidimensional nature of these instruments (Formby et al., 2014; Sicilia & González-Cutre, 2011). It is therefore surprising to find these instrument scores (and their reliability in terms of alpha) have more often been computed on an aggregate basis than a factor-by-factor basis. This is particularly concerning considering that, in instruments with correlated factors, the use of alpha should be limited to such subscale scores, so that in no case should it be used for the overall test score (Cho, 2016; Cho & Kim, 2015). This leads to a suggestion that, should the overall score of any of the instruments under examination be defensible from a theoretical perspective, reliability should be estimated by adopting methodologically sounder alternatives than alpha (see Cho, 2016; Cho & Kim, 2015; Gignac, 2014).

A first point to note with regard to the instruments whose scores showed the lowest alpha estimates concerns the one whose global score showed the lowest alpha estimate among those examined (i.e., the EAI). One explanation for this finding may be that this instrument was developed on six specific theoretical components of behavioural addictions, therefore just one item per component were proposed (Terry et al., 2004). However, the complex nature of some of these components may not be totally represented by a single item without resorting to the use of complex or double-barrelled items (e.g., the item alluding to the conflicts arising between individuals and their “family and/or partner” because of the amount of exercise being engaged in). Such items may be subject to heterogeneous interpretation and, by extension, to contribute to a lesser extent that those more clearly conceptualizing the underlying latent construct (Hayes & Coutts, 2020; Kyriazos & Stalikas, 2018). The latter implies not fulfilling the tau-equivalence assumption for unbiased estimations of alpha, so that this coefficient no longer reflects the true actual reliability of the score but rather its lower bound (Hayes & Coutts, 2020). Consequently, the possibility exists that the EAI’s reliability score was above the one calculated by the analysis in the present study. However, the lack of formal testing of the tau-equivalence assumption of the EAI’s items detected in the retrieved studies prevents us from providing empirical evidence that support this possibility, the collection of which should be subject of future research.

A second point to be noted is that with regard to the instruments whose scores showed the lowest alpha estimates concerns the three subscale scores of the EDQ showing alpha values below the minimum .70 cut-off traditionally employed for discouraging the employment of a given score (i.e., insight into problem, social reasons, and stereotyped behaviour). These findings are not entirely surprising considering the difficulty of achieving high alpha values using only a few items in the subscales (i.e., from two to four) (Greco et al., 2018). However, it is worth noting that, despite using a similarly small number of items, the scores on some of the other subscales examined (e.g., those of the EDS-21) showed higher levels of alpha than the three aforementioned EDQ subscales. The explanation for these differences is probably due to the way in which the content of the two instruments were developed. That is, on the basis of the theoretical definition of the seven constructs being assessed (in the EDS-21), or by assigning the statements provided by exercisers concerning their exercise-related feelings and cognitions to the factors emerging from statistical analyses (in the EDQ). Therefore, the fact that the items included in these three subscales of the EDQ with particularly low alpha values did not derive from a predetermined theoretical approach could have meant grouping indicators that do not reflect an unequivocal underlying factor, leading to decreased measurement reliability. This is important because low reliability tends to attenuate the strength of the relationship being examined (Graham & Unterschute, 2015). Consequently, these findings raise the need to review the content and number of items included in these subscales in order to improve their reliability.

Moderators of the reliability scores of self-report instruments of PE

Evidence supported the relationship between some of the characteristics of the studies evaluated and the variability in alpha estimates. For example, higher alpha values were found for the global scores of the CES-VAS and the avoidance and rule-driven behaviour subscale of the CET among clinical populations in terms of eating disorders. These findings are relatively unsurprising given that both instruments include content of particular relevance to individuals with eating disorders such as the negative consequences of being unable to exercise, especially feelings of guilt (Davis et al., 1993; Scharmer et al., 2020; Taranis et al., 2011; Zeeck et al., 2017). It follows that comparing scores derived from these two instruments involving individuals with and without a clinical eating disorder diagnosis may be susceptible to bias.

Findings also suggested that the alpha values of the global scores of the CET and the OEQ may be lower among populations comprising regular exercisers. Moreover, it should be noted that the CET was developed with a particular focus on excessive exercise within the eating disorders domain. Therefore, the possibility exists that some of the content included in the instrument (e.g., exercising due to weight/appearance reasons or to the lack of enjoyment when exercising; Taranis et al., 2011) may not be equally relevant for non-clinical populations in terms of eating disorders (Alcaraz-Ibáñez et al., 2019). Additionally, the lower alpha values obtained for OEQ scores among regular exercisers may be due to the low potential variability of some of the instrument’s items among those featuring very low levels of exercise. Clear examples are items referring to exercise frequency (e.g., exercising on a daily basis) or specific exercise-related habits (e.g., keeping a record of exercise performance) (Pasman & Thompson, 1988). Taken together, these results reinforce the notion that differences in the interpretation of the content of self-report instruments assessing PE may exist among individuals with unequal levels of exercise involvement (Szabo et al., 2015).

Exercise modality is another exercise-related feature that support the likely relationship in alpha estimate variability (i.e., the global scores of the EDS-21). In particular, results suggested that alpha values were lower in studies reporting very precise exercise modalities compared to those that did not. However, the fact that the instrument scores under consideration were found to be similarly reliable in terms of alpha values suggests that comparisons across modalities could be reasonably made. This is important given that this kind of comparison has been a matter of research interest (Di Lodovico et al., 2019).

Findings also suggested that the alpha estimates of the linguistically adapted versions may be lower than original versions in the case of CES-VAT and EAI global scores, and several EDS-21 subscale scores. These findings suggest the existence of possible weaknesses in the linguistic adaptation processes. However, it should be noted that cross-cultural and cross-linguistic research in this field is scarce (Griffiths et al., 2015). Consequently, further research is needed that examines the extent to which the psychometric properties of the scores of the self-report instruments assessing PE are equivalent across their different linguistic adaptations.

There was no conclusive evidence found linking the proportion of females included in the samples with the alpha estimates of the global scores of the instruments under consideration. This suggest that the reliability of such scores does not greatly differ between males and females. However, this was not the case for some of the subscale scores (i.e., weight control and exercise rigidity subscales of the CET; and tolerance, lack of control, and time subscales of the EDS-21). Indeed, evidence suggested that the higher the number of females in the sample, the higher the reliability alpha estimates of these subscale scores. Therefore, the reliability of these scores may be lower for males than for females. These findings are relevant considering that gender has been proposed as a potential risk factor for several potentially addictive behaviours and, particularly, PE (Bueno-Antequera et al., 2020; Cunningham et al., 2016). The existence of gender differences in reliability scores may have led to biased estimates in comparisons involving these two population groups.

A last notable group of findings emerging from moderator analyses concerns continuous variables. The fact that no evidence was obtained relating alpha values to mean scores on the scales suggests that the reliability of the scores examined is likely to be similar among individuals with very different levels of self-reported PE. An exception to this general trend was the negative relationship observed between the mean scores and the associated reliability values in the case of the EAI. This is important because it suggests that the reliability of the EAI scores may decrease among individuals scoring high on this instrument.

This might be explained by evidence suggesting that individuals with similarly high levels of PE on the EAI may differ markedly on the score for the item reflecting conflict (Chamberlain & Grant, 2020; Sicilia, Alcaraz-Ibáñez, et al., 2020). This may imply a decreased level of inter-correlations among items and, by extension, a decrease in alpha values (Greco et al., 2018).

Finally, it worth noting that the variance of scores under consideration were found to be positively related to alpha estimates in just in three cases (i.e., the avoidance and mood modification subscales of the CET, and the tolerance subscale of the EDS-21). These findings are somewhat unexpected considering that psychometric theory points to score variance as one of the main components of reliability estimation (Nunnally & Bernstein, 1994). From this, it follows that the population characteristics already discussed here may help explain the variability of alpha to a greater extent than the standard deviation of the scores. On balance, findings from the moderator analyses underscore the need to examine reliability in each of the groups involved in cross-groups comparisons on self-reported PE symptoms.

Reliability reporting practices in studies using self-report assessment of problematic exercise

The global induction rate found in the present study (i.e., 47.58%) appears to be slightly higher than the one reported for exercise psychology research more generally (i.e., 41.20%; Wilson et al., 2011). It is worth noting that induction rates above the mean were found for the instruments whose scores showed the lowest values of alpha at the global level (i.e., EAI) and subscale level (i.e., EDQ). This suggests that information concerning reliability in this field may be more likely to be omitted for those scores with lower values of alpha. In the case of the EAI, one explanation for these findings may be that this instrument has been used not only for providing a continuous score representing the construct of interest but also as a screening instrument for the purpose of distinguishing individuals at-risk from those having some or no symptoms of exercise addiction. Therefore, the possibility exists that the focus on classifying individuals on the basis of a fixed cut-off point may have led some authors to overlook the issue of examining the reliability of the instrument’s global score.

A particularly worrying issue in view of the highly prevalent use of alpha is the almost non-existent testing of the assumptions required for its unbiased employment. Researchers in this field may opt instead to use the reliability index that is most appropriate to the data (Cho & Kim, 2015). A misconception that may deter researchers from approaching this task is the alleged difficulty of both testing the assumptions of alpha and using the alternative methods required when its assumptions are violated (Cho, 2016; Hayes & Coutts, 2020). However, it should be noted that convenient practical guidelines for addressing these tasks have been provided, with some involving relatively non-complex tools (e.g., spreadsheet-based solutions; Cho, 2016) or software that is familiar to large numbers of researchers (e.g., SPSS; Hayes & Coutts, 2020).

Limitations

Despite the many strengths of the present review, there are a number of limitations. A first group of limitations concerns the limited data available on the population characteristics being examined as potential moderators. For example, the small number of studies reporting reliability estimates in some populations meant that, in many cases, only a small number of primary estimates were available. This prevented providing a higher level of evidence for some of the moderation analyses conducted or even, in some cases, from carrying them out at all. The latter was the case for the EDQ, for which it was impossible to examine the variables that may contribute to the variability of the alpha estimates of its global and subscale scores. Also related to the limited availability of data were the characteristics of the study participants. For example, there were more studies that omitted information on exercise modalities or minimum exercise levels of the participants than those that provided such information. These omissions are particularly relevant in view of the limited amount of variance (i.e., < 50%) explained by some of the regression models aimed at exploring the potential sources of variability in the alpha estimates. This is so because these relatively low levels of explained variance point towards the existence of other important moderator variables beyond those considered in the present study. This scarcity of data is also relevant given the results here pointed to some of the variables for which limited data were available (e.g., region or exercise modality) as potential moderators of the alpha estimates under consideration. In view of these limitations, a two suggestions can be made. Firstly, researchers in this field should pay particular attention to reporting the characteristics of study participants. This means providing sociodemographic information that, in view of the findings here, may be of interest due to its likely influence on the reliability levels of the scores in terms of coefficient alpha. Examples of the latter include the type of survey, volume of exercise, and the main exercise modality practised. Moreover, it would be particularly useful to provide specific information for the subgroups identified on the basis of these or other socio-demographic variables, because this would facilitate further meta-analytical research. Secondly, more research is needed that examines the reliability of the scores of self-report instruments assessing PE among populations for which limited evidence is currently available. Depending on the instrument, this would involve regions or linguistic contexts still under represented, as well as clinical populations in terms of eating disorders.

A second important limitation is that the fact that there were virtually no primary studies reporting test-retest reliability. This prevented the providing of summarized evidence on the consistency of instrument scores over time. Therefore, further primary research is needed examining the reliability of the test scores under consideration in terms of temporal stability. Finally, it worth mentioning the lack of testing of the assumptions required for the unbiased function of alpha. This makes it advisable to treat the results presented with caution, particularly in the case of the global scores of instruments with a non-clearly unidimensional character (i.e., EDQ, CET, and EDS-21).

Conclusions and practical implications

First, the alpha estimates of the global and subscale scores of existing self-report instruments assessing PE vary largely not just from one to the other but also across different applications. Indeed, the 95% CI of the summarized alpha estimates obtained in the present study did not contain (in most cases) the alpha values reported in the studies in which the instruments under consideration were originally proposed. Therefore, the possibility exists that the originally-reported alpha values were not the most adequate ones to be compared with those obtained in primary research, nor to correct for measurement-related artefacts in quantitative meta-analytic research. It is therefore suggested that the values provided in the present study should be used for such purposes.

Second, the reliability of test scores of existing self-report instruments assessing PE appears to be particularly sensitive to the characteristics of the study population. Researchers including the self-report PE instruments in their studies are encouraged to report specific reliability estimates for the different population groups of interest. This would provide insight into the potential for cross-group comparisons to be biased by the presence of differences in inter-group reliability. Future research efforts aimed at refining existing instruments or proposing new ones should be conducted including not just one or two convenience samples but, instead, several groups according to the characteristics that were proved to be related with the variability in alpha estimates (e.g., clinical condition in terms of eating disorders, language, and exercise modality). This would allow for examining the extent to which the instrument's scores are acceptable in terms of reliability for a minimum number of target groups of interest, which, if this were not the case, would allow the instrument to be refined at an early stage of development.

Third, existing quantitative research using self-report instruments assessing PE suffers from two main deficiencies in terms of reliability reporting: (i) the frequent omission of reliability estimates for the data at hand; and (ii) the (almost exclusive) employment of alpha without proper testing of the assumptions necessary for its unbiased use or even when the nature of the test to be examined would make its use particularly unsuitable. Researchers, journal editors, and reviewers should be aware of the need to report the reliability of scores derived from instruments assessing PE for the data at hand in all primary research. Therefore, the suitability of reliability index to be used should be justified on the basis of the theoretical nature of the constructs under consideration and the characteristics of the data being examined, for example, in terms of test dimensionality and measurement model.

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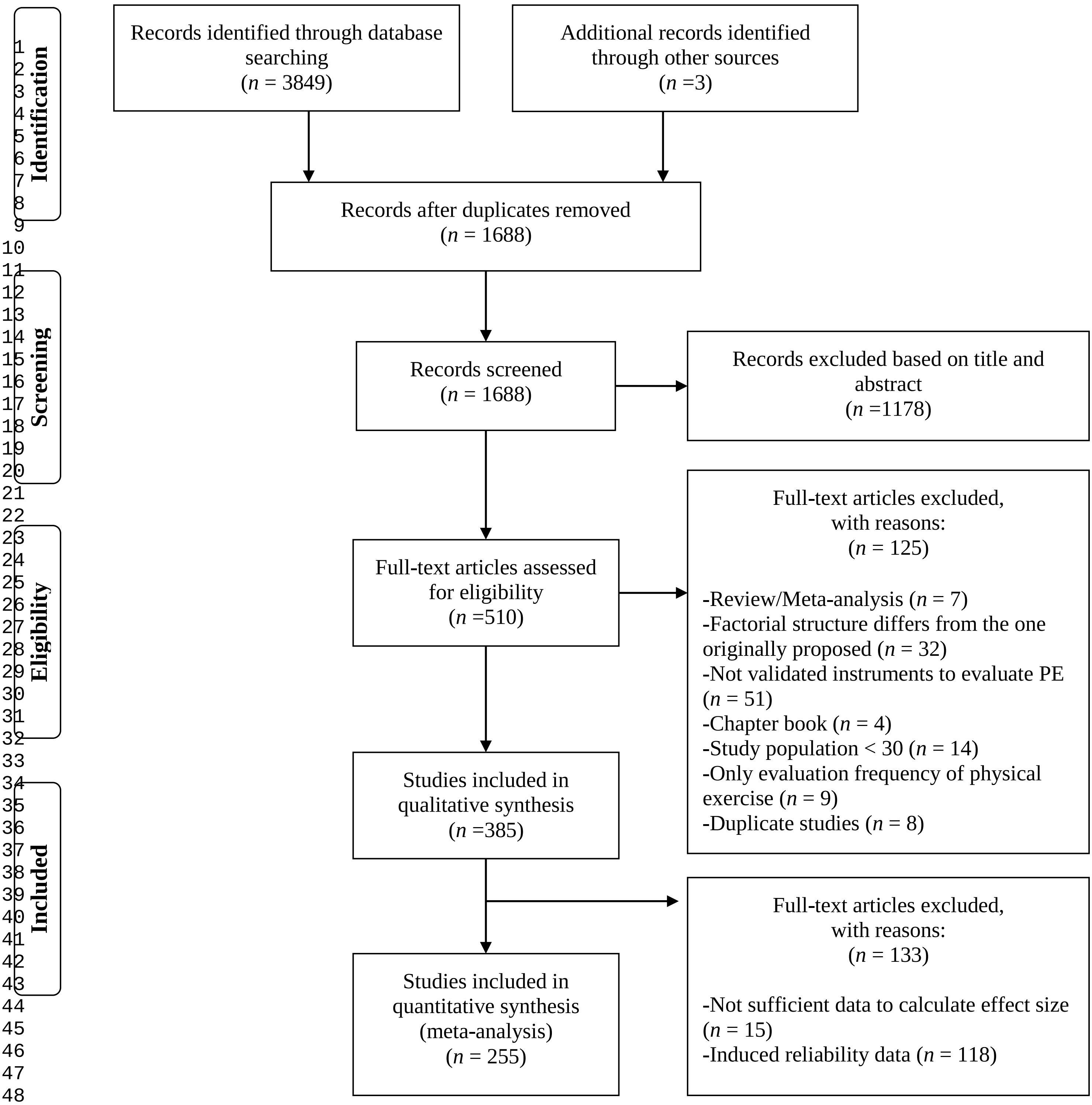


Figure 1. PRISMA flow diagram of study selection

Table 1

Alpha estimates for the scores of instruments assessing problematic exercise

Measure (Subscale)	Items	Range	Original α	Meta-analysis report k	$\bar{\alpha}$	95% CI Lo	95% CI Up	Q	I^2
CES-Likert	8	1-10	N.R.	10	.872	.853	.889	47.856	81.29
CES-VAS	8	0-155	.770	30	.842	.816	.864	401.834	93.60
CET	24	0-5	.850, .830	48	.880	.868	.891	450.903	92.99
CET (Avoidance)	8	0-5	.880, .880	27	.907	.888	.923	601.459	95.98
CET (Weight control)	5	0-5	.860, .850	21	.817	.787	.842	175.464	90.72
CET (Mood improvement)	5	0-5	.750, .720	20	.801	.779	.836	187.271	90.71
CET (Lack of enjoyment)	3	0-5	.840, .820	18	.777	.739	.810	155.376	88.08
CET (Rigidity)	3	0-5	.730, .820	23	.771	.748	.793	92.048	76.36
EAI	6	1-5	.840	42	.768	.739	.794	2258.405	97.27
EDQ	29	1-7	.843	12	.862	.842	.879	70.101	84.26
EDQ (Interference)	5	1-7	.814	7	.743	.676	.795	49.772	86.57
EDQ (Positive reward)	4	1-7	.795	6	.789	.688	.857	75.291	94.89
EDQ (Withdrawal)	4	1-7	.799	7	.772	.719	.815	35.498	82.67
EDQ (Weight control)	4	1-7	.781	6	.721	.670	.764	18.925	71.44
EDQ (Insight into problem)	4	1-7	.756	6	.690	.625	.744	24.952	78.19
EDQ (Social reasons)	3	1-7	.755	6	.615	.489	.710	53.587	88.86
EDQ (Health reasons)	3	1-7	.701	6	.774	.692	.834	56.772	90.64
EDQ (Stereotyped behaviour)	2	1-7	.516	6	.670	.561	.736	25.358	81.63
EDS-21	21	1-6	N.R.	90	.930	.923	.937	3906.857	97.76
EDS-21 (Tolerance)	3	1-6	.780, .780	43	.857	.840	.872	673.810	93.94
EDS-21 (Withdrawal)	3	1-6	.930, .900	42	.828	.809	.845	603.767	92.86
EDS-21 (Intention effects)	3	1-6	.920, .890	43	.881	.865	.895	906.013	95.48
EDS-21 (Lack of control)	3	1-6	.820, .820	44	.823	.803	.841	691.373	93.80
EDS-21 (Time)	3	1-6	.880, .860	43	.848	.833	.862	549.977	91.82
EDS-21 (Reduction in other activities)	3	1-6	.670, .750	53	.704	.675	.730	692.150	92.53
EDS-21 (Continuance)	3	1-6	.890, .900	43	.834	.816	.851	611.499	93.26
OEQ 20	20	1-4	.960	38	.870	.853	.885	556.527	94.43

Note. α = alpha value(s) reported in the original validation studies; $\bar{\alpha}$ = Estimated effect size (corrected coefficient alpha); CI= Confidence interval; Lo= Lower; Up= Upper; N.R. = non-reported; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire

Table 2

Results of univariable meta-regression analyses for categorical variables (global scores)

Subgroups	CES-VAS					CET					EAI					EDS-21					OEQ				
	K	$\bar{\alpha}$	95% CI		I^2	K	$\bar{\alpha}$	95% CI		I^2	K	$\bar{\alpha}$	95% CI		I^2	K	$\bar{\alpha}$	95% CI		I^2	K	$\bar{\alpha}$	95% CI		I^2
			Lo	Up				Lo	Up				Lo	Up				Lo	Up				Lo	Up	
Exercise modality																									
Unknown (RC)	19	.843	.805	.874	95.23	38	.887	.876	.897	92.07	16	.783	.740	.819	97.46	39	.946	.937	.953	96.57	25	.867	.849	.883	90.02
Unclear	2	.800	.746	.842	71.77	8	.843	.790	.883	90.36	8	.769	.710	.815	94.69	18	.920	.896	.939	98.60	6	.863	.829	.890	89.39
Power disciplines	-	-	-	-	-	-	-	-	-	-	2	.733	.705	.759	0.00	3	.918	.889	.939	76.70	-	-	-	-	-
Non-endurance	1	.770	.642	.852	-	1	.850	.805	.885	-	2	.708	.523	.821	85.27	4	.917	.838	.957	98.09	-	-	-	-	-
Multiple sports	7	.871	.860	.855	13.50	-	-	-	-	-	6	.796	.647	.882	98.49	9	.925	.903	.941	95.89	2	.954	.943	.962	34.26
Fitness and health	1	.770	.726	.807	-	-	-	-	-	-	4	.720	.661	.770	92.09	7	.924	.903	.942	95.89	-	-	-	-	-
Endurance	-	-	-	-	-	1	.850	.822	.874	-	4	.764	.581	.867	96.99	10	.913	.899	.925	93.52	5	.837	.805	.864	89.47
Eating disorders																									
Unknown (RC)	23	.824	.799	.846	90.69	32	.863	.850	.875	91.31	39	.770	.739	.798	97.35	69	.930	.921	.938	.97.90	37	.869	.852	.884	94.61
At-risk	-	-	-	-	-	2	.874	.801	.921	91.04	-	-	-	-	-	4	.963	.945	.974	78.37	-	-	-	-	-
Not at-risk	-	-	-	-	-	1	.900	.861	.928	-	-	-	-	-	-	5	.917	.894	.934	84.06	-	-	-	-	-
Mixed	6	.857	.827	.911	90.33	3	.902	.853	.934	84.62	3	.745	.695	.785	80.49	11	.922	.896	.942	98.00	1	.900	.863	.927	-
Clinical	1	.950	.930	.964	-	10	.927	.920	.934	0.01	-	-	-	-	-	1	.930	.913	.944	-	-	-	-	-	-
Report of LTE																									
No (RC)	13	.808	.766	.842	92.11	31	.887	.875	.899	92.81	20	.786	.740	.824	98.06	42	.931	.920	.941	98.30	23	.868	.849	.884	90.84
Yes	17	.864	.836	.887	92.50	17	.864	.839	.885	90.77	22	.751	.714	.782	95.19	48	.929	.919	.939	96.95	15	.873	.839	.900	96.96
Regular exercisers																									
Unknown (RC)	21	.838	.803	.867	95.06	40	.886	.874	.896	92.08	28	.784	.751	.813	97.57	55	.934	.925	.942	97.93	10	.883	.866	.898	93.10
Yes	9	.851	.821	.877	83.40	8	.842	.792	.881	89.36	13	.729	.673	.775	94.91	34	.922	.909	.934	97.24	28	.827	.800	.850	88.61
Region																									
Unknown (RC)	2	.815	.719	.878	88.12	7	.905	.872	.929	92.18	8	.790	.756	.819	90.96	16	.941	.928	.951	94.85	13	.891	.863	.914	94.59
South America	18	.820	.789	.847	91.29	-	-	-	-	-	2	.640	.527	.726	82.69	4	.880	.856	.900	75.04	-	-	-	-	-
Oceania	-	-	-	-	-	7	.890	.861	.913	84.45	2	.704	.649	.750	0.00	1	.930	.911	.945	-	7	.854	.804	.892	94.19
North America	7	.875	.832	.907	90.63	12	.864	.841	.884	87.56	5	.837	.795	.871	87.39	29	.938	.927	.947	97.52	15	.858	.833	.879	93.31
Mixed	1	.950	.930	.964	-	4	.890	.795	.941	93.92	-	-	-	-	-	4	.938	.889	.965	98.47	-	-	-	-	-
Europe	2	.834	.803	.862	67.28	18	.875	.861	.887	89.97	24	.745	.706	.779	96.82	34	.920	.905	.932	97.69	3	.855	.787	.901	85.50
Asia	-	-	-	-	-	-	-	-	-	-	1	.920	.914	.926	-	2	.942	.525	.993	99.67	-	-	-	-	-
Test version																									
Original (RC)	11	.874	.834	.904	93.81	44	.877	.865	.888	92.89	21	.795	.765	.821	95.19	58	.936	.928	.944	97.38	38	.870	.853	.855	94.43
Linguistically adapted	19	.820	.791	.846	81.28	4	.905	.857	.937	85.16	21	.739	.687	.782	97.73	32	.918	.902	.930	97.96	-	-	-	-	-
Type of survey																									
Unknown (RC)	15	.871	.844	.893	91.89	36	.884	.871	.896	92.54	25	.786	.751	.816	97.45	46	.929	.919	.938	97.18	24	.863	.848	.878	90.19

Paper-pencil	2	.708	.592	.791	55.12	9	.878	.859	.895	54.25	5	.727	.634	.796	96.08	26	.928	.914	.940	97.66	8	.867	.822	.901	94.57
On-line	12	.820	.780	.852	91.66	3	.861	.822	.893	94.61	11	.748	.676	.803	96.12	16	.930	.905	.948	98.26	4	.881	.788	.933	96.45
Both	1	.770	.714	.815	-	-	-	-	-	-	1	.710	.669	.746	-	2	.968	.923	.987	97.81	2	.920	.687	.979	98.31
Publication status																									
Published (RC)	24	.830	.800	.855	93.76	41	.881	.868	.893	94.10	38	.759	.728	.785	97.25	79	.931	.923	.938	97.95	30	.870	.849	.888	95.59
Unpublished	6	.882	.846	.910	85.65	7	.870	.849	.899	70.78	4	.843	.795	.879	89.55	11	.920	.896	939	94.01	8	.870	.848	.889	80.17
Study design																									
Psychometric (RC)	5	.859	.767	.914	96.57	8	.848	.797	.887	93.70	12	.784	.714	.837	97.74	9	.933	.902	.954	98.69	6	.878	.805	.924	96.13
Applied	25	.838	.811	.861	92.81	40	.885	.873	.895	91.62	30	.761	.730	.789	96.68	81	.930	.922	.937	97.60	32	.868	.852	.883	93.68

Note. $\bar{\alpha}$ = Corrected coefficient alpha; CI= Confidence interval; Lo= Lower; Up= Upper; RC= Reference category; LTE = Leisure time exercise; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire.

Table 3

Results of univariable meta-regression analyses for continuous variables (global scores)

Moderators	CES-VAS					CET					EAI					EDS-21					OEQ				
	K	β_1	F	p	R^2	K	β_1	F	p	R^2	K	β_1	F	p	R^2	K	β_1	F	p	R^2	K	β_1	F	p	R^2
Mean of test score	29	.000	0.001	.971	0.00	40	-.025	0.998	.324	0.36	31	**-.250**	4.993	.033	13.08	68	**-.243**	4.895	.030	6.37	33	-.047	0.150	.701	0.00
SD of test score	29	-.001	0.004	.948	0.00	39	-.301	2.690	.109	5.34	31	.398	1.304	.263	2.18	66	**.618**	5.836	.019	6.88	33	-.166	0.402	.531	0.00
Mean age	26	.011	1.396	.249	1.41	43	-.008	0.785	.381	0.00	40	-.003	0.076	.785	0.00	78	-.001	0.012	.913	0.00	32	-.005	0.233	.633	0.00
SD age	26	.029	0.734	.400	0.00	42	.008	0.270	.606	0.00	37	.000	0.001	.982	0.00	76	-.007	0.189	.666	0.00	31	.004	0.034	.855	0.00
% of Whites	14	.001	0.138	.717	0.00	17	-.003	0.133	.720	0.00	7*	-.003	0.279	.620	0.00	38	-.003	2.379	.132	4.50	18	.003	0.155	.699	0.00
% of Females	30	.001	0.273	.605	0.00	47	.002	0.948	.336	0.00	40	.001	0.167	.685	0.00	89	.002	1.544	.217	0.44	34	-.001	0.156	.695	0.00
Year of publication	30	.002	0.040	.843	0.00	48	.027	3.821	.057	5.95	42	-.005	0.091	.765	0.00	90	.008	0.442	.508	0.00	38	-.012	1.688	.202	1.40

Note. β_1 = estimated regression coefficient; R^2 = Explained variance; F = Omnibus test; RC = Reference category; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire. Statistically-significant effects (p< .05) appear highlighted in bold.

* Correspond to K< 10 and should therefore not be interpreted (Fu et al., 2011).

Table 4

Results of multivariable meta-regression analyses (global scores)

Moderators	*K*	β_0	β_1	*SE*	*F*	*p*	R^2
CES-VAS	30				51.844	<.001	68.73
		1.779	-	.117			
Eating disorders (Mixed)			**.281**	.133			
Eating disorders (Clinical)			**.931**	.298			
Report of LTE (Yes)			**.286**	.117			
Test version (linguistically adapted)			**-.268**	.125			
Type of survey (Paper-pencil)			**-.476**	.222			
Type of survey (Online)			.110	.142			
Type of survey (Both)			**-.595**	.267			
CET	48				49.917	<.001	57.55
		2.039	-	.043			
Eating disorders (At risk)			.041	.163			
Eating disorders (Not at risk)			.263	.264			
Eating disorders (Mixed)			.255	.147			
Eating disorders (Clinical)			**.564**	.093			
Regular exercisers (Yes)			**-.257**	.094			
EAI	31				38.281	<.001	59.22
		2.251	-	.282			
Region (South America)			**-.334**	.168			
Region (Oceania)			**-.337**	.166			
Region (North America)			.023	.145			
Region (Europe)			-.139	.102			
Test version (linguistically adapted)			**-.248**	.091			
Mean total score*			**-.223**	.094			
EDS-21	66				37.410	<.001	38.02
		2.938	-	.323			
Exercise modality (Unclear)			**-.380**	.137			
Exercise modality (Power disciplines)			-.437	.287			
Exercise modality (Non-endurance)			**-.684**	.247			
Exercise modality (Multiple sports)			**-.382**	.169			
Exercise modality (Fitness and health)			**-.645**	.214			
Exercise modality (Endurance)			**-.488**	.159			
Mean total score*			-.078	.106			
SD total score*			.203	.228			
OEQ	38				64.660	<.001	68.55
		2.096	-	.050			
Exercise modality (Unclear)			.156	.114			
Exercise modality (Multiple sports)			**.997**	.174			
Exercise modality (Endurance)			.295	.160			
Regular exercisers (Yes)			**-.463**	.124			
Publication status (Unpublished)			**-.197**	.093			

Note. β_0 = intercept/mean effect size; β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire; LTE = Leisure time exercise. The reference categories were: Unknown (Eating disorders, Exercise modality, and Region), Original version (Test version), and Published (Publication status). Statistically-significant effects ($p < .05$) appear highlighted in bold.

* Continuous moderator.

Table 5

Results of univariable meta-regression analyses for categorical variables (subscale scores of the Compulsive Exercise Test)

Subgroups	Avoidance					Weight control					Mood improvement					Lack of enjoyment					Exercise rigidity				
	K	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2
Exercise modality																									
Unknown (RC)	18	.922	.901	.938	96.19	12	.797	.748	.836	92.92	11	.830	.793	.860	91.25	11	.787	.727	.833	93.27	16	.764	.736	.789	77.44
Unclear	6	.857	.827	.880	68.90	6	.864	.846	.879	22.90	6	.796	.728	.846	85.18	6	.758	.731	.783	0.01	6	.800	.756	.836	62.75
Power disciplines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-endurance	1	.870	.831	.900	-	1	.750	.670	.810	-	1	.770	.697	.826	-	1	.770	.689	.830	-	1	.720	.621	.793	-
Multiple sports	2	.890	.843	.924	88.14	2	.818	.798	.936	0.00	2	.736	.670	.789	67.36	-	-	-	-	-	-	-	-	-	-
Fitness and health	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eating disorders																									
Unknown (RC)	15	.876	.856	.893	90.17	12	.818	.778	.851	92.22	12	.806	.775	.832	84.76	12	.770	.726	.807	88.23	15	.764	.732	.791	82.02
At risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not at risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed	4	.893	.864	.918	79.73	4	.808	.780	.833	36.92	3	.744	.695	.784	55.30	1	.770	.689	.830	-	1	.720	.621	.793	-
Clinical	8	.953	.947	.959	44.96	5	.828	.730	.890	91.46	5	.849	.769	.901	90.32	5	.800	.698	.867	87.42	7	.798	.767	.825	34.89
Report of LTE																									
No (RC)	16	.921	.900	.939	96.07	10	.809	.761	.847	91.37	9	.823	.770	.865	93.77	8	.781	.730	.838	88.71	13	.768	.739	.793	70.21
Yes	11	.880	.852	.903	91.86	11	.824	.784	.856	89.97	11	.796	.761	.826	83.04	10	.766	.714	.809	87.17	10	.778	.734	.814	82.07
Regular exercisers																									
Unknown (RC)	19	.919	.898	.935	96.59	13	.804	.769	.834	89.48	12	.822	.782	.855	93.01	11	.797	.747	.837	90.97	16	.766	.740	.790	74.34
Yes	8	.873	.844	.897	83.62	8	.834	.783	.873	89.44	8	.788	.738	.829	82.36	7	.741	.689	.785	69.09	7	.783	.730	.826	76.72
Region																									
Unknown (RC)	6	.935	.914	.951	88.06	3	.789	.734	.833	76.58	3	.827	.763	.874	87.53	3	.764	.596	.862	94.83	6	.755	.707	.795	64.68
South America	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oceania	5	.904	.864	.932	87.25	5	.869	.832	.898	66.02	5	.777	.723	.820	54.50	4	.776	.725	.817	15.30	4	.825	.788	.855	0.00
North America	2	.896	.819	.940	92.29	2	.774	.619	.866	85.93	1	.850	.816	.878	-	1	.770	.713	.816	-	1	.800	.750	.840	-
Mixed	2	.932	.879	.962	88.46	2	.858	.790	.904	76.18	2	.860	.838	.879	0.00	2	.785	.689	.851	68.86	2	.842	.814	.865	0.00
Europe	12	.887	.847	.917	97.50	9	.791	.743	.831	91.92	9	.800	.739	.847	95.18	8	.800	.708	.834	93.13	10	.746	.713	.777	75.82
Asia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test version																									
Original (RC)	23	.899	.878	.916	95.75	21	.817	.787	.842	90.72	20	.809	.779	.836	90.71	18	.777	.739	.810	88.08	19	.776	.750	.800	79.31
Linguistically adapted	4	.943	.920	.960	86.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	.748	.691	.795	49.57
Type of survey																									
Unknown (RC)	17	.914	.889	.934	97.04	17	.832	.807	.853	84.49	13	.809	.774	.840	87.15	11	.778	.727	.820	89.17	18	.769	.744	.791	68.54

Paper-pencil	5	.895	.840	.931	93.83	1	.620	.536	.689	-	3	.854	.728	.922	96.73	4	.770	.644	.852	94.86	3	.746	.593	.842	91.87
On-line	5	.892	.857	.918	85.85	3	.767	.678	.831	90.90	4	.778	.754	.800	17.01	3	.783	.735	.823	-	2	.807	.776	.834	19.73
Both	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Publication status																									
Published (RC)	23	.912	.891	.928	96.45	17	.816	.781	.846	92.43	16	.821	.787	.849	91.73	14	.766	.719	.805	89.12	19	.776	.750	.798	76.70
Unpublished	4	.873	.842	.898	69.71	4	.819	.766	.859	75.08	4	.761	.714	.800	50.14	4	.815	758	.859	74.17	4	.752	.673	.812	74.92
Study design																									
Psychometric (RC)	11	.904	.866	.931	97.23	10	.828	.791	.857	89.21	10	.817	.763	.858	94.15	8	.780	.726	.823	85.34	8	.802	.769	.831	70.24
Applied	16	.909	.887	.927	94.64	11	.806	.757	.846	91.20	10	.805	.770	.831	81.90	10	.775	.717	.822	89.44	15	.753	.724	.780	72.36

Note: $\bar{\alpha}$ = Corrected coefficient alpha. CI= Confidence interval; Lo= Lower; Up= Upper; RC = Reference category. LTE = Leisure time exercise.

Table 6

Results of univariable meta-regression analyses for continuous variables (subscale scores of the Compulsive Exercise Test)

Moderators	Avoidance					Weight control					Mood improvement					Lack of enjoyment					Exercise rigidity				
	K	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2
Mean total scores	20	.314	2.627	.122	8.29	18	-.200	3.473	.080	17.27	17	-.159	0.696	.417	0.00	15	-.118	1.345	.267	1.84	17	-.087	0.840	.374	0.00
SD total scores	20	**1.383**	41.712	<.001	70.92	18	-.454	0.739	.403	0.00	17	**1.912**	30.996	<.001	71.45	15	-.072	0.057	.814	0.00	17	.371	1.675	.215	2.51
Mean age	27	**.038**	4.748	.039	14.91	21	-.024	0.013	.081	8.75	20	.026	4.357	.051	14.75	18	.021	2.182	.159	7.12	23	.007	0.330	.572	0.00
SD age	27	**.071**	9.548	.005	27.69	21	-.029	1.851	.190	3.14	20	**.045**	4.916	.040	17.60	18	.033	1.930	.184	4.68	23	.006	0.140	.712	0.00
% of Whites	7*	-.002	0.062	.813	0.00	7*	.013	2.477	.176	23.21	6*	-.006	2.714	.175	32.78	6*	.002	0.078	.794	0.00	6*	-.006	2.188	.213	61.24
% of Females	27	.003	1.049	.316	0.12	21	**.006**	8.154	.010	29.83	20	.003	1.202	.287	2.56	18	.001	0.150	.703	0.00	23	**.004**	8.807	.007	38.16
Year of publication	27	**.071**	10.694	.003	28.75	21	**-.046**	6.218	.022	27.52	20	.026	1.599	.222	3.60	18	.001	0.001	.971	0.00	23	-.011	0.654	.428	0.00

Note. β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; Statistically-significant effects (p< .05) appear highlighted in bold.

* Correspond to *K*< 10 and should therefore not be interpreted (Fu et al., 2011).

Table 7

Results of multivariable meta-regression analyses (subscale scores of the Compulsive Exercise Test)

Moderators	*K*	β_0	β_1	*SE*	*F*	*p*	R^2
Avoidance	27				26.516	<.001	86.08
		1.300	-	.263			
Eating disorders (Mixed)			-.020	.132			
Eating disorders (Clinical)			**.615**	.182			
SD total score*			**.806**	.245			
Weight control	21				9.335	.002	63.26
		2.418	-	.436			
% of Females*			**.005**	.002			
Year of publication*			**-.042**	.015			
Mood improvement	20				20.014	<.001	81.45
		-.325	-	.340			
SD total score*			**1.777**	.321			
SD age*			.0264	.013			
Exercise rigidity	23				5.427	.004	73.70
		1.144	-	.132			
Region (Oceania)			**.289**	.135			
Region (North America)			.228	.172			
Region (Mixed)			**.407**	.139			
Region (Europe)			.030	.090			
% of Females*			**.003**	.001			

Note. β_0 = intercept/mean effect size; β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators. Unknown was considered as the reference category both for Eating disorders and Region. Statistically-significant effects ($p < .05$) appear highlighted in bold.

* Continuous moderator.

Table 8

Results of univariable meta-regression analyses for categorical variables (subscale scores of the Exercise Dependence Scale-21)

Subgroups	Tolerance					Withdrawal					Intention effects					Lack of control					Time					Reduction in other activities					Continuance				
	K	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2	*K*	$\bar{\alpha}$	95% CI Lo	95% CI Up	I^2
Exercise modality																																			
Unknown (RC)	8	.892	.859	.917	91.34	8	.838	.793	.874	90.27	9	.909	.877	.933	94.42	9	.829	.762	.878	95.85	8	.849	.811	.800	88.67	13	.720	.639	.782	93.67	9	.811	.748	.858	94.43
Unclear	18	.849	.823	.870	93.48	17	.805	.776	.829	90.77	17	.872	.845	.894	95.32	17	.824	.789	.853	94.99	18	.854	.825	.878	95.41	18	.707	.667	.741	90.22	17	.838	.807	.863	94.42
Power disciplines	2	.784	.690	.849	69.70	2	.835	.799	.865	0.00	1	.890	.854	.817	-	2	.765	.714	.807	0.00	2	.805	.763	.840	0.00	3	.762	.718	.799	7.61	2	.844	.693	.921	91.47
Non-endurance	2	.822	.791	.848	0.00	2	.803	.760	.838	34.28	2	.808	.775	.836	0.00	2	.839	.755	.895	85.74	2	.834	.806	.859	0.00	2	.606	.496	.692	58.10	2	.790	.754	.821	0.00
Multiple sports	6	.853	.798	.892	94.86	6	.830	.779	.869	92.59	6	.881	.833	.915	95.56	6	.811	.750	.857	.93.41	6	.844	.805	.875	89.79	6	.749	.646	.822	95.75	6	.843	.817	.865	76.98
Fitness and health	4	.836	.751	.892	96.38	4	.869	.764	.927	98.17	4	.884	.843	.915	93.26	4	.836	.802	.864	81.93	3	.868	.838	.893	83.71	5	.703	.617	.769	88.71	4	.876	.830	.909	93.58
Endurance	3	.891	.859	.915	73.57	3	.865	.830	.892	67.62	4	.871	.774	.926	97.30	4	.813	.761	.855	85.39	4	.825	.806	.843	23.85	6	.614	.551	.667	77.38	3	.806	.740	.855	80.53
Eating disorders																																			
Unknown (RC)	41	.858	.841	.874	94.13	40	.831	.811	.848	93.02	40	.882	.865	.897	95.43	42	.823	.802	.842	94.11	41	.849	.834	.863	92.11	48	.706	.676	.734	92.79	41	.837	.819	.854	93.14
At risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not at risk	1	.820	.788	.847	-	1	.770	.729	.805	-	1	.850	.823	.873	-	1	.840	.811	.864	-	1	.800	.764	.831	-	1	.680	.622	.729	-	1	.720	.700	.763	-
Mixed	1	.810	.759	.851	-	1	.780	.721	.827	-	2	.871	.668	.950	97.92	1	.800	.746	.843	-	1	.840	.797	.874	-	2	.643	.451	.768	89.98	1	.790	.733	.835	-
Clinical	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Report of LTE																																			
No (RC)	12	.874	.842	.900	96.27	11	.845	.816	.869	92.42	12	.903	.870	.928	97.62	13	.841	.799	.874	96.77	13	.863	.841	.883	92.28	19	.701	.636	.754	95.87	12	.829	.792	.860	94.96
Yes	31	.849	.829	.866	91.93	31	.822	.797	.843	92.45	31	.871	.854	.886	92.65	31	.814	.792	.834	90.68	30	.840	.821	.858	90.79	34	.705	.674	.733	88.82	31	.836	.814	.855	92.36
Regular exercisers																																			
Unknown (RC)	16	.873	.847	.895	95.26	15	.840	.815	.861	90.91	17	.900	.875	.920	96.73	17	.839	.806	.866	95.40	17	.864	.846	.880	89.72	25	7.02	.650	.746	95.13	16	.831	.802	.855	93.08
Yes	27	.846	.824	.865	92.15	27	.821	.794	.845	93.22	26	.866	.847	.884	92.68	27	.812	.786	.834	91.82	26	.836	.813	.856	91.64	28	.706	.673	.736	88.11	27	.836	.811	.858	93.27
Region																																			
Unknown (RC)	6	.881	.846	.907	87.45	6	.854	.824	.879	76.96	7	.909	.880	.931	91.16	8	.847	.807	.879	91.41	7	.866	.838	.889	83.77	13	.726	.634	.795	95.56	7	.865	.839	.886	79.85
South America	4	.780	.737	.816	67.21	4	.748	.646	.820	90.94	3	.838	.790	.875	82.54	4	.754	.712	.791	59.47	4	.779	.721	.824	79.95	5	.743	.639	.817	91.94	4	.834	.772	.878	89.22
Oceania	1	.920	.903	.934	-	1	.890	.866	.910	-	1	.930	.915	.943	-	1	.920	.903	.934	-	1	.940	.927	.951	-	1	.760	.708	.803	-	1	.930	.915	.943	-
North America	8	.891	.854	.918	95.52	8	.885	.860	.906	90.08	9	.924	.912	.935	85.80	8	.862	.832	.887	90.28	8	.870	.845	.891	87.76	10	.674	.625	.717	84.51	8	.871	.847	.892	86.75
Mixed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Europe	22	.847	.827	.864	90.65	21	.809	.795	.823	72.08	9	.845	.823	.864	91.68	21	.797	.766	.823	92.74	22	.838	.820	.854	87.73	22	.688	.648	.723	90.90	21	.796	.770	.819	90.36
Asia	2	.807	.752	.850	60.93	2	.749	.707	.786	0.00	2	.886	.866	.902	0.00	2	.832	.762	.882	79.59	1	.840	.802	.871	-	2	.741	.697	.779	0.00	2	.841	.814	.864	0.00
Test version																																			
Original (RC)	18	.878	.853	.899	94.05	18	.863	.840	.882	90.84	19	.912	.896	.926	93.34	20	.849	.824	.871	92.59	19	.868	.847	.885	90.64	25	.712	.669	.749	92.59	19	.858	.830	.881	93.73
Linguistically adapted	25	.839	.819	.857	91.33	24	.798	.777	.816	86.27	24	.849	.830	.866	91.18	24	.797	.769	.821	92.47	24	.831	.811	.849	90.09	28	.697	.656	.732	92.43	24	.812	.791	.831	88.98
Type of survey																																			

Unknown (RC)	18	.859	.831	.882	95.00	24	.836	.809	.859	94.41	12	.896	.866	.919	95.59	18	.807	.769	.839	94.61	22	.838	.817	.856	91.16	32	.702	.658	.740	93.58	22	.851	.831	.869	91.33
Paper-pencil	15	.863	.835	.886	93.46	9	.807	.764	.842	90.27	17	.886	.862	.905	95.44	11	.830	.788	.864	94.33	11	.856	.828	.880	90.06	9	.690	.616	.749	93.50	8	.808	.751	.852	94.16
On-line	7	.813	.775	.845	86.20	8	.823	.784	.855	86.25	12	.862	.822	.893	95.65	12	.823	.801	.842	77.67	9	.858	.816	.890	93.50	11	.707	.676	.735	69.15	11	.819	.771	.857	94.49
Both	3	.896	.863	.921	70.05	1	.850	.809	.882	-	2	.842	.795	.877	0.00	3	.878	.779	.933	94.35	1	.900	.859	.929	-	1	.840	.796	.875	-	2	.818	.704	.888	81.46
Publication status																																			
Published (RC)	40	.852	.835	.868	93.56	39	.825	.804	.843	93.02	39	.874	.857	.889	94.93	41	.817	.797	.836	93.13	40	.849	.833	.863	92.03	49	.707	.676	.734	92.83	40	.833	.813	.850	93.57
Unpublished	3	.906	.863	.936	88.89	3	.876	.854	.894	38.59	4	.931	.913	.946	83.59	3	.882	.801	.931	94.26	3	.837	.751	.893	91.07	4	.669	.578	.741	84.99	3	.855	.798	.895	84.94
Study design																																			
Psychometric (RC)	15	.843	.812	.869	95.02	15	.815	.771	.852	96.66	16	.873	.846	.894	95.73	15	.789	.748	.824	95.04	15	.838	.810	.863	94.11	16	.712	.664	.754	93.49	15	.832	.797	.860	95.34
Applied	28	.864	.843	.882	92.78	27	.835	.816	.852	86.96	27	.886	.864	.903	95.07	29	.838	.817	.857	91.50	28	.853	.835	.869	89.90	37	.700	.663	.733	91.87	28	.835	.812	.855	91.60

Note. $\bar{\alpha}$ = Corrected coefficient alpha. CI= Confidence interval; Lo= Lower; Up= Upper; RC = Reference category. LTE = Leisure time exercise.

Table 9

Results of univariable meta-regression analyses for continuous variables (subscale scores of the Exercise Dependence Scale-21)

Moderators	Tolerance					Withdrawal					Intention effects					Lack of control					Time					Reduction in other activities					Continuance				
	K	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2	*K*	β_1	*F*	*p*	R^2
Mean total scores	36	-.183	3.573	.067	8.02	36	-.035	0.312	.580	9.59	37	-.170	1.266	.268	1.19	38	**-.294**	8.745	.006	19.17	36	-.129	2.629	.114	5.44	41	-.096	0.748	.393	0.00	37	.060	0.256	.616	0.00
SD total scores	36	**.623**	4.524	.041	9.22	36	-.060	0.054	.818	9.58	37	.082	0.041	.840	0.00	38	-.075	0.097	.758	0.00	36	.210	0.539	.468	0.00	41	-.008	0.002	.967	0.00	37	-.458	2.319	.137	4.02
Mean age	41	-.001	0.003	.957	0.00	40	-.003	0.179	.675	14.64	40	-.004	0.134	.716	0.00	42	.003	0.140	.710	0.00	41	-.003	0.198	.659	0.00	49	.006	0.519	.475	0.00	41	-.011	2.253	.141	3.84
SD age	40	-.010	0.430	.516	0.00	39	-.019	1.616	.212	14.32	39	-.001	0.002	.966	0.00	41	-.004	0.055	.815	0.00	40	-.001	0.009	.927	0.00	48	.022	2.342	.133	2.34	40	-.014	0.986	.327	0.87
% of Whites	8*	.010	2.638	.156	19.41	8*	.008	3.708	.103	9.21	10	.003	0.401	.544	0.00	9*	.001	0.044	.841	0.00	7*	-.007	0.494	.513	0.00	12	.002	0.117	.740	0.00	9*	.001	0.112	.748	0.00
% of Females	40	**.005**	4.256	.046	8.58	39	.003	2.242	.143	13.88	40	**.006**	5.420	.025	11.17	41	**.007**	12.342	.001	24.97	40	**.008**	17.577	<.001	32.19	50	.002	0.646	.426	0.00	40	**.005**	6.018	.019	12.29
Year of publication	43	.005	0.126	.725	0.00	42	-.022	2.740	.106	12.99	43	-.012	0.559	.459	0.00	44	-.004	0.065	.800	0.00	43	-.003	0.041	.842	0.00	53	-.001	0.012	.913	0.00	43	-.007	0.258	.614	0.00

Note. β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; Statistically-significant effects (p< .05) appear highlighted in bold.

Table 10

Results of multivariable meta-regression analyses (subscale scores of the Exercise Dependence Scale-21)

Moderators	*K*	β_0	β_1	*SE*	*F*	*p*	R^2
Tolerance	43				5.591	.008	27.97
		.825	**-**	.387			
SD total scores*			**.697**	.277			
% of Females*			**.006**	.002			
Withdrawal	42				10.550	<.001	67.73
		1.925	**-**	.099			
Region (South America)			**-.569**	.154			
Region (Oceania)			.283	.251			
Region (North America)			.243	.128			
Region (Europe)			**-.270**	.111			
Region (Asia)			**-.539**	.196			
Intention effects	43				9.240	<.001	69.91
		2.596	**-**	.188			
Report of LTE (Yes)			**-.306**	.107			
Region (South America)			-.339	.217			
Region (Oceania)			.414	.322			
Region (North America)			.216	.139			
Region (Europe)			**-.482**	.123			
Region (Asia)			-.090	.241			
% of Females*			-.000	.002			
Lack of control	44				4.592	.002	47.07
		1.661	**-**	.146			
Region (South America)			**-.440**	.205			
Region (Oceania)			.375	.337			
Region (North America)			.032	.152			
Region (Europe)			**-.263**	.126			
Region (Asia)			-.264	.250			
% of Females*			**.005**	.002			
Time	43				14.198	<.001	47.48
		1.683	**-**	.100			
Test version (Linguistically adapted)			**-.218**	.078			
% of Females*			**.007**	.002			
Continuance	43				6.847	<.001	65.81
		2.004	**-**	.148			
Region (South America)			**-.567**	.257			
Region (Oceania)			**.665**	.290			
Region (North America)			.057	.133			
Region (Europe)			**-.955**	.248			
Region (Asia)			**-.770**	.292			
Test version (Linguistically adapted)			**.600**	.226			
% of Females*			-.000	.002			

Note. β_0 = intercept/mean effect size; β_1 = estimated regression coefficient; R^2 = Explained variance; *F* = Omnibus test of moderators; LTE = Leisure time exercise. The reference categories were: No (Report of LTE), Unknown (Region), and Original version (Test version). Statistically-significant effects ($p < .05$) appear highlighted in bold.

* Continuous moderator.

Table 11

Reliability reporting practices of in studies using self-report instruments assessing problematic exercise

Measure (Subscale)	Induced reliability				Reported reliability	
	By omission	Vague report	Precise report	Induction rate	Unusable	Usable
	K (%)	*K* (%)	*K* (%)	%	*K* (%)	*K* (%)
CES-Likert	5 (31.25)	-	-	31.25	1 (6.25)	10 (62.50)
CES-VAS	14 (27.45)	2 (3.92)	5 (9.80)	41.18	-	30 (58.82)
CET	7 (11.86)	3 (5.08)	1 (1.69)	18.64	-	48 (81.36)
CET (Avoidance)	5 (13.16)	4 (10.53)	1 (2.63)	26.32	1 (2.63)	27 (71.05)
CET (Weight control)	5 (16.13)	4 (12.90)	-	29.03	1 (3.23)	21 (67.74)
CET (Mood improvement)	5 (16.67)	4 (13.33)	-	30.00	1 (3.33)	20 (66.67)
CET (Lack of enjoyment)	5 (18.52)	4 (14.81)	-	33.33	-	18 (66.67)
CET (Rigidity)	5 (15.15)	4 (12.12)	1 (3.03)	30.30	-	23 (69.70)
EAI	26 (26.80)	9 (9.28)	17 (17.53)	53.61	2 (2.06)	43 (44.33)
EDQ	3 (10.71)	5 (17.86)	8 (28.57)	57.14	-	12 (42.86)
EDQ (Interference)	1 (5.56)	5 (27.78)	5 (27.78)	61.11	-	7 (38.89)
EDQ (Positive reward)	1 (5.88)	5 (29.41)	5 (29.41)	64.71	-	6 (35.29)
EDQ (Withdrawal)	1 (5.56)	5 (27.78)	5 (27.78)	61.11	-	7 (38.89)
EDQ (Weight control)	2 (11.11)	5 (27.78)	5 (27.78)	66.67	-	6 (33.33)
EDQ (Insight into problem)	1 (5.88)	5 (29.41)	5 (29.41)	64.71		6 (35.29)
EDQ (Social reasons)	2 (11.11)	5 (27.78)	5 (27.78)	66.67	-	6 (33.33)
EDQ (Health reasons)	2 (11.11)	5 (27.78)	5 (27.78)	66.67	-	6 (33.33)
EDQ (Stereotyped behaviour)	1 (5.88)	5 (29.41)	5 (29.41)	64.71	-	6 (35.29)
EDS-21	8 (6.30)	15 (11.81)	6 (4.72)	22.83	8 (6.30)	90 (70.87)
EDS-21 (Tolerance)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
EDS-21 (Withdrawal)	1 (1.79)	9 (16.07)	-	17.86	4 (7.14)	42 (75.00)
EDS-21 (Intention effects)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
EDS-21 (Lack of control)	1 (1.72)	9 (15.52)	-	17.24	4 (6.90)	44 (75.86)
EDS-21 (Time)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
EDS-21 (Reduction in other activities)	1 (1.49)	9 (13.43)	-	14.93	4 (5.97)	53 (79.10)
EDS-21 (Continuance)	1 (1.75)	9 (15.79)	-	17.54	4 (7.02)	43 (75.44)
OEQ	7 (10.00)	5 (7.14)	19 (27.14)	44.29	1 (1.43)	38 (54.29)
Total	113 (9.77)	162 (14.00)	98 (8.47)	47.58	43 (3.72)	741 (64.04)

Note. CES-VAS = Commitment Exercise Scale; CET = Compulsive Exercise Test; EAI = Exercise Addiction Inventory; EDS-21= Exercise Dependence Scale-21; OEQ = Obligatory Exercise Questionnaire; Induced reliability= No reliability values for the data at hand are provided; By omission= No reference to reliability is made; Vague= Some reference to reliability is made, but information concerning the source of such information is missing; Precise report= Reported reliability values correspond to those provided in another studies; Unusable= Reliability values for the data at hand is provided employing indices different to alpha; Usable= Data that were effectively included in the meta-analysis.

Supplementary materials

Examining the reliability of the scores of self-report instruments assessing problematic exercise: A systematic review and meta-analysis

Appendix A: PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	1-4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4-5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	5
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-6; Figure1

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5-6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	NA
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6-8
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6-8
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6-8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	6-8 (Appendix C; Appendix D)
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8; Figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8; Tables 2-11
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	NA
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Appendix E
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	8-15; Table 1
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Appendix D
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	8-15; Tables 2-11; Appendix C

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	15-24
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	24-25
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	25-27
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Title page

Appendix B. Search Strategy

WOS Core Collection **(n = 1197)**	**ScieLO** **(n = 46)**	**Medline** **(n = 862)**	**Current Contents Connect** **(n = 675)**	**PsycINFO** **(n = 802)**	**Dissertations & Theses** **Global (n = 267)**
1. Problematic exercise / 2. Morbid exercise / 3. Exercise addiction / 4. Exercise Addiction Inventory / 5. Exercise dependence / 6. Exercise Dependence Scale / 7. Compulsive exercise / Compulsive 8. Exercise Test / Compulsive 9. physical activity / Obligatory 10. exercise / 11. Obligatory Exercise 12. Questionnaire / Commitment to 13. exercise / Commitment to Exercise 14. Scale / Excessive exercise / 15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 16. Limit 14 to English language	1. Problematic exercise / 2. Morbid exercise / 3. Exercise addiction / 4. Exercise Addiction Inventory / 5. Exercise dependence / 6. Exercise Dependence Scale / 7. Compulsive exercise / Compulsive 8. Exercise Test /Compulsive 9. physical activity /Obligatory 10. exercise / 11. Obligatory Exercise 12. Questionnaire /Commitment to 13. exercise / Commitment to Exercise 14. Scale / Excessive exercise / 1. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 1. Limit 14 to English language	1. Problematic exercise / 2. Morbid exercise / 3. Exercise addiction / 4. Exercise Addiction Inventory / 5. Exercise dependence / 6. Exercise Dependence Scale / 7. Compulsive exercise / Compulsive 8. Exercise Test / Compulsive 9. physical activity / Obligatory 10. exercise / 11. Obligatory Exercise 12. Questionnaire /Commitment to 13. exercise / Commitment to Exercise 14. Scale / Excessive exercise / 15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 16. Limit 14 to English language	1. Problematic exercise / 2. Morbid exercise / 3. Exercise addiction / 4. Exercise Addiction Inventory / 5. Exercise dependence / 6. Exercise Dependence Scale / 7. Compulsive exercise / Compulsive 8. Exercise Test / Compulsive 9. physical activity / Obligatory 10. exercise / 11. Obligatory Exercise 12. Questionnaire / Commitment to 13. exercise / Commitment to Exercise 14. Scale / Excessive exercise / 15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 16. Limit 14 to English language	1. Problematic exercise / 2. Morbid exercise / 3. Exercise addiction / 4. Exercise Addiction Inventory / 5. Exercise dependence / 6. Exercise Dependence Scale / 7. Compulsive exercise / Compulsive 8. Exercise Test / Compulsive 9. physical activity / Obligatory 10. exercise / 11. Obligatory Exercise 12. Questionnaire /Commitment to 13. exercise / Commitment to Exercise 14. Scale / Excessive exercise / 15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 16. Limit 14 to English language and Spanish language	1. Problematic exercise / 2. Morbid exercise / 3. Exercise addiction / 4. Exercise Addiction Inventory / 5. Exercise dependence / 6. Exercise Dependence Scale / 7. Compulsive exercise / Compulsive 8. Exercise Test / Compulsive 9. physical activity / Obligatory 10. exercise / 11. Obligatory Exercise 12. Questionnaire /Commitment to 13. exercise / Commitment to Exercise 14. Scale / Excessive exercise / 15. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 16. Limit 14 to English language and Spanish language, Title, Abstract, Keywords

Appendix C: Sensitivity analysis by PE

Results from the sensitivity analyses (i.e., by conducting systematic reanalysis while removing studies one at a time) showed that the pooled estimates resulting from the 27 meta-analyses conducted were not significantly modified when specific data were removed one at a time therefore suggesting the robustness of the results.

CES-Likert

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Teixeira et al. (2010)	0.8772	31.9685	0.0000	0.8603	0.8920	39.8706	0.0000	0.0264	76.3444	4.2273
Aruguete et al. (2012)	0.8746	26.2499	0.0000	0.8535	0.8926	44.9499	0.0000	0.0411	82.0344	5.5662
Martin & Racine (2017)	0.8677	27.4288	0.0000	0.8471	0.8855	29.8816	0.0002	0.0334	76.5406	4.2627
Mond e al. (2008)	0.8673	29.4133	0.0000	0.8482	0.8840	37.4617	0.0000	0.0286	76.8184	4.3138
McLaren (2000_female)	0.8709	24.7847	0.0000	0.8482	0.8902	47.2008	0.0000	0.0458	83.4130	6.0288
McLaren (2000_male)	0.8710	25.1442	0.0000	0.8487	0.8901	47.5235	0.0000	0.0450	84.0961	6.2877
Ditmer et al. (2018)	0.8716	26.6761	0.0000	0.8507	0.8896	47.7931	0.0000	0.0418	83.9243	6.2206
Goodwin et al. (2011b)	0.8750	26.2626	0.0000	0.8541	0.8930	31.7410	0.0001	0.0401	77.3719	4.4193
Taranis & Meyer (2011_study2)	0.8740	26.4216	0.0000	0.8530	0.8919	46.7964	0.0000	0.0415	83.3532	6.0072
McLaren et al. (2001)	0.8709	24.8082	0.0000	0.8482	0.8902	47.2368	0.0000	0.0457	83.4957	6.0590

CES-VAS

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Teixeira et al. (2010)	0.8772	31.9685	0.0000	0.8603	0.8920	39.8706	0.0000	0.0264	76.3444	4.2273
Aruguete et al. (2012)	0.8746	26.2499	0.0000	0.8535	0.8926	44.9499	0.0000	0.0411	82.0344	5.5662
Martin & Racine (2017)	0.8677	27.4288	0.0000	0.8471	0.8855	29.8816	0.0002	0.0334	76.5406	4.2627
Mond e al. (2008)	0.8673	29.4133	0.0000	0.8482	0.8840	37.4617	0.0000	0.0286	76.8184	4.3138
McLaren (2000_female)	0.8709	24.7847	0.0000	0.8482	0.8902	47.2008	0.0000	0.0458	83.4130	6.0288
McLaren (2000_male)	0.8710	25.1442	0.0000	0.8487	0.8901	47.5235	0.0000	0.0450	84.0961	6.2877
Ditmer et al. (2018)	0.8716	26.6761	0.0000	0.8507	0.8896	47.7931	0.0000	0.0418	83.9243	6.2206
Goodwin et al. (2011b)	0.8750	26.2626	0.0000	0.8541	0.8930	31.7410	0.0001	0.0401	77.3719	4.4193
Taranis & Meyer (2011_study2)	0.8740	26.4216	0.0000	0.8530	0.8919	46.7964	0.0000	0.0415	83.3532	6.0072
McLaren et al. (2001)	0.8709	24.8082	0.0000	0.8482	0.8902	47.2368	0.0000	0.0457	83.4957	6.0590

CET global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.8800	43.2723	0.0000	0.8679	0.8909	450.4404	0.0000	0.0979	93.1834	14.6701
Bezzina et al. (2019)	0.8790	43.8213	0.0000	0.8670	0.8899	448.1605	0.0000	0.0952	93.1039	14.5009
Brewsster et al. (2016)	0.8814	45.8707	0.0000	0.8701	0.8917	387.1389	0.0000	0.0868	92.3285	13.0352
Ditmer et al. (2018)	0.8799	43.6094	0.0000	0.8679	0.8908	450.8460	0.0000	0.0970	93.2264	14.7632
Donovan et al. (2020)	0.8792	43.2817	0.0000	0.8671	0.8902	439.8912	0.0000	0.0971	92.9763	14.2376
Fewell et al. (2018)	0.8785	44.2367	0.0000	0.8666	0.8893	441.5301	0.0000	0.0924	92.8926	14.0698
Goodwin et al. (2011)	0.8795	43.1614	0.0000	0.8673	0.8905	446.3593	0.0000	0.0979	92.9025	14.0894
Goodwin et al. (2011b)	0.8797	43.1459	0.0000	0.8676	0.8908	450.7528	0.0000	0.0982	92.8349	13.9566
Goodwin et al. (2011c)	0.8797	43.1389	0.0000	0.8676	0.8908	450.6736	0.0000	0.0982	92.6156	13.5421
Goodwin et al. (2012)	0.8797	43.1376	0.0000	0.8676	0.8908	450.6489	0.0000	0.0982	92.5519	13.4262
Goodwin et al. (2014)	0.8795	43.1619	0.0000	0.8673	0.8905	446.4468	0.0000	0.0979	92.9096	14.1035
Goodwin et al. (2014b)	0.8795	43.1920	0.0000	0.8673	0.8905	448.9507	0.0000	0.0978	93.1178	14.5302
Goodwin et al. (2014c_female)	0.8797	43.2360	0.0000	0.8676	0.8907	450.8774	0.0000	0.0980	93.2136	14.7353
Goodwin et al. (2014c_male)	0.8795	43.2688	0.0000	0.8674	0.8905	450.1492	0.0000	0.0977	93.2136	14.7353
Goodwin et al. (2016)	0.8795	43.1858	0.0000	0.8673	0.8905	448.6877	0.0000	0.0979	93.0956	14.4836
Gorrell et al. (2020)	0.8803	43.5376	0.0000	0.8683	0.8912	445.1730	0.0000	0.0969	93.0967	14.4858
Hefner et al. (2016)	0.8789	43.5333	0.0000	0.8668	0.8899	439.1241	0.0000	0.0957	93.0253	14.3374
Mathisen et al. (2018)	0.8805	43.7363	0.0000	0.8685	0.8913	444.9712	0.0000	0.0961	93.0982	14.4890
Meyer et al. (2016_clinical)	0.8781	44.6480	0.0000	0.8663	0.8889	397.1377	0.0000	0.0896	92.5387	13.4026
Meyer et al. (2016_control)	0.8800	43.2470	0.0000	0.8679	0.8910	450.2041	0.0000	0.0980	93.1305	14.5571
Naylor et al. (2011_ clinical)	0.8788	43.8378	0.0000	0.8668	0.8897	445.5779	0.0000	0.0946	93.0470	14.3822
Naylor et al. (2011_non clinical)	0.8793	43.4329	0.0000	0.8672	0.8903	449.4872	0.0000	0.0969	93.1984	14.7024
Noetel et al.(2016a)	0.8786	44.1434	0.0000	0.8667	0.8895	444.2166	0.0000	0.0931	92.9533	14.1910
Noetel et al.(2016b)	0.8785	44.2130	0.0000	0.8666	0.8894	442.2770	0.0000	0.0925	92.9079	14.1001
Patterson & Goodson (2017)	0.8805	43.7350	0.0000	0.8685	0.8913	443.5656	0.0000	0.0961	93.0770	14.4447
Patterson & Goodson (2018)	0.8805	43.7351	0.0000	0.8685	0.8913	443.7101	0.0000	0.0961	93.0792	14.4491
Prochnow et al. (2019)	0.8805	43.7350	0.0000	0.8685	0.8913	443.5656	0.0000	0.0961	93.0770	14.4447
Scharmer et al. (2020a)	0.8797	43.2143	0.0000	0.8676	0.8908	450.8705	0.0000	0.0980	93.1938	14.6924
Scharmer et al. (2020b)	0.8800	43.2584	0.0000	0.8679	0.8909	450.3337	0.0000	0.0979	93.1598	14.6194
Schlegl et al. (2018_anorexia)	0.8778	45.4227	0.0000	0.8662	0.8884	414.5191	0.0000	0.0861	92.3655	13.0984
Schlegl et al. (2018_bulimia)	0.8788	43.8474	0.0000	0.8668	0.8897	444.6283	0.0000	0.0944	93.0305	14.3483
Schlegl et al. (2018_healty controls)	0.8801	43.4518	0.0000	0.8681	0.8910	449.9316	0.0000	0.0974	93.2111	14.7298
Shu et al. (2019)	0.8795	43.2122	0.0000	0.8674	0.8905	449.5036	0.0000	0.0978	93.1638	14.6280
Taranis & Meyer (2010b).1	0.8797	43.1681	0.0000	0.8676	0.8908	450.8321	0.0000	0.0981	93.0756	14.4417
Taranis & Meyer (2010b).2	0.8811	44.8550	0.0000	0.8695	0.8917	401.0810	0.0000	0.0910	92.6170	13.5446
Taranis & Meyer (2011_study1)	0.8817	47.3594	0.0000	0.8708	0.8917	372.8302	0.0000	0.0809	91.8546	12.2769
Taranis & Meyer (2011_study2)	0.8806	44.0788	0.0000	0.8688	0.8914	445.8994	0.0000	0.0948	93.0627	14.4148
Taranis & Meyer (2011_study3)	0.8814	45.9813	0.0000	0.8701	0.8917	430.8505	0.0000	0.0867	92.4642	13.2700
Valetine et al. (2018)	0.8799	43.3573	0.0000	0.8679	0.8909	450.6999	0.0000	0.0977	93.2330	14.7775
Young et al. (2016)	0.8788	43.8500	0.0000	0.8668	0.8897	444.3690	0.0000	0.0944	93.0264	14.3398
Young et al. (2018)	0.8788	43.8500	0.0000	0.8668	0.8897	444.3690	0.0000	0.0944	93.0264	14.3398
Arrante (2019)	0.8803	43.5771	0.0000	0.8683	0.8912	448.5220	0.0000	0.0968	93.1729	14.6475
Buchman (2019)	0.8790	43.5720	0.0000	0.8670	0.8900	447.0547	0.0000	0.0959	93.1264	14.5483
Matthews (2010)	0.8803	43.5351	0.0000	0.8683	0.8912	444.6428	0.0000	0.0969	93.0846	14.4604
Schamer (2018)	0.8792	43.3068	0.0000	0.8671	0.8902	445.3435	0.0000	0.0971	93.1053	14.5040
Taranis (2010_study5)	0.8801	43.4431	0.0000	0.8681	0.8911	449.8492	0.0000	0.0974	93.2080	14.7231
Taranis (2010_study6)	0.8803	43.5766	0.0000	0.8683	0.8912	448.5013	0.0000	0.0968	93.1724	14.6465
Turning (2016)	0.8801	43.3847	0.0000	0.8681	0.8911	448.6753	0.0000	0.0975	93.1549	14.6089

CET-Avoidance

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Goodwin et al. (2011b)	0.9083	24.5807	0.0000	0.8891	0.9242	567.7994	0.0000	0.2293	95.6059	22.7580
Limburg et al. (2019)	0.9069	24.2222	0.0000	0.8872	0.9232	600.4290	0.0000	0.2339	96.1769	26.1569
Marin et al. (2020)	0.9065	24.2709	0.0000	0.8868	0.9228	599.4505	0.0000	0.2325	96.2125	26.4024
Matthews (2010)	0.9088	24.9070	0.0000	0.8899	0.9245	579.6639	0.0000	0.2242	95.9410	24.6368
Meyer et al. (2016_clinical)	0.9038	25.5773	0.0000	0.8849	0.9196	461.9096	0.0000	0.2017	95.4719	22.0841
Meyer et al. (2016_control)	0.9069	24.1971	0.0000	0.8872	0.9232	599.3417	0.0000	0.2341	96.0725	25.4613
Noetel et al.(2016a)	0.9057	24.5132	0.0000	0.8861	0.9219	596.1283	0.0000	0.2265	96.1410	25.9137
Noetel et al.(2016b)	0.9056	24.4989	0.0000	0.8860	0.9218	594.5750	0.0000	0.2263	96.1297	25.8379
Plateau et al. (2014)	0.9083	24.5820	0.0000	0.8891	0.9242	579.3221	0.0000	0.2293	95.7843	23.7206
Sauchelli et al. (2016)	0.9038	25.5576	0.0000	0.8849	0.9196	491.1195	0.0000	0.2021	95.5308	22.3754
Scharmer et al. (2020a)	0.9069	24.2107	0.0000	0.8872	0.9232	600.1073	0.0000	0.2340	96.1460	25.9471
Schlegl et al. (2018_healty controls)	0.9085	24.7432	0.0000	0.8894	0.9243	596.3204	0.0000	0.2272	96.1129	25.7264
Taranis & Meyer (2010a)	0.9089	25.0450	0.0000	0.8901	0.9245	592.4530	0.0000	0.2224	96.0403	25.2547
Taranis & Meyer (2010b).1	0.9096	25.6937	0.0000	0.8915	0.9248	531.0583	0.0000	0.2114	95.6558	23.0190
Taranis & Meyer (2011_study1)	0.9088	24.9095	0.0000	0.8899	0.9245	572.0638	0.0000	0.2241	95.8772	24.2552
Taranis & Meyer (2011_study3)	0.9091	25.2155	0.0000	0.8905	0.9246	588.8210	0.0000	0.2196	95.9859	24.9125
Taranis (2010_study6)	0.9085	24.7427	0.0000	0.8894	0.9243	595.8317	0.0000	0.2271	96.1062	25.6818
Badau & Badau (2018)	0.9069	24.2098	0.0000	0.8872	0.9232	600.0712	0.0000	0.2340	96.1425	25.9237
Goodwin et al. (2016)	0.9077	24.3319	0.0000	0.8881	0.9238	599.9773	0.0000	0.2330	96.0197	25.1240
Power (2020)	0.9082	24.6020	0.0000	0.8890	0.9241	597.8186	0.0000	0.2293	96.1362	25.8811
Schlegl et al. (2018_anorexia)	0.9048	24.8143	0.0000	0.8853	0.9209	568.7107	0.0000	0.2177	95.9231	24.5281
Schlegl et al. (2018_bulimia)	0.9056	24.4889	0.0000	0.8859	0.9218	592.7753	0.0000	0.2262	96.1176	25.7572
Taranis & Meyer (2010b).2	0.9065	24.1907	0.0000	0.8867	0.9228	588.9713	0.0000	0.2332	95.9736	24.8362
Taranis & Meyer (2011_study2)	0.9091	25.2187	0.0000	0.8905	0.9246	588.2802	0.0000	0.2195	95.9818	24.8868
Taranis (2010_study5)	0.9069	24.2482	0.0000	0.8872	0.9232	600.7978	0.0000	0.2336	96.2110	26.3921
Vrabel & Bratland-Sanda (2019)	0.9039	25.4921	0.0000	0.8849	0.9197	538.6686	0.0000	0.2037	95.6450	22.9621
Young et al. (2016)	0.9049	24.7851	0.0000	0.8855	0.9211	584.9373	0.0000	0.2190	95.9946	24.9660

CET-Weight control

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.8227	25.4758	0.0000	0.7975	0.8448	131.2184	0.0000	0.0751	87.8371	8.2217
Goodwin et al. (2011b)	0.8189	21.7576	0.0000	0.7888	0.8448	162.2497	0.0000	0.1054	89.7272	9.7344
Goodwin et al. (2016)	0.8165	21.3383	0.0000	0.7855	0.8429	174.2389	0.0000	0.1084	90.9437	11.0421
Limburg et al. (2019)	0.8170	21.4470	0.0000	0.7862	0.8433	175.4045	0.0000	0.1080	91.3251	11.5276
Marin et al. (2020)	0.8160	21.5393	0.0000	0.7853	0.8422	174.7905	0.0000	0.1069	91.4069	11.6372
Matthews (2010)	0.8175	21.4564	0.0000	0.7868	0.8438	175.3974	0.0000	0.1080	91.1114	11.2503
Meyer et al. (2016_clinical)	0.8188	21.7748	0.0000	0.7887	0.8447	171.4491	0.0000	0.1054	90.8144	10.8866
Meyer et al. (2016_control)	0.8159	21.3491	0.0000	0.7849	0.8424	172.4694	0.0000	0.1079	91.0020	11.1136
Noetel et al.(2016a)	0.8121	22.5718	0.0000	0.7828	0.8375	167.3083	0.0000	0.0941	90.4303	10.4497
Noetel et al.(2016b)	0.8117	22.6976	0.0000	0.7825	0.8370	164.9260	0.0000	0.0922	90.2303	10.2358
Plateau et al. (2014)	0.8165	21.3125	0.0000	0.7855	0.8430	173.2689	0.0000	0.1086	90.4732	10.4967
Power (2020)	0.8193	22.0776	0.0000	0.7896	0.8447	172.3389	0.0000	0.1031	91.0427	11.1641
Scharmer et al. (2020a)	0.8207	22.8575	0.0000	0.7923	0.8453	160.2939	0.0000	0.0957	90.2113	10.2158
Taranis & Meyer (2010a)	0.8154	21.5443	0.0000	0.7848	0.8417	173.9125	0.0000	0.1063	91.3437	11.5523
Taranis & Meyer (2011_study1)	0.8119	22.2897	0.0000	0.7821	0.8376	134.3373	0.0000	0.0947	89.7964	9.8005
Taranis & Meyer (2011_study2)	0.8126	22.1525	0.0000	0.7827	0.8384	164.9365	0.0000	0.0975	90.6124	10.6523
Taranis & Meyer (2011_study3)	0.8154	21.5285	0.0000	0.7847	0.8417	173.7641	0.0000	0.1063	91.3329	11.5379
Taranis (2010_study5)	0.8141	21.7028	0.0000	0.7836	0.8403	170.1786	0.0000	0.1033	91.0776	11.2077
Taranis (2010_study6)	0.8148	21.5803	0.0000	0.7841	0.8411	172.1085	0.0000	0.1051	91.2195	11.3889
Vrabel & Bratland-Sanda (2019)	0.8213	23.4349	0.0000	0.7936	0.8453	159.0166	0.0000	0.0909	89.8860	9.8873
Young et al. (2016)	0.8165	21.5673	0.0000	0.7859	0.8427	175.2545	0.0000	0.1071	91.4375	11.6788

CET-Mood improvement

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.8117	21.0574	0.0000	0.7801	0.8388	182.5792	0.0000	0.1023	90.9603	11.0623
Goodwin et al. (2011b)	0.8104	20.6357	0.0000	0.7779	0.8381	183.8251	0.0000	0.1056	89.9151	9.9158
Goodwin et al. (2016)	0.8073	20.5853	0.0000	0.7746	0.8353	180.8115	0.0000	0.1041	90.7822	10.8486
Limburg et al. (2019)	0.8112	20.9396	0.0000	0.7793	0.8385	185.0310	0.0000	0.1034	91.1612	11.3138
Meyer et al. (2016_clinical)	0.8051	21.1608	0.0000	0.7732	0.8325	163.3312	0.0000	0.0961	90.2114	10.2160
Noetel et al.(2016a)	0.8113	21.2677	0.0000	0.7800	0.8382	186.0701	0.0000	0.1015	91.2590	11.4404
Noetel et al.(2016b)	0.8115	21.2478	0.0000	0.7801	0.8384	185.7193	0.0000	0.1015	91.2316	11.4046
Plateau et al. (2014)	0.8142	22.1022	0.0000	0.7842	0.8399	133.9621	0.0000	0.0926	89.2013	9.2604
Power (2020)	0.8111	20.9683	0.0000	0.7793	0.8384	185.7109	0.0000	0.1034	91.2516	11.4307
Taranis & Meyer (2011_study1)	0.8059	20.8861	0.0000	0.7736	0.8336	170.9092	0.0000	0.0997	90.5050	10.5318
Taranis (2010_study5)	0.8127	21.5083	0.0000	0.7818	0.8392	181.9718	0.0000	0.0987	90.8923	10.9797
Vrabel & Bratland-Sanda (2019)	0.8008	25.1492	0.0000	0.7741	0.8244	134.5246	0.0000	0.0619	86.1059	7.1973
Young et al. (2016)	0.8066	20.9509	0.0000	0.7745	0.8341	184.0583	0.0000	0.1008	91.1410	11.2880
Matthews (2010)	0.8098	20.6104	0.0000	0.7773	0.8376	187.1230	0.0000	0.1058	91.1241	11.2665
Meyer et al. (2016_control)	0.8086	20.5224	0.0000	0.7759	0.8366	186.4872	0.0000	0.1059	91.0270	11.1446
Scharmer et al. (2020a)	0.8067	20.7267	0.0000	0.7742	0.8346	180.9888	0.0000	0.1023	90.9733	11.0782
Taranis & Meyer (2010a)	0.8132	21.7981	0.0000	0.7828	0.8393	180.9029	0.0000	0.0962	90.7261	10.7830
Taranis & Meyer (2011_study2)	0.8070	20.8061	0.0000	0.7747	0.8347	184.6725	0.0000	0.1024	91.2273	11.3990
Taranis & Meyer (2011_study3)	0.8077	20.7379	0.0000	0.7752	0.8354	185.8859	0.0000	0.1037	91.3334	11.5386
Taranis (2010_study6)	0.8134	21.8423	0.0000	0.7830	0.8395	179.3939	0.0000	0.0957	90.6344	10.6774

CET-Lack of enjoyment

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.7850	19.7862	0.0000	0.7496	0.8154	134.5941	0.0000	0.0819	86.2625	7.2793
Goodwin et al. (2011b)	0.7815	18.1355	0.0000	0.7425	0.8146	137.8107	0.0000	0.0979	86.3028	7.3008
Meyer et al. (2016_clinical)	0.7850	19.7304	0.0000	0.7495	0.8154	126.9402	0.0000	0.0822	85.9360	7.1104
Noetel et al.(2016a)	0.7765	17.9280	0.0000	0.7367	0.8102	154.9317	0.0000	0.1002	89.0100	9.0991
Noetel et al.(2016b)	0.7764	17.8567	0.0000	0.7364	0.8103	154.8016	0.0000	0.1005	89.0119	9.1008
Scharmer et al. (2020a)	0.7780	17.6380	0.0000	0.7376	0.8122	155.2948	0.0000	0.1027	88.7502	8.8890
Taranis & Meyer (2010a)	0.7768	17.7366	0.0000	0.7366	0.8109	154.8908	0.0000	0.1016	89.0145	9.1029
Taranis & Meyer (2011_study1)	0.7792	17.7097	0.0000	0.7390	0.8132	154.9386	0.0000	0.1022	88.1482	8.4375
Taranis & Meyer (2011_study2)	0.7803	18.0651	0.0000	0.7411	0.8136	154.2644	0.0000	0.0994	88.7359	8.8778
Matthews (2010)	0.7691	18.9194	0.0000	0.7312	0.8016	116.3296	0.0000	0.0812	85.9571	7.1210
Power (2020)	0.7779	17.7263	0.0000	0.7377	0.8120	155.3332	0.0000	0.1022	88.9831	9.0769
Goodwin et al. (2016)	0.7786	17.6413	0.0000	0.7382	0.8128	155.3572	0.0000	0.1028	88.2639	8.5207
Meyer et al. (2016_control)	0.7714	18.1726	0.0000	0.7320	0.8051	128.0072	0.0000	0.0910	87.1065	7.7559
Taranis & Meyer (2011_study3)	0.7807	18.1595	0.0000	0.7417	0.8138	153.8100	0.0000	0.0985	88.6589	8.8175
Vrabel & Bratland-Sanda (2019)	0.7687	19.1893	0.0000	0.7314	0.8008	128.9559	0.0000	0.0787	86.0281	7.1572
Young et al. (2016)	0.7744	17.8979	0.0000	0.7345	0.8083	152.5044	0.0000	0.0981	88.7241	8.8685
Taranis (2010_study5)	0.7761	17.6976	0.0000	0.7358	0.8103	154.2115	0.0000	0.1014	88.9356	9.0380
Taranis (2010_study6)	0.7768	17.6937	0.0000	0.7364	0.8109	154.7753	0.0000	0.1019	88.9798	9.0743

CET-Rigidity

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Badau & Badau (2018)	0.7753	29.8627	0.0000	0.7522	0.7963	83.2008	0.0000	0.0364	74.6900	3.9510
Goodwin et al. (2011b)	0.7729	27.8714	0.0000	0.7479	0.7954	89.4750	0.0000	0.0426	75.1315	4.0211
Goodwin et al. (2016)	0.7746	28.9805	0.0000	0.7507	0.7962	84.3118	0.0000	0.0390	75.3769	4.0612
Matthews (2010)	0.7748	29.2571	0.0000	0.7512	0.7962	84.7966	0.0000	0.0382	75.3987	4.0648
Meyer et al. (2016_clinical)	0.7685	28.5424	0.0000	0.7440	0.7906	84.2535	0.0000	0.0388	75.4730	4.0771
Meyer et al. (2016_control)	0.7722	27.8771	0.0000	0.7473	0.7947	91.8582	0.0000	0.0427	77.2120	4.3883
Noetel et al.(2016a)	0.7705	28.6501	0.0000	0.7462	0.7925	91.4732	0.0000	0.0407	77.4272	4.4301
Noetel et al.(2016b)	0.7704	28.5644	0.0000	0.7460	0.7924	91.3055	0.0000	0.0407	77.4055	4.4259
Power (2020)	0.7735	28.6689	0.0000	0.7493	0.7954	90.4524	0.0000	0.0407	77.1392	4.3743
Sauchelli et al. (2016)	0.7706	27.8912	0.0000	0.7456	0.7931	91.1548	0.0000	0.0422	77.2586	4.3973
Scharmer et al. (2020a)	0.7700	28.0497	0.0000	0.7452	0.7925	90.3773	0.0000	0.0415	77.1286	4.3723
Schlegl et al. (2018_anorexia)	0.7733	28.4877	0.0000	0.7489	0.7953	90.8008	0.0000	0.0412	77.2730	4.4001
Schlegl et al. (2018_bulimia)	0.7716	28.3911	0.0000	0.7471	0.7938	92.0476	0.0000	0.0416	77.7360	4.4916
Schlegl et al. (2018_healty controls)	0.7747	29.5837	0.0000	0.7513	0.7959	87.4147	0.0000	0.0378	75.8832	4.1465
Taranis & Meyer (2010a)	0.7730	28.5739	0.0000	0.7487	0.7949	91.2603	0.0000	0.0411	77.4427	4.4332
Taranis & Meyer (2010b).1	0.7682	28.5832	0.0000	0.7437	0.7903	78.3360	0.0000	0.0383	74.3984	3.9060
Taranis & Meyer (2010b).2	0.7742	28.6654	0.0000	0.7501	0.7961	85.3294	0.0000	0.0400	75.5743	4.0941
Taranis & Meyer (2011_study1)	0.7667	29.8508	0.0000	0.7433	0.7879	74.5771	0.0000	0.0336	72.6585	3.6574
Taranis & Meyer (2011_study2)	0.7695	28.5501	0.0000	0.7451	0.7916	89.9656	0.0000	0.0400	76.9511	4.3386
Taranis & Meyer (2011_study3)	0.7709	28.2708	0.0000	0.7462	0.7931	91.7580	0.0000	0.0416	77.6529	4.4749
Taranis (2010_study5)	0.7682	29.1012	0.0000	0.7442	0.7899	86.7386	0.0000	0.0374	75.6714	4.1104
Taranis (2010_study6)	0.7731	28.5305	0.0000	0.7488	0.7951	91.0742	0.0000	0.0412	77.3787	4.4206
Young et al. (2016)	0.7683	29.2292	0.0000	0.7444	0.7900	87.2713	0.0000	0.0374	75.7902	4.1306

EAI global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alcaraz-Ibáñez et al. (2019)	0.7687	23.7162	0.0000	0.7389	0.7951	2237.3976	0.0000	0.1471	97.3261	37.3983
Babusa et al. (2015)	0.7689	23.7613	0.0000	0.7392	0.7952	2245.7272	0.0000	0.1469	97.3596	37.8725
Béres et al. (2017)	0.7714	24.5167	0.0000	0.7428	0.7968	2183.2184	0.0000	0.1396	97.2234	36.0155
Blackstone (2019)	0.7671	23.6755	0.0000	0.7372	0.7936	2258.4044	0.0000	0.1463	97.3348	37.5202
Bureau et al. (2017)	0.7685	23.6938	0.0000	0.7387	0.7948	2246.6229	0.0000	0.1472	97.3441	37.6521
Bureau et al. (2019)	0.7682	23.7869	0.0000	0.7385	0.7945	2257.4873	0.0000	0.1466	97.3817	38.1922
Cook et al. (2018)	0.7666	23.7751	0.0000	0.7369	0.7930	2257.8454	0.0000	0.1449	97.3468	37.6908
Ertl et al. (2017)	0.7668	23.7072	0.0000	0.7370	0.7933	2258.0383	0.0000	0.1456	97.3360	37.5379
Fernández & Fernández-Río (2019)	0.7706	24.1977	0.0000	0.7416	0.7964	2198.5548	0.0000	0.1428	97.2779	36.7361
Fernández-Río et al. (2020)	0.7682	23.7008	0.0000	0.7384	0.7946	2255.3090	0.0000	0.1471	97.3757	38.1051
Forbes (2019_sample1)	0.7668	23.7056	0.0000	0.7370	0.7933	2258.0070	0.0000	0.1456	97.3330	37.4951
Forbes (2019_sample2)	0.7639	24.5562	0.0000	0.7351	0.7896	2184.8652	0.0000	0.1326	97.0502	33.9010
Griffiths et al. (2005)	0.7662	23.8087	0.0000	0.7365	0.7926	2256.0054	0.0000	0.1439	97.3186	37.2939
Hopkins (2014)	0.7662	23.8059	0.0000	0.7365	0.7925	2255.4427	0.0000	0.1438	97.3125	37.2090
Kotyuk et al. (2018)	0.7679	23.6443	0.0000	0.7381	0.7944	2227.2876	0.0000	0.1473	97.0643	34.0639
Kovacsik et al. (2018)	0.7706	24.1970	0.0000	0.7416	0.7964	2201.6125	0.0000	0.1428	97.2803	36.7689
Kovacsik et al. (2020)	0.7706	24.2347	0.0000	0.7416	0.7964	2233.0965	0.0000	0.1426	97.3003	37.0410
Li et al. (2016)	0.7620	25.9929	0.0000	0.7347	0.7864	1730.2462	0.0000	0.1159	96.4954	28.5343
lichtenstein & Jensen (2016)	0.7691	23.7855	0.0000	0.7395	0.7954	2226.6872	0.0000	0.1467	97.3229	37.3535
lichtenstein et al. (2012)	0.7705	24.1405	0.0000	0.7414	0.7963	2179.3667	0.0000	0.1433	97.2685	36.6101
lichtenstein et al. (2014_fitness)	0.7697	23.9321	0.0000	0.7402	0.7958	2243.0498	0.0000	0.1455	97.3497	37.7318
lichtenstein et al. (2014_football)	0.7708	24.3206	0.0000	0.7419	0.7964	2239.0088	0.0000	0.1418	97.2923	36.9321
lichtenstein et al. (2017)	0.7680	23.6585	0.0000	0.7381	0.7944	2253.1932	0.0000	0.1472	97.3377	37.5610
Marmet et al. (2019)	0.7638	24.6049	0.0000	0.7350	0.7895	1397.7820	0.0000	0.1319	96.4579	28.2320
Mayolas et al. (2020)	0.7668	23.6892	0.0000	0.7369	0.7932	2256.0285	0.0000	0.1457	97.1506	35.0950
Mónok et al. (2012)	0.7694	23.8289	0.0000	0.7398	0.7956	2227.9950	0.0000	0.1463	97.3307	37.4633
Nogueira et al. (2019)	0.7636	24.7713	0.0000	0.7350	0.7891	2217.2555	0.0000	0.1301	97.0371	33.7502
Petty (2010)	0.7674	23.6830	0.0000	0.7376	0.7939	2258.1599	0.0000	0.1466	97.3663	37.9690
Raggatt et al. (2018)	0.7699	23.9778	0.0000	0.7405	0.7959	2240.3680	0.0000	0.1450	97.3417	37.6177
Rokcs et al. (2017)	0.7693	23.8551	0.0000	0.7397	0.7955	2249.3069	0.0000	0.1462	97.3655	37.9583
Rudolph (2017)	0.7689	23.7437	0.0000	0.7392	0.7953	2215.0063	0.0000	0.1470	97.2819	36.7904
Schou-Andreassen et al. (2013)	0.7668	23.7171	0.0000	0.7370	0.7933	2258.1585	0.0000	0.1456	97.3476	37.7022
Schüler et al. (2014)	0.7698	24.0334	0.0000	0.7405	0.7958	2250.2840	0.0000	0.1447	97.3480	37.7079
Schüler et al. (2018)	0.7693	23.8345	0.0000	0.7398	0.7955	2237.8430	0.0000	0.1463	97.3473	37.6976
Sicilia et al. (2013)	0.7698	23.9193	0.0000	0.7403	0.7959	2206.2352	0.0000	0.1455	97.3035	37.0856
Sicilia et al. (2017a)	0.7699	23.9748	0.0000	0.7405	0.7959	2233.1051	0.0000	0.1450	97.3333	37.4999
Sicilia et al. (2017b)	0.7703	24.0803	0.0000	0.7411	0.7962	2208.8375	0.0000	0.1440	97.2988	37.0210
Sicilia et al. (2020a)	0.7716	24.6131	0.0000	0.7431	0.7970	2102.1681	0.0000	0.1385	97.1676	35.3058
Szabo et al. (2013)	0.7682	23.6932	0.0000	0.7384	0.7946	2254.6462	0.0000	0.1472	97.3718	38.0491
Szabo et al. (2018)	0.7696	23.8719	0.0000	0.7401	0.7957	2217.2712	0.0000	0.1459	97.3166	37.2668
Terry et al. (2004)	0.7662	23.8087	0.0000	0.7365	0.7926	2256.0054	0.0000	0.1439	97.3186	37.2939
Trott et al. (2020)	0.7689	23.7405	0.0000	0.7392	0.7953	2184.7642	0.0000	0.1470	97.2077	35.8124

EDQ global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Grandi et al. (2013)	0.8530	41.0109	0.0000	0.8389	0.8659	25.5385	0.0044	0.0145	62.6732	2.6790
Hausenblas &Downs (2002a_study 1)	0.8643	27.7571	0.0000	0.8438	0.8822	65.4996	0.0000	0.0469	84.4011	6.4107
Odgen et al (1997)	0.8637	27.0583	0.0000	0.8425	0.8820	66.3961	0.0000	0.0492	84.1814	6.3217
Zmijewski & Howard (2003_female)	0.8601	27.0570	0.0000	0.8387	0.8787	68.5477	0.0000	0.0489	85.7049	6.9954
Zmijewski & Howard (2003_male)	0.8591	27.5716	0.0000	0.8380	0.8774	66.2374	0.0000	0.0463	84.9720	6.6542
Bishop (2009)	0.8625	27.0759	0.0000	0.8413	0.8809	69.9489	0.0000	0.0500	86.0465	7.1667
Heaney et al. (2010)	0.8599	26.8410	0.0000	0.8382	0.8786	66.9457	0.0000	0.0490	85.2104	6.7615
Hall et al. (2009)	0.8636	27.1033	0.0000	0.8425	0.8819	67.7446	0.0000	0.0492	84.8569	6.6036
Martin et al. (2008)	0.8619	26.4347	0.0000	0.8400	0.8807	70.0766	0.0000	0.0515	85.5292	6.9105
Serrao (2010)	0.8619	26.4325	0.0000	0.8400	0.8807	70.0765	0.0000	0.0515	85.5210	6.9066
MacLaren & Best (2007)	0.8628	26.6593	0.0000	0.8412	0.8814	69.6123	0.0000	0.0509	85.3234	6.8136
Ruby (2008)	0.8657	29.6672	0.0000	0.8466	0.8824	57.7200	0.0000	0.0403	82.2676	5.6394

EDQ-Interference

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7505	10.3975	0.0000	0.6759	0.8079	47.3811	0.0000	0.0918	88.3347	8.5725
Grandi et al. (2013)	0.7615	13.7027	0.0000	0.7073	0.8057	25.8375	0.0001	0.0498	78.9586	4.7525
Odgen et al (1997)	0.7268	10.6805	0.0000	0.6533	0.7847	25.8627	0.0001	0.0716	82.5946	5.7453
Zmijewski & Howard (2003_female)	0.7416	9.9080	0.0000	0.6623	0.8023	49.7254	0.0000	0.0978	89.4075	9.4406
Zmijewski & Howard (2003_male)	0.7416	9.8880	0.0000	0.6621	0.8024	49.7217	0.0000	0.0980	89.3551	9.3942
Hall et al. (2009)	0.7497	10.1802	0.0000	0.6732	0.8083	46.3251	0.0000	0.0946	87.2917	7.8689
Forrest et al. (2016)	0.7241	11.7019	0.0000	0.6577	0.7777	40.9293	0.0000	0.0594	83.9424	6.2276

EDQ-Positive reward

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7940	6.5055	0.0000	0.6684	0.8720	72.8122	0.0000	0.2808	96.0549	25.3478
Odgen et al (1997)	0.7863	6.2607	0.0000	0.6536	0.8682	75.2647	0.0000	0.2874	95.1370	20.5634
Zmijewski & Howard (2003_male)	0.8204	12.1532	0.0000	0.7631	0.8639	35.2091	0.0000	0.0870	88.7277	8.8713
Zmijewski & Howard (2003_female)	0.7772	6.3891	0.0000	0.6469	0.8595	73.2407	0.0000	0.2634	96.0063	25.0395
Grandi et al. (2013)	0.7593	7.8222	0.0000	0.6560	0.8315	34.4891	0.0000	0.1504	92.1716	12.7740
Hall et al. (2009)	0.7905	6.3509	0.0000	0.6606	0.8707	73.6861	0.0000	0.2870	95.5686	22.5660

EDQ-Withdrawal

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7874	15.6925	0.0000	0.7420	0.8248	22.1934	0.0005	0.0429	76.8195	4.3140
Grandi et al. (2013)	0.7529	17.8064	0.0000	0.7118	0.7881	12.9960	0.0234	0.0210	59.6879	2.4806
Hall et al. (2009)	0.7755	11.9223	0.0000	0.7130	0.8244	32.7050	0.0000	0.0768	83.9373	6.2256
Forrest et al. (2016)	0.7734	12.1254	0.0000	0.7119	0.8217	35.1371	0.0000	0.0757	86.2000	7.2464
Odgen et al (1997)	0.7659	11.6324	0.0000	0.7010	0.8167	33.8574	0.0000	0.0754	82.4156	5.6868
Zmijewski & Howard (2003_female)	0.7735	12.0403	0.0000	0.7115	0.8221	35.0514	0.0000	0.0763	86.0655	7.1765
Zmijewski & Howard (2003_male)	0.7750	12.1469	0.0000	0.7137	0.8231	34.5410	0.0000	0.0753	85.8087	7.0466

EDQ-Weight control

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7223	12.3898	0.0000	0.6599	0.7733	18.6929	0.0009	0.0401	77.6722	4.4787
Odgen et al (1997)	0.7005	17.1262	0.0000	0.6562	0.7391	7.2604	0.1228	0.0097	39.8746	1.6632
Zmijewski & Howard (2003_female)	0.7083	14.0663	0.0000	0.6536	0.7543	15.7745	0.0033	0.0263	70.5902	3.4002
Zmijewski & Howard (2003_male)	0.7305	14.3134	0.0000	0.6775	0.7748	15.9496	0.0031	0.0297	72.8458	3.6827
Grandi et al. (2013)	0.7286	13.0753	0.0000	0.6700	0.7768	16.0001	0.0030	0.0352	73.3539	3.7529
Hall et al. (2009)	0.7290	13.0701	0.0000	0.6704	0.7772	15.3614	0.0040	0.0349	72.4086	3.6243

EDQ-Insight in to problem

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.6921	9.9407	0.0000	0.6116	0.7560	24.7865	0.0001	0.0567	83.0866	5.9125
Odgen et al (1997)	0.6694	11.7083	0.0000	0.6021	0.7253	10.9696	0.0269	0.0290	66.3800	2.9744
Zmijewski & Howard (2003_female)	0.6993	10.8330	0.0000	0.6263	0.7581	23.2341	0.0001	0.0492	81.7793	5.4883
Zmijewski & Howard (2003_male)	0.6723	11.6621	0.0000	0.6048	0.7284	19.7972	0.0005	0.0334	75.1276	4.0205
Grandi et al. (2013)	0.7036	11.2206	0.0000	0.6334	0.7603	19.1519	0.0007	0.0440	77.4941	4.4433
Hall et al. (2009)	0.7022	10.8548	0.0000	0.6294	0.7607	19.4842	0.0006	0.0471	77.9761	4.5405

EDQ-Social reason

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.6419	6.7827	0.0000	0.5182	0.7338	41.3545	0.0000	0.0991	88.4211	8.6364
Hall et al. (2009)	0.6039	5.3031	0.0000	0.4422	0.7187	53.3254	0.0000	0.1349	90.0108	10.0109
Odgen et al (1997)	0.5719	6.7192	0.0000	0.4517	0.6658	19.6111	0.0006	0.0617	78.8819	4.7353
Zmijewski & Howard (2003_female)	0.6251	5.7724	0.0000	0.4769	0.7313	51.3650	0.0000	0.1302	91.3516	11.5629
Zmijewski & Howard (2003_male)	0.5961	5.4858	0.0000	0.4416	0.7078	52.3281	0.0000	0.1220	90.7514	10.8125
Grandi et al. (2013)	0.6426	6.7761	0.0000	0.5187	0.7346	33.6396	0.0000	0.0983	87.2444	7.8397

EDQ-Health reason

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.7681	7.7169	0.0000	0.6639	0.8400	55.6380	0.0000	0.1636	92.6540	13.6129
Hall et al. (2009)	0.7783	7.8554	0.0000	0.6772	0.8478	55.8484	0.0000	0.1663	91.7418	12.1092
Odgen et al (1997)	0.7871	8.6204	0.0000	0.6974	0.8502	41.0981	0.0000	0.1427	89.6223	9.6360
Zmijewski & Howard (2003_female)	0.7705	7.7740	0.0000	0.6674	0.8417	56.4510	0.0000	0.1650	93.0475	14.3833
Zmijewski & Howard (2003_male)	0.7924	9.8768	0.0000	0.7164	0.8481	48.0050	0.0000	0.1123	90.0263	10.0264
Grandi et al. (2013)	0.7409	13.3525	0.0000	0.6841	0.7875	12.5251	0.0138	0.0349	70.8077	3.4256

EDQ-Stereotype behavior

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Kern (2011)	0.6701	7.0701	0.0000	0.5513	0.7574	25.2827	0.0000	0.1025	85.5573	6.9239
Odgen et al (1997)	0.6850	8.6604	0.0000	0.5908	0.7574	15.1862	0.0043	0.0651	74.7156	3.9550
Zmijewski & Howard (2003_female)	0.6466	7.0661	0.0000	0.5284	0.7351	22.1384	0.0002	0.0897	84.5111	6.4562
Zmijewski & Howard (2003_male)	0.6222	9.4197	0.0000	0.5374	0.6914	12.5757	0.0135	0.0351	67.9332	3.1185
Grandi et al. (2013)	0.6547	6.6672	0.0000	0.5280	0.7474	22.5554	0.0002	0.1047	84.5278	6.4632
Hall et al. (2009)	0.6775	7.4690	0.0000	0.5660	0.7603	23.5131	0.0001	0.0918	82.1414	5.5995

EDS-21 global score

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Buchman (2019)	0.9305	50.7546	0.0000	0.9230	0.9373	3889.3657	0.0000	0.2336	97.7690	44.8221
Chittester (2007)	0.9303	50.3362	0.0000	0.9226	0.9371	3902.5495	0.0000	0.2369	97.7980	45.4131
Damon (2017)	0.9300	50.2727	0.0000	0.9223	0.9369	3906.5734	0.0000	0.2370	97.8037	45.5308
Hopkins (2014)	0.9308	51.6305	0.0000	0.9235	0.9375	3782.2003	0.0000	0.2260	97.6852	43.2009
Johnson (2020)	0.9295	50.7201	0.0000	0.9219	0.9364	3897.3928	0.0000	0.2317	97.7546	44.5360
Kessler (2010)	0.9299	50.2023	0.0000	0.9223	0.9368	3905.7955	0.0000	0.2373	97.7993	45.4396
Lewis (2012)	0.9301	50.1859	0.0000	0.9224	0.9370	3906.6242	0.0000	0.2377	97.7856	45.1592
North (2011)	0.9304	50.4152	0.0000	0.9228	0.9372	3856.6234	0.0000	0.2362	97.7556	44.5551
Parnell (2011)	0.9302	50.2657	0.0000	0.9225	0.9370	3905.4677	0.0000	0.2374	97.8027	45.5104
Scharmer et al. (2020a)	0.9299	50.1921	0.0000	0.9223	0.9368	3905.2368	0.0000	0.2374	97.7946	45.3434
Scott (2011)	0.9302	50.2940	0.0000	0.9225	0.9370	3906.0832	0.0000	0.2372	97.8044	45.5447
Alcaraz-Ibáñez et al. (2019)	0.9302	50.2320	0.0000	0.9225	0.9371	3898.1217	0.0000	0.2375	97.7701	44.8448
Alchieri et al. (2015_sample1)	0.9305	50.6535	0.0000	0.9229	0.9373	3870.4316	0.0000	0.2343	97.7664	44.7709
Allegre (2008)	0.9304	50.5321	0.0000	0.9228	0.9373	3848.2724	0.0000	0.2353	97.7574	44.5905
Back et al. (2019)	0.9306	50.9251	0.0000	0.9231	0.9374	3823.5714	0.0000	0.2320	97.7384	44.2156
Badau & Badau (2018)	0.9303	50.3215	0.0000	0.9226	0.9371	3897.5488	0.0000	0.2370	97.7904	45.2568
Berger et al. (2014)	0.9293	50.9279	0.0000	0.9218	0.9362	3374.3156	0.0000	0.2286	97.6218	42.0486
Blackstone (2020)	0.9299	50.1859	0.0000	0.9223	0.9368	3904.5209	0.0000	0.2374	97.7884	45.2161
Bratland-Sanda (2009)	0.9295	50.7315	0.0000	0.9219	0.9364	3896.4456	0.0000	0.2315	97.7526	44.4968
Bratland-Sanda (2011_control)	0.9302	50.3048	0.0000	0.9225	0.9370	3906.2034	0.0000	0.2372	97.8044	45.5466
Bratland-Sanda (2011_patients)	0.9295	50.7652	0.0000	0.9219	0.9363	3892.9708	0.0000	0.2309	97.7469	44.3824
Bratland-Sanda (2015_female)	0.9306	50.7953	0.0000	0.9230	0.9374	3765.5700	0.0000	0.2331	97.7257	43.9697
Bratland-Sanda (2015_male)	0.9305	50.6487	0.0000	0.9229	0.9373	3883.3299	0.0000	0.2344	97.7724	44.8908
Brosof et al. (2019)	0.9301	50.2038	0.0000	0.9224	0.9370	3906.7667	0.0000	0.2376	97.8011	45.4783
Cabrita et al. (2017)	0.9309	51.8190	0.0000	0.9235	0.9375	3657.7907	0.0000	0.2243	97.6557	42.6560
Chisttter & Hausenblas (2009)	0.9303	50.3362	0.0000	0.9226	0.9371	3902.5495	0.0000	0.2369	97.7980	45.4131
Compte et al. (2018)	0.9303	50.4209	0.0000	0.9227	0.9372	3892.1873	0.0000	0.2362	97.7860	45.1669
Condello et al. (2016)	0.9303	50.3261	0.0000	0.9226	0.9371	3899.9755	0.0000	0.2369	97.7942	45.3342
Cook & Hausenblas (2008)	0.9301	50.1894	0.0000	0.9224	0.9370	3906.6778	0.0000	0.2377	97.7916	45.2812
Cook & Hausenblas (2011)	0.9298	50.2555	0.0000	0.9221	0.9367	3889.8679	0.0000	0.2363	97.7752	44.9473
Cook & Luke (2017)	0.9301	50.2020	0.0000	0.9224	0.9370	3906.7607	0.0000	0.2376	97.8005	45.4656
Cook et al. (2011)	0.9299	50.1806	0.0000	0.9223	0.9368	3903.0907	0.0000	0.2374	97.7758	44.9608
Cook et al. (2013a)	0.9294	50.9078	0.0000	0.9218	0.9362	3784.1775	0.0000	0.2289	97.7047	43.5679
Cook et al. (2013b)	0.9299	50.1810	0.0000	0.9223	0.9368	3903.2757	0.0000	0.2374	97.7775	44.9936
Cook et al. (2013c)	0.9301	50.1759	0.0000	0.9224	0.9370	3905.3027	0.0000	0.2378	97.6465	42.4892
Cook et al. (2015a)	0.9295	50.7571	0.0000	0.9219	0.9363	3893.9187	0.0000	0.2311	97.7482	44.4099
Cook et al. (2015b)	0.9301	50.1768	0.0000	0.9224	0.9370	3905.8527	0.0000	0.2378	97.7018	43.5124
Costa et al. (2012b)	0.9303	50.3158	0.0000	0.9226	0.9371	3890.3758	0.0000	0.2370	97.7791	45.0260
Costa et al. (2013)	0.9299	50.1834	0.0000	0.9223	0.9368	3904.0130	0.0000	0.2374	97.7839	45.1252
Costa et al. (2014)	0.9305	50.7844	0.0000	0.9230	0.9373	3853.7162	0.0000	0.2332	97.7542	44.5275
Costa et al. (2015)	0.9302	50.2511	0.0000	0.9225	0.9371	3904.6222	0.0000	0.2374	97.7994	45.4414
Costa et al. (2016_female)	0.9299	50.1997	0.0000	0.9223	0.9368	3905.6909	0.0000	0.2373	97.7984	45.4221
Costa et al. (2016_male)	0.9298	50.2653	0.0000	0.9221	0.9367	3899.1363	0.0000	0.2363	97.7884	45.2164
Dorneles et al. (2019)	0.9307	51.0759	0.0000	0.9232	0.9374	3755.7672	0.0000	0.2307	97.7150	43.7645
Downs et al. (2004_study1)	0.9302	50.2360	0.0000	0.9225	0.9371	3901.3872	0.0000	0.2375	97.7849	45.1454
Downs et al. (2004_study2)	0.9304	50.5323	0.0000	0.9229	0.9373	3808.6859	0.0000	0.2353	97.7356	44.1625
Downs et al. (2013)	0.9299	50.1776	0.0000	0.9223	0.9368	3901.1821	0.0000	0.2374	97.7592	44.6260
Edmunds et al. (2006)	0.9303	50.4176	0.0000	0.9227	0.9372	3882.1668	0.0000	0.2362	97.7773	44.9909
Ergun & Guzel (2018)	0.9298	50.2513	0.0000	0.9221	0.9367	3872.2298	0.0000	0.2363	97.7504	44.4517
Gaetan et al. (2018)	0.9299	50.2132	0.0000	0.9223	0.9368	3906.0878	0.0000	0.2373	97.8015	45.4860
González-Cutre & Sicilia (2012a)	0.9302	50.2335	0.0000	0.9225	0.9371	3899.7051	0.0000	0.2375	97.7773	44.9899
González-Cutre & Sicilia (2012b)	0.9302	50.2335	0.0000	0.9225	0.9371	3899.7051	0.0000	0.2375	97.7773	44.9899
Hale et al. (2010)	0.9301	50.2081	0.0000	0.9224	0.9370	3906.7787	0.0000	0.2376	97.8023	45.5030
Hausenblas &Giacobbi Jr (2004)	0.9301	50.1871	0.0000	0.9224	0.9370	3906.6447	0.0000	0.2377	97.7879	45.2059
Hausenblas et al. (2008)	0.9298	50.3231	0.0000	0.9222	0.9367	3905.1964	0.0000	0.2362	97.7967	45.3867
Karademir (2020)	0.9302	50.2360	0.0000	0.9225	0.9371	3901.3599	0.0000	0.2375	97.7848	45.1429
Kelly et al. (2018)	0.9296	50.4575	0.0000	0.9220	0.9365	3755.6822	0.0000	0.2338	97.7051	43.5740
Kelly et al. (2020)	0.9296	50.4575	0.0000	0.9220	0.9365	3756.3838	0.0000	0.2338	97.7054	43.5801
Lamarche &Gammage (2012)	0.9301	50.1959	0.0000	0.9224	0.9370	3906.7322	0.0000	0.2377	97.7975	45.4036
Latorre-Román et al. (2015)	0.9301	50.2233	0.0000	0.9224	0.9370	3906.8043	0.0000	0.2375	97.8046	45.5502
Latorre-Román et al. (2016)	0.9302	50.2544	0.0000	0.9225	0.9371	3904.8910	0.0000	0.2374	97.8005	45.4645
Levallius et al. (2020)	0.9296	50.4566	0.0000	0.9220	0.9365	3840.3383	0.0000	0.2338	97.7449	44.3431
Liu et al (2018)	0.9308	51.3475	0.0000	0.9233	0.9375	3794.5002	0.0000	0.2284	97.7069	43.6099
Lukás et al. (2019)	0.9303	50.4192	0.0000	0.9227	0.9372	3888.2178	0.0000	0.2362	97.7825	45.0968
Maclntyre et al. (2020_black men)	0.9296	50.4516	0.0000	0.9220	0.9365	3897.7517	0.0000	0.2343	97.7766	44.9754
Maclntyre et al. (2020_black women)	0.9298	50.2585	0.0000	0.9221	0.9367	3894.4049	0.0000	0.2363	97.7816	45.0784
Maclntyre et al. (2020_white men)	0.9294	50.8574	0.0000	0.9218	0.9363	3868.5873	0.0000	0.2296	97.7288	44.0296
Maclntyre et al. (2020_white women)	0.9296	50.4560	0.0000	0.9220	0.9365	3859.2282	0.0000	0.2339	97.7541	44.5266
Maselli et al. (2018)	0.9309	51.9686	0.0000	0.9236	0.9375	3644.2402	0.0000	0.2231	97.6437	42.4398
Menczel et al. (2017)	0.9304	50.4139	0.0000	0.9228	0.9372	3798.1876	0.0000	0.2362	97.7076	43.6215
Miller & Mesagno (2014)	0.9302	50.2725	0.0000	0.9225	0.9370	3905.6820	0.0000	0.2373	97.8034	45.5251
Müller et al. (2013)	0.9296	50.4578	0.0000	0.9220	0.9365	3684.9190	0.0000	0.2338	97.6732	42.9776
Müller et al. (2015a)	0.9304	50.5325	0.0000	0.9228	0.9372	3900.2183	0.0000	0.2355	97.7883	45.2150
Müller et al. (2015b)	0.9303	50.3330	0.0000	0.9226	0.9371	3901.9653	0.0000	0.2369	97.7972	45.3958
Orhan et al. (2019)	0.9294	50.8661	0.0000	0.9218	0.9362	3862.8720	0.0000	0.2295	97.7264	43.9837
Pinto et al. (2019)	0.9290	51.9212	0.0000	0.9216	0.9358	3710.7352	0.0000	0.2188	97.6087	41.8190
Pugh & Hadjistavropoulos (2011)	0.9298	50.2636	0.0000	0.9221	0.9367	3898.2982	0.0000	0.2363	97.7872	45.1919
Qesnel et al. (2017)	0.9298	50.2507	0.0000	0.9221	0.9367	3866.7369	0.0000	0.2363	97.7428	44.3019
Rankin et al. (2019)	0.9301	50.2105	0.0000	0.9224	0.9370	3906.7841	0.0000	0.2376	97.8029	45.5138
Reche-García et al. (2020)	0.9304	50.5320	0.0000	0.9228	0.9373	3863.1362	0.0000	0.2353	97.7657	44.7568
Rogers et al. (2018)	0.9296	50.4567	0.0000	0.9220	0.9365	3834.9135	0.0000	0.2338	97.7422	44.2915
Schamer (2018)	0.9299	50.1881	0.0000	0.9223	0.9368	3904.8386	0.0000	0.2374	97.7912	45.2728
Sicilia et al. (2011)	0.9302	50.2336	0.0000	0.9225	0.9371	3899.7600	0.0000	0.2375	97.7775	44.9950
Sicilia et al. (2020b)	0.9306	50.9227	0.0000	0.9231	0.9374	3832.2765	0.0000	0.2320	97.7408	44.2637
Soler et al. (2013)	0.9304	50.5314	0.0000	0.9228	0.9372	3890.0490	0.0000	0.2353	97.7814	45.0733
Szabo et al. (2019)	0.9290	51.9212	0.0000	0.9216	0.9358	3710.7352	0.0000	0.2188	97.6087	41.8190
Terry et al. (2004)	0.9298	50.2656	0.0000	0.9221	0.9367	3899.2575	0.0000	0.2363	97.7886	45.2199
Tornero-quiñones et al. (2019)	0.9302	50.2448	0.0000	0.9225	0.9371	3903.8681	0.0000	0.2375	97.7961	45.3742
White et al. (2020)	0.9301	50.2215	0.0000	0.9224	0.9370	3906.8021	0.0000	0.2375	97.8045	45.5467
Yildiz et al. (2020)	0.9305	50.6576	0.0000	0.9229	0.9373	3843.0336	0.0000	0.2342	97.7548	44.5387

EDS-21 Tolerance

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8588	34.9628	0.0000	0.8424	0.8734	628.8485	0.0000	0.1195	93.6733	15.8060
Alchieri et al. (2015_sample2)	0.8577	33.9112	0.0000	0.8407	0.8728	655.1690	0.0000	0.1266	93.9316	16.4788
Allegre (2008)	0.8563	33.5136	0.0000	0.8391	0.8717	673.1431	0.0000	0.1285	94.0245	16.7350
Badau & Badau (2018)	0.8570	33.6476	0.0000	0.8399	0.8724	672.0795	0.0000	0.1283	94.1146	16.9911
Chang et al. (2018)	0.8581	34.2943	0.0000	0.8414	0.8731	658.1967	0.0000	0.1241	93.9393	16.4998
Compte et al. (2018)	0.8576	33.9237	0.0000	0.8406	0.8728	666.9436	0.0000	0.1266	94.0566	16.8253
Cook (2011)	0.8541	34.9474	0.0000	0.8375	0.8691	612.9454	0.0000	0.1153	93.4373	15.2376
Costa et al. (2012a)	0.8563	33.5134	0.0000	0.8391	0.8717	673.1391	0.0000	0.1285	94.0235	16.7321
Costa et al. (2012b)	0.8575	33.8000	0.0000	0.8404	0.8727	663.7628	0.0000	0.1273	94.0064	16.6844
Costa et al. (2013)	0.8577	33.9135	0.0000	0.8407	0.8728	659.7248	0.0000	0.1266	93.9789	16.6083
Costa et al. (2014)	0.8573	33.7195	0.0000	0.8402	0.8725	670.0390	0.0000	0.1279	94.0893	16.9184
Costa et al. (2015)	0.8558	33.6784	0.0000	0.8386	0.8712	670.8747	0.0000	0.1269	94.0813	16.8957
Divine et al. (2016)	0.8571	33.6298	0.0000	0.8399	0.8724	671.3549	0.0000	0.1284	94.0820	16.8977
Downs et al. (2004_study1)	0.8582	34.3222	0.0000	0.8415	0.8732	643.8275	0.0000	0.1238	93.8532	16.2686
Downs et al. (2004_study2)	0.8550	34.0457	0.0000	0.8379	0.8702	618.5369	0.0000	0.1228	93.6367	15.7151
González-Cutre & Sicilia (2012a)	0.8589	35.2059	0.0000	0.8427	0.8735	592.0886	0.0000	0.1178	93.5101	15.4085
Guíu-Carrera & Leyton-Román (2019)	0.8560	33.7646	0.0000	0.8388	0.8713	672.6920	0.0000	0.1269	94.1175	16.9996
Hale et al. (2010)	0.8574	33.8371	0.0000	0.8404	0.8726	670.4327	0.0000	0.1273	94.1049	16.9632
Hillet al. (2015)	0.8561	33.5815	0.0000	0.8388	0.8715	672.1444	0.0000	0.1278	94.0929	16.9289
Kern (2007_study1)	0.8575	33.9622	0.0000	0.8405	0.8726	671.4039	0.0000	0.1267	94.1067	16.9684
Kern (2007_study2)	0.8573	33.8805	0.0000	0.8403	0.8725	672.0114	0.0000	0.1272	94.1252	17.0217
Kern (2007_study3)	0.8563	33.5006	0.0000	0.8390	0.8717	672.7404	0.0000	0.1286	93.9201	16.4477
Lease & Bond (2013)	0.8547	34.3732	0.0000	0.8378	0.8698	643.3359	0.0000	0.1201	93.7157	15.9127
Lindwall & Palmeira (2019_portuguese)	0.8561	33.5768	0.0000	0.8388	0.8715	671.9999	0.0000	0.1279	94.0858	16.9084
Lindwall & Palmeira (2019_swedish)	0.8585	34.6887	0.0000	0.8419	0.8733	654.8954	0.0000	0.1215	93.8378	16.2280
Lu et al. (2012)	0.8573	33.7211	0.0000	0.8402	0.8725	670.1716	0.0000	0.1279	94.0923	16.9271
Maselli et al. (2018)	0.8563	33.5082	0.0000	0.8390	0.8717	673.0176	0.0000	0.1285	93.9917	16.6436
Mónok et al. (2012)	0.8563	33.5167	0.0000	0.8391	0.8717	673.1992	0.0000	0.1285	94.0392	16.7763
Müller et al. (2013)	0.8557	33.6215	0.0000	0.8385	0.8711	642.7270	0.0000	0.1269	93.5596	15.5270
Murray et al. (2012)	0.8561	33.6609	0.0000	0.8389	0.8715	673.1456	0.0000	0.1276	94.1376	17.0577
Nuzzo et al.(2013)	0.8554	33.7921	0.0000	0.8382	0.8707	659.7011	0.0000	0.1253	93.9275	16.4677
Paradis et al. (2013)	0.8573	33.6981	0.0000	0.8402	0.8726	666.7810	0.0000	0.1279	94.0129	16.7026
Parastatidou et al.(2012)	0.8560	33.5459	0.0000	0.8388	0.8714	669.8066	0.0000	0.1279	93.9756	16.5991
Parastatidou et al.(2014)	0.8573	33.6966	0.0000	0.8402	0.8726	666.3255	0.0000	0.1280	94.0022	16.6729
Parnell (2011)	0.8566	33.6404	0.0000	0.8394	0.8719	673.8039	0.0000	0.1282	94.1618	17.1285
Pollock (2014)	0.8550	34.0256	0.0000	0.8380	0.8703	653.5811	0.0000	0.1232	93.8539	16.2706
Pugh & Hadjistavropoulos (2011)	0.8547	34.3274	0.0000	0.8378	0.8699	654.1321	0.0000	0.1207	93.7831	16.0851
Reche-García et al. (2018b)	0.8566	33.5577	0.0000	0.8394	0.8720	673.7965	0.0000	0.1286	94.1276	17.0288
Reche-García et al. (2020)	0.8563	33.5253	0.0000	0.8391	0.8717	673.3145	0.0000	0.1285	94.0694	16.8618
Rogers et al. (2018)	0.8550	34.0379	0.0000	0.8379	0.8703	639.6521	0.0000	0.1229	93.7618	16.0302
Scharmer et al. (2020a)	0.8542	34.8479	0.0000	0.8376	0.8692	637.3268	0.0000	0.1163	93.5472	15.4971
Sicilia et al. (2011)	0.8589	35.2050	0.0000	0.8427	0.8735	592.7273	0.0000	0.1178	93.5120	15.4130
Soler et al. (2013)	0.8586	34.8206	0.0000	0.8421	0.8733	653.8007	0.0000	0.1207	93.8003	16.1298

EDS-21 Withdrawal

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8310	34.0743	0.0000	0.8128	0.8474	557.2407	0.0000	0.0994	92.3803	13.1238
Alchieri et al. (2015_sample2)	0.8314	34.5577	0.0000	0.8135	0.8476	512.6042	0.0000	0.0965	92.0692	12.6091
Allegre (2008)	0.8280	32.2573	0.0000	0.8086	0.8454	603.3107	0.0000	0.1097	92.9668	14.2183
Badau & Badau (2018)	0.8302	33.2374	0.0000	0.8115	0.8471	585.7013	0.0000	0.1045	92.7687	13.8288
Chang et al. (2018)	0.8297	32.8534	0.0000	0.8107	0.8468	594.6649	0.0000	0.1069	92.9283	14.1409
Compte et al. (2018)	0.8293	32.6450	0.0000	0.8102	0.8465	598.9015	0.0000	0.1081	93.0098	14.3058
Cook (2011)	0.8264	32.8101	0.0000	0.8072	0.8436	579.9501	0.0000	0.1045	92.6984	13.6957
Costa et al. (2012a)	0.8292	32.5240	0.0000	0.8100	0.8464	595.0439	0.0000	0.1087	92.9037	14.0918
Costa et al. (2012b)	0.8296	32.7416	0.0000	0.8105	0.8467	589.7097	0.0000	0.1075	92.8698	14.0249
Costa et al. (2013)	0.8292	32.5296	0.0000	0.8100	0.8464	596.9498	0.0000	0.1087	92.9518	14.1880
Costa et al. (2014)	0.8285	32.3413	0.0000	0.8092	0.8459	603.3704	0.0000	0.1097	93.0740	14.4383
Costa et al. (2015)	0.8285	32.3792	0.0000	0.8092	0.8459	603.5137	0.0000	0.1095	93.1066	14.5066
Divine et al. (2016)	0.8283	32.2900	0.0000	0.8089	0.8457	603.7555	0.0000	0.1098	93.0475	14.3834
Downs et al. (2004_study1)	0.8244	35.2336	0.0000	0.8065	0.8406	496.7849	0.0000	0.0878	91.4165	11.6502
Downs et al. (2004_study2)	0.8254	33.6924	0.0000	0.8067	0.8422	485.8339	0.0000	0.0977	92.0016	12.5025
González-Cutre & Sicilia (2012a)	0.8277	32.2745	0.0000	0.8083	0.8452	601.3413	0.0000	0.1094	92.9386	14.1614
Guíu-Carrera & Leyton-Román (2019)	0.8266	32.8954	0.0000	0.8075	0.8438	597.9580	0.0000	0.1048	92.8652	14.0157
Hale et al. (2010)	0.8283	32.3641	0.0000	0.8089	0.8456	603.7620	0.0000	0.1095	93.1163	14.5271
Hillet al. (2015)	0.8283	32.3119	0.0000	0.8089	0.8457	603.7586	0.0000	0.1097	93.0827	14.4566
Kern (2007_study1)	0.8298	33.0882	0.0000	0.8110	0.8468	598.4583	0.0000	0.1059	92.9285	14.1413
Kern (2007_study2)	0.8301	33.2883	0.0000	0.8114	0.8469	596.1338	0.0000	0.1046	92.8479	13.9818
Kern (2007_study3)	0.8285	32.2896	0.0000	0.8091	0.8459	602.4876	0.0000	0.1099	92.8452	13.9766
Lease & Bond (2013)	0.8264	32.8005	0.0000	0.8073	0.8437	585.3119	0.0000	0.1046	92.7473	13.7879
Lindwall & Palmeira (2019_portuguese)	0.8289	32.4607	0.0000	0.8097	0.8462	601.0748	0.0000	0.1091	93.0389	14.3656
Lindwall & Palmeira (2019_swedish)	0.8285	32.3836	0.0000	0.8092	0.8458	603.5244	0.0000	0.1095	93.1087	14.5111
Lu et al. (2012)	0.8300	33.1065	0.0000	0.8112	0.8470	587.6913	0.0000	0.1053	92.8135	13.9151
Mónok et al. (2012)	0.8290	32.4374	0.0000	0.8097	0.8463	598.9432	0.0000	0.1092	92.9527	14.1898
Müller et al. (2013)	0.8288	32.3360	0.0000	0.8094	0.8461	594.9894	0.0000	0.1097	92.4926	13.3202
Murray et al. (2012)	0.8276	32.4423	0.0000	0.8082	0.8449	602.6391	0.0000	0.1086	93.0801	14.4511
Nuzzo et al.(2013)	0.8267	32.5867	0.0000	0.8075	0.8441	588.3347	0.0000	0.1064	92.8143	13.9166
Paradis et al. (2013)	0.8283	32.2717	0.0000	0.8089	0.8457	603.7506	0.0000	0.1099	92.9897	14.2647
Parastatidou et al.(2012)	0.8283	32.2639	0.0000	0.8089	0.8457	603.7471	0.0000	0.1099	92.9472	14.1787
Parastatidou et al.(2014)	0.8290	32.4351	0.0000	0.8097	0.8463	598.5628	0.0000	0.1092	92.9372	14.1587
Parnell (2011)	0.8278	32.4034	0.0000	0.8085	0.8452	603.3030	0.0000	0.1090	93.1048	14.5027
Pollock (2014)	0.8271	32.4405	0.0000	0.8078	0.8445	596.4269	0.0000	0.1078	92.9325	14.1493
Pugh & Hadjistavropoulos (2011)	0.8278	32.3337	0.0000	0.8084	0.8452	602.8921	0.0000	0.1092	93.0761	14.4428
Reche-García et al. (2018b)	0.8289	32.4670	0.0000	0.8097	0.8462	601.3717	0.0000	0.1091	93.0506	14.3897
Reche-García et al. (2020)	0.8292	32.5311	0.0000	0.8100	0.8464	597.3276	0.0000	0.1087	92.9614	14.2073
Rogers et al. (2018)	0.8259	33.1578	0.0000	0.8070	0.8430	553.3935	0.0000	0.1017	92.4390	13.2258
Scharmer et al. (2020a)	0.8268	32.5882	0.0000	0.8076	0.8441	594.7367	0.0000	0.1065	92.8979	14.0804
Sicilia et al. (2011)	0.8277	32.2748	0.0000	0.8083	0.8452	601.3602	0.0000	0.1094	92.9403	14.1649
Soler et al. (2013)	0.8280	32.3484	0.0000	0.8087	0.8454	603.6377	0.0000	0.1094	93.1090	14.5116

EDS-21 Intention effects

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8812	32.0829	0.0000	0.8647	0.8957	903.4707	0.0000	0.1731	95.5949	22.7009
Alchieri et al. (2015_sample2)	0.8818	32.3389	0.0000	0.8655	0.8962	882.4303	0.0000	0.1710	95.4873	22.1596
Allegre (2008)	0.8826	33.0238	0.0000	0.8667	0.8966	835.8404	0.0000	0.1646	95.3268	21.3988
Badau & Badau (2018)	0.8816	32.2496	0.0000	0.8652	0.8960	899.0555	0.0000	0.1718	95.5897	22.6741
Chang et al. (2018)	0.8810	32.0553	0.0000	0.8644	0.8955	905.6567	0.0000	0.1732	95.6290	22.8783
Compte et al. (2018)	0.8825	32.9714	0.0000	0.8666	0.8966	879.1045	0.0000	0.1653	95.4332	21.8970
Cook (2011)	0.8785	33.5290	0.0000	0.8625	0.8925	820.7851	0.0000	0.1538	95.0557	20.2251
Costa et al. (2012a)	0.8807	32.0010	0.0000	0.8641	0.8953	905.9626	0.0000	0.1732	95.5482	22.4628
Costa et al. (2012b)	0.8816	32.2365	0.0000	0.8652	0.8960	893.6172	0.0000	0.1719	95.5411	22.4271
Costa et al. (2013)	0.8820	32.4580	0.0000	0.8657	0.8963	881.6432	0.0000	0.1699	95.4958	22.2015
Costa et al. (2014)	0.8821	32.5804	0.0000	0.8659	0.8963	886.0863	0.0000	0.1688	95.5096	22.2698
Costa et al. (2015)	0.8814	32.1811	0.0000	0.8649	0.8958	903.1820	0.0000	0.1724	95.6240	22.8519
Divine et al. (2016)	0.8794	32.4729	0.0000	0.8630	0.8939	880.8055	0.0000	0.1661	95.4183	21.8262
Downs et al. (2004_study1)	0.8798	32.2342	0.0000	0.8633	0.8943	890.4135	0.0000	0.1693	95.4801	22.1243
Downs et al. (2004_study2)	0.8807	31.9908	0.0000	0.8641	0.8953	905.9281	0.0000	0.1733	95.4588	22.0208
González-Cutre & Sicilia (2012a)	0.8820	32.4576	0.0000	0.8657	0.8963	874.0937	0.0000	0.1699	95.4615	22.0338
Guíu-Carrera & Leyton-Román (2019)	0.8824	32.9533	0.0000	0.8664	0.8965	896.2159	0.0000	0.1659	95.4883	22.1648
Hale et al. (2010)	0.8807	32.0626	0.0000	0.8642	0.8953	905.9992	0.0000	0.1729	95.6415	22.9434
Hillet al. (2015)	0.8798	32.2395	0.0000	0.8633	0.8943	896.6551	0.0000	0.1694	95.5270	22.3563
Kern (2007_study1)	0.8818	32.4733	0.0000	0.8655	0.8961	901.8496	0.0000	0.1702	95.5961	22.7073
Kern (2007_study2)	0.8818	32.4714	0.0000	0.8656	0.8961	901.4961	0.0000	0.1702	95.5941	22.6966
Kern (2007_study3)	0.8807	31.9917	0.0000	0.8641	0.8953	905.9327	0.0000	0.1733	95.4706	22.0778
Lease & Bond (2013)	0.8794	32.4707	0.0000	0.8630	0.8939	883.6249	0.0000	0.1662	95.4305	21.8841
Lindwall & Palmeira (2019_portuguese)	0.8831	33.6134	0.0000	0.8675	0.8968	847.5002	0.0000	0.1592	95.2489	21.0479
Lindwall & Palmeira (2019_swedish)	0.8812	32.1187	0.0000	0.8647	0.8957	904.7970	0.0000	0.1729	95.6364	22.9168
Lu et al. (2012)	0.8807	32.0273	0.0000	0.8641	0.8953	905.9889	0.0000	0.1731	95.6169	22.8151
Mónok et al. (2012)	0.8810	32.0232	0.0000	0.8644	0.8955	905.2144	0.0000	0.1733	95.5636	22.5407
Müller et al. (2013)	0.8793	32.4896	0.0000	0.8629	0.8938	775.2586	0.0000	0.1657	95.0534	20.2158
Murray et al. (2012)	0.8815	32.2892	0.0000	0.8652	0.8959	903.1558	0.0000	0.1717	95.6242	22.8532
North (2011)	0.8798	32.2311	0.0000	0.8632	0.8943	879.4691	0.0000	0.1692	95.4028	21.7524
Nuzzo et al.(2013)	0.8798	32.2345	0.0000	0.8633	0.8943	890.8860	0.0000	0.1693	95.4835	22.1412
Paradis et al. (2013)	0.8798	32.2331	0.0000	0.8632	0.8943	887.5637	0.0000	0.1692	95.4595	22.0240
Parastatidou et al.(2012)	0.8814	32.1402	0.0000	0.8649	0.8959	895.9411	0.0000	0.1726	95.5170	22.3066
Parastatidou et al.(2014)	0.8820	32.4577	0.0000	0.8657	0.8963	875.4015	0.0000	0.1699	95.4674	22.0624
Parnell (2011)	0.8796	32.4439	0.0000	0.8631	0.8940	898.3455	0.0000	0.1671	95.5092	22.2679
Pollock (2014)	0.8798	32.2363	0.0000	0.8633	0.8943	893.6669	0.0000	0.1693	95.5041	22.2427
Pugh & Hadjistavropoulos (2011)	0.8816	32.2563	0.0000	0.8652	0.8960	900.3519	0.0000	0.1718	95.6011	22.7330
Reche-García et al. (2018b)	0.8827	33.1301	0.0000	0.8668	0.8967	869.1862	0.0000	0.1637	95.3820	21.6543
Reche-García et al. (2020)	0.8825	32.8622	0.0000	0.8664	0.8965	861.6418	0.0000	0.1661	95.4048	21.7620
Reel et al. (2016)	0.8790	32.8455	0.0000	0.8628	0.8933	871.4361	0.0000	0.1616	95.3181	21.3590
Rogers et al. (2018)	0.8794	32.4802	0.0000	0.8630	0.8938	865.2584	0.0000	0.1659	95.3563	21.5344
Scharmer et al. (2020a)	0.8790	32.8353	0.0000	0.8628	0.8934	875.4373	0.0000	0.1618	95.3313	21.4194
Sicilia et al. (2011)	0.8820	32.4577	0.0000	0.8657	0.8963	874.3431	0.0000	0.1699	95.4626	22.0392

EDS-21 Lack of control

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8241	31.2320	0.0000	0.8038	0.8422	674.5539	0.0000	0.1211	93.8215	16.1850
Alchieri et al. (2015_sample2)	0.8248	31.7028	0.0000	0.8048	0.8427	638.7194	0.0000	0.1177	93.5782	15.5719
Allegre (2008)	0.8233	30.8811	0.0000	0.8028	0.8418	683.4137	0.0000	0.1234	93.8643	16.2981
Badau & Badau (2018)	0.8242	31.3261	0.0000	0.8040	0.8423	676.7216	0.0000	0.1205	93.8261	16.1971
Chang et al. (2018)	0.8217	30.8104	0.0000	0.8010	0.8402	688.6738	0.0000	0.1228	93.9411	16.5048
Compte et al. (2018)	0.8231	30.8560	0.0000	0.8025	0.8415	689.5624	0.0000	0.1237	93.9866	16.6295
Cook (2011)	0.8187	33.1495	0.0000	0.7995	0.8361	588.1557	0.0000	0.1022	92.7376	13.7696
Costa et al. (2012a)	0.8213	30.8688	0.0000	0.8006	0.8398	678.6587	0.0000	0.1217	93.7828	16.0844
Costa et al. (2012b)	0.8222	30.7107	0.0000	0.8015	0.8407	690.8592	0.0000	0.1239	93.9205	16.4487
Costa et al. (2013)	0.8219	30.7342	0.0000	0.8012	0.8405	689.2252	0.0000	0.1235	93.9051	16.4072
Costa et al. (2014)	0.8213	30.8818	0.0000	0.8007	0.8398	685.0790	0.0000	0.1218	93.8798	16.3395
Costa et al. (2015)	0.8247	31.7186	0.0000	0.8048	0.8426	673.1768	0.0000	0.1178	93.7207	15.9255
Divine et al. (2016)	0.8216	30.7912	0.0000	0.8009	0.8402	687.0904	0.0000	0.1228	93.8974	16.3865
Downs et al. (2004_study1)	0.8216	30.7854	0.0000	0.8009	0.8402	686.1917	0.0000	0.1228	93.8727	16.3204
Downs et al. (2004_study2)	0.8224	30.6911	0.0000	0.8017	0.8410	691.3728	0.0000	0.1242	93.7810	16.0797
Duffy et al. (2018)	0.8206	31.2043	0.0000	0.8001	0.8389	656.3996	0.0000	0.1183	93.6047	15.6366
González-Cutre & Sicilia (2012a)	0.8236	30.9561	0.0000	0.8031	0.8419	679.1846	0.0000	0.1230	93.8365	16.2246
Guíu-Carrera & Leyton-Román (2019)	0.8219	30.9136	0.0000	0.8013	0.8403	690.5731	0.0000	0.1226	93.9890	16.6361
Hale et al. (2010)	0.8238	31.1418	0.0000	0.8034	0.8420	685.5860	0.0000	0.1219	93.9266	16.4652
Hillet al. (2015)	0.8210	31.0049	0.0000	0.8005	0.8395	681.3273	0.0000	0.1205	93.8224	16.1876
Kern (2007_study1)	0.8238	31.2211	0.0000	0.8035	0.8420	687.8218	0.0000	0.1216	93.9385	16.4975
Kern (2007_study2)	0.8238	31.2208	0.0000	0.8035	0.8420	687.5203	0.0000	0.1216	93.9350	16.4880
Kern (2007_study3)	0.8222	30.6915	0.0000	0.8014	0.8407	690.3616	0.0000	0.1240	93.7856	16.0916
Lease & Bond (2013)	0.8193	32.3154	0.0000	0.7996	0.8371	633.6515	0.0000	0.1087	93.1738	14.6494
Lindwall & Palmeira (2019_portuguese)	0.8237	31.0502	0.0000	0.8033	0.8420	683.0603	0.0000	0.1224	93.9052	16.4075
Lindwall & Palmeira (2019_swedish)	0.8255	32.5223	0.0000	0.8062	0.8430	658.7297	0.0000	0.1122	93.4299	15.2205
Lu et al. (2012)	0.8231	30.8436	0.0000	0.8025	0.8416	689.1051	0.0000	0.1237	93.9710	16.5865
Mónok et al. (2012)	0.8260	32.9938	0.0000	0.8069	0.8431	586.3842	0.0000	0.1088	93.1114	14.5168
Müller et al. (2013)	0.8209	31.0072	0.0000	0.8003	0.8393	619.7306	0.0000	0.1201	93.3106	14.9489
Murray et al. (2012)	0.8218	30.8655	0.0000	0.8011	0.8403	690.1330	0.0000	0.1227	93.9798	16.6108
Nuzzo et al.(2013)	0.8219	30.7354	0.0000	0.8012	0.8405	689.2955	0.0000	0.1235	93.9096	16.4193
Paradis et al. (2013)	0.8219	30.7288	0.0000	0.8012	0.8405	688.8395	0.0000	0.1235	93.8803	16.3408
Parastatidou et al.(2012)	0.8234	30.8786	0.0000	0.8028	0.8418	682.3710	0.0000	0.1235	93.8414	16.2375
Parastatidou et al.(2014)	0.8233	30.8813	0.0000	0.8028	0.8418	683.5095	0.0000	0.1234	93.8664	16.3037
Parnell (2011)	0.8222	30.8142	0.0000	0.8016	0.8407	691.2485	0.0000	0.1236	94.0163	16.7121
Pollock (2014)	0.8219	30.7435	0.0000	0.8012	0.8405	689.6772	0.0000	0.1235	93.9341	16.4855
Pugh & Hadjistavropoulos (2011)	0.8229	30.8110	0.0000	0.8023	0.8414	690.5465	0.0000	0.1239	93.9988	16.6634
Reche-García et al. (2018b)	0.8231	30.8464	0.0000	0.8025	0.8415	689.2242	0.0000	0.1237	93.9751	16.5979
Reche-García et al. (2020)	0.8235	30.9620	0.0000	0.8031	0.8419	682.5808	0.0000	0.1230	93.8878	16.3607
Rogers et al. (2018)	0.8206	31.2043	0.0000	0.8001	0.8389	656.3996	0.0000	0.1183	93.6047	15.6366
Scharmer et al. (2020a)	0.8219	30.7604	0.0000	0.8012	0.8405	690.1565	0.0000	0.1234	93.9642	16.5679
Sicilia et al. (2011)	0.8236	30.9562	0.0000	0.8031	0.8419	679.2797	0.0000	0.1230	93.8379	16.2283
Soler et al. (2013)	0.8236	31.0646	0.0000	0.8032	0.8419	686.7672	0.0000	0.1224	93.9485	16.5247
Stenseng et al. (2015_study2)	0.8239	31.1346	0.0000	0.8036	0.8422	665.5897	0.0000	0.1217	93.7446	15.9861

EDS-21 Time

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8499	39.6358	0.0000	0.8351	0.8633	516.7822	0.0000	0.0845	91.4841	11.7428
Alchieri et al. (2015_sample2)	0.8503	40.2653	0.0000	0.8358	0.8635	479.2435	0.0000	0.0817	91.1150	11.2549
Allegre (2008)	0.8482	38.1031	0.0000	0.8328	0.8622	548.3235	0.0000	0.0910	91.9619	12.4407
Badau & Badau (2018)	0.8484	38.2382	0.0000	0.8330	0.8624	547.9763	0.0000	0.0906	92.0571	12.5899
Compte et al. (2018)	0.8482	38.1808	0.0000	0.8328	0.8622	549.3429	0.0000	0.0908	92.0910	12.6439
Cook (2011)	0.8468	38.4349	0.0000	0.8314	0.8608	539.8240	0.0000	0.0883	91.7997	12.1946
Costa et al. (2012a)	0.8480	38.0545	0.0000	0.8325	0.8620	549.7932	0.0000	0.0911	91.9672	12.4489
Costa et al. (2012b)	0.8491	38.6120	0.0000	0.8339	0.8629	535.2457	0.0000	0.0890	91.8365	12.2496
Costa et al. (2013)	0.8492	38.7923	0.0000	0.8341	0.8630	531.0757	0.0000	0.0882	91.7759	12.1594
Costa et al. (2014)	0.8484	38.2310	0.0000	0.8330	0.8624	547.7977	0.0000	0.0906	92.0487	12.5766
Costa et al. (2015)	0.8477	38.1556	0.0000	0.8323	0.8618	549.9010	0.0000	0.0907	92.0968	12.6532
Divine et al. (2016)	0.8468	38.4352	0.0000	0.8314	0.8608	541.1162	0.0000	0.0884	91.8256	12.2334
Downs et al. (2004_study1)	0.8468	38.4348	0.0000	0.8314	0.8608	539.2563	0.0000	0.0883	91.7885	12.1780
Downs et al. (2004_study2)	0.8474	38.0828	0.0000	0.8319	0.8615	546.2882	0.0000	0.0905	91.7609	12.1372
González-Cutre & Sicilia (2012a)	0.8482	38.1016	0.0000	0.8328	0.8622	548.2736	0.0000	0.0910	91.9552	12.4304
Guíu-Carrera & Leyton-Román (2019)	0.8480	38.3441	0.0000	0.8326	0.8619	549.9551	0.0000	0.0903	92.1172	12.6858
Hale et al. (2010)	0.8486	38.3829	0.0000	0.8333	0.8625	547.7496	0.0000	0.0901	92.0635	12.5999
Hillet al. (2015)	0.8469	38.4370	0.0000	0.8315	0.8608	543.5450	0.0000	0.0885	91.8773	12.3112
Kern (2007_study1)	0.8490	38.8509	0.0000	0.8339	0.8628	545.8805	0.0000	0.0884	91.9547	12.4296
Kern (2007_study2)	0.8492	38.9774	0.0000	0.8341	0.8629	544.5300	0.0000	0.0878	91.9029	12.3501
Kern (2007_study3)	0.8474	38.0844	0.0000	0.8319	0.8615	546.4883	0.0000	0.0905	91.7810	12.1670
Lease & Bond (2013)	0.8447	42.4544	0.0000	0.8308	0.8575	470.3671	0.0000	0.0693	89.8312	9.8340
Lindwall & Palmeira (2019_portuguese)	0.8488	38.4633	0.0000	0.8336	0.8627	543.4530	0.0000	0.0897	91.9686	12.4512
Lindwall & Palmeira (2019_swedish)	0.8469	38.4436	0.0000	0.8316	0.8609	545.8156	0.0000	0.0886	91.9317	12.3942
Lu et al. (2012)	0.8482	38.1568	0.0000	0.8328	0.8622	549.1827	0.0000	0.0909	92.0728	12.6148
Maselli et al. (2018)	0.8474	38.0947	0.0000	0.8319	0.8615	547.3920	0.0000	0.0905	91.8736	12.3056
Mónok et al. (2012)	0.8491	38.6120	0.0000	0.8339	0.8629	533.4087	0.0000	0.0890	91.8111	12.2116
Müller et al. (2013)	0.8459	39.3732	0.0000	0.8309	0.8596	413.8636	0.0000	0.0829	90.7081	10.7620
Murray et al. (2012)	0.8468	38.6564	0.0000	0.8315	0.8607	545.3511	0.0000	0.0876	91.8768	12.3103
Nuzzo et al.(2013)	0.8465	38.7547	0.0000	0.8312	0.8603	531.2297	0.0000	0.0865	91.6322	11.9505
Paradis et al. (2013)	0.8474	38.1056	0.0000	0.8319	0.8615	547.9582	0.0000	0.0904	91.9325	12.3955
Parastatidou et al.(2012)	0.8484	38.1829	0.0000	0.8330	0.8624	545.0266	0.0000	0.0907	91.9092	12.3597
Parastatidou et al.(2014)	0.8482	38.1038	0.0000	0.8328	0.8622	548.3434	0.0000	0.0910	91.9645	12.4448
Parnell (2011)	0.8493	39.0232	0.0000	0.8343	0.8630	542.6078	0.0000	0.0875	91.8629	12.2894
Pollock (2014)	0.8486	38.3237	0.0000	0.8333	0.8626	544.9253	0.0000	0.0902	91.9878	12.4809
Pugh & Hadjistavropoulos (2011)	0.8480	38.1415	0.0000	0.8325	0.8620	549.9092	0.0000	0.0909	92.0986	12.6560
Reche-García et al. (2018b)	0.8480	38.1178	0.0000	0.8325	0.8620	549.8940	0.0000	0.0909	92.0835	12.6319
Reche-García et al. (2020)	0.8501	39.9171	0.0000	0.8354	0.8634	505.4393	0.0000	0.0832	91.3401	11.5474
Rogers et al. (2018)	0.8471	38.2216	0.0000	0.8317	0.8611	543.2170	0.0000	0.0896	91.8339	12.2458
Scharmer et al. (2020a)	0.8469	38.4375	0.0000	0.8315	0.8608	543.8898	0.0000	0.0885	91.8851	12.3230
Sicilia et al. (2011)	0.8482	38.1020	0.0000	0.8328	0.8622	548.2870	0.0000	0.0910	91.9570	12.4332
Soler et al. (2013)	0.8491	38.7595	0.0000	0.8340	0.8629	543.1664	0.0000	0.0885	91.9291	12.3903
Stenseng et al. (2015_study2)	0.8489	38.4434	0.0000	0.8336	0.8628	534.4137	0.0000	0.0897	91.7994	12.1943

EDS-21 Reduction in other activities

	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.7005	25.8225	0.0000	0.6718	0.7267	658.6454	0.0000	0.0988	92.1194	12.6894
Alchieri et al. (2015_sample2)	0.7034	25.0868	0.0000	0.6739	0.7303	692.0534	0.0000	0.1073	92.6217	13.5532
Allegre (2008)	0.7064	25.6692	0.0000	0.6776	0.7326	657.6889	0.0000	0.1038	92.4000	13.1578
Badau & Badau (2018)	0.7046	25.2174	0.0000	0.6753	0.7314	689.6031	0.0000	0.1070	92.7125	13.7222
Brosof et al. (2019)	0.7056	25.4480	0.0000	0.6765	0.7320	685.5164	0.0000	0.1055	92.6474	13.6006
Chang et al. (2018)	0.7035	25.1248	0.0000	0.6740	0.7303	692.1121	0.0000	0.1071	92.7306	13.7563
Compte et al. (2018)	0.7065	25.7456	0.0000	0.6778	0.7326	676.0348	0.0000	0.1033	92.4896	13.3149
Costa et al. (2012a)	0.7041	25.1165	0.0000	0.6746	0.7309	690.9483	0.0000	0.1074	92.6376	13.5826
Costa et al. (2012b)	0.7045	25.1685	0.0000	0.6751	0.7312	689.0529	0.0000	0.1072	92.6603	13.6246
Costa et al. (2013)	0.7041	25.1239	0.0000	0.6746	0.7309	691.2096	0.0000	0.1074	92.6761	13.6540
Costa et al. (2014)	0.7050	25.2799	0.0000	0.6757	0.7316	687.2346	0.0000	0.1066	92.6809	13.6629
Costa et al. (2015)	0.6998	26.3513	0.0000	0.6717	0.7255	660.2324	0.0000	0.0941	91.8277	12.2364
Divine et al. (2016)	0.7049	25.2370	0.0000	0.6755	0.7315	687.2247	0.0000	0.1068	92.6680	13.6388
Downs et al. (2004_study1)	0.7041	25.1239	0.0000	0.6746	0.7309	691.2120	0.0000	0.1074	92.6765	13.6546
Downs et al. (2004_study2)	0.7022	25.1960	0.0000	0.6728	0.7290	676.7035	0.0000	0.1053	92.3781	13.1200
Duffy et al. (2018)	0.6985	27.7243	0.0000	0.6718	0.7230	535.6208	0.0000	0.0829	90.6524	10.6979
González-Cutre & Sicilia (2012a)	0.7045	25.1624	0.0000	0.6751	0.7313	688.2356	0.0000	0.1072	92.6221	13.5540
Guíu-Carrera & Leyton-Román (2019)	0.7063	25.7621	0.0000	0.6776	0.7324	685.6191	0.0000	0.1035	92.5540	13.4300
Hale et al. (2010)	0.7027	25.1976	0.0000	0.6733	0.7294	690.5246	0.0000	0.1060	92.6867	13.6737
Hillet al. (2015)	0.7048	25.2472	0.0000	0.6755	0.7315	688.5722	0.0000	0.1068	92.6991	13.6969
Kern (2007_study1)	0.7061	25.7005	0.0000	0.6774	0.7323	685.9759	0.0000	0.1039	92.5787	13.4747
Kern (2007_study2)	0.7061	25.6701	0.0000	0.6773	0.7323	686.0171	0.0000	0.1041	92.5893	13.4940
Kern (2007_study3)	0.7030	25.0946	0.0000	0.6734	0.7298	689.3363	0.0000	0.1068	92.4916	13.3184
Lease & Bond (2013)	0.7028	25.1398	0.0000	0.6733	0.7296	690.1367	0.0000	0.1064	92.6549	13.6145
Lindwall & Palmeira (2019_portuguese)	0.7033	25.1155	0.0000	0.6737	0.7301	691.8173	0.0000	0.1070	92.7033	13.7048
Lindwall & Palmeira (2019_swedish)	0.7064	25.7295	0.0000	0.6777	0.7326	679.3500	0.0000	0.1035	92.5164	13.3625
Lu et al. (2012)	0.7030	25.1284	0.0000	0.6735	0.7299	691.3032	0.0000	0.1067	92.6932	13.6859
Magee et al. (2016)	0.7054	25.3539	0.0000	0.6762	0.7319	682.2163	0.0000	0.1061	92.6172	13.5450
Maselli et al. (2018)	0.7045	25.1593	0.0000	0.6751	0.7313	687.6382	0.0000	0.1073	92.5941	13.5027
Mónok et al. (2012)	0.7047	25.1950	0.0000	0.6753	0.7314	687.0566	0.0000	0.1071	92.6324	13.5730
Müller et al. (2013)	0.7006	25.7254	0.0000	0.6718	0.7269	553.9652	0.0000	0.0995	91.6753	12.0125
Müller et al. (2014_ patients ED)	0.7017	25.5985	0.0000	0.6727	0.7281	687.5220	0.0000	0.1025	92.4998	13.3330
Müller et al. (2014_clients of fitness)	0.7070	26.1652	0.0000	0.6788	0.7327	683.2112	0.0000	0.1008	92.3826	13.1278
Müller et al. (2014_sports studies)	0.7066	26.0108	0.0000	0.6782	0.7325	685.3181	0.0000	0.1020	92.4656	13.2725
Murray et al. (2012)	0.7057	25.5272	0.0000	0.6767	0.7321	686.9811	0.0000	0.1051	92.6433	13.5931
Nuzzo et al.(2013)	0.7047	25.1997	0.0000	0.6753	0.7314	687.9162	0.0000	0.1070	92.6601	13.6241
Paradis et al. (2013)	0.7059	25.4981	0.0000	0.6769	0.7323	669.7681	0.0000	0.1050	92.4981	13.3299
Parastatidou et al.(2012)	0.7045	25.1604	0.0000	0.6751	0.7313	687.8539	0.0000	0.1072	92.6042	13.5212
Parastatidou et al.(2014)	0.7041	25.1170	0.0000	0.6746	0.7309	690.9698	0.0000	0.1074	92.6408	13.5885
Pugh & Hadjistavropoulos (2011)	0.7007	25.7560	0.0000	0.6720	0.7270	672.5545	0.0000	0.0996	92.2328	12.8746
Reche-García et al. (2018b)	0.7048	25.2485	0.0000	0.6755	0.7315	688.6900	0.0000	0.1068	92.7017	13.7018
Reche-García et al. (2020)	0.7049	25.2334	0.0000	0.6755	0.7315	686.5086	0.0000	0.1068	92.6511	13.6074
Reel et al. (2016)	0.7026	25.1724	0.0000	0.6731	0.7294	689.1623	0.0000	0.1060	92.6413	13.5894
Rogers et al. (2018)	0.7008	25.6879	0.0000	0.6719	0.7271	648.6267	0.0000	0.1000	92.1273	12.7022
Scharmer et al. (2020a)	0.7052	25.3203	0.0000	0.6759	0.7318	686.6412	0.0000	0.1063	92.6751	13.6520
Sicilia et al. (2011)	0.7045	25.1626	0.0000	0.6751	0.7313	688.2660	0.0000	0.1072	92.6235	13.5566
Soler et al. (2013).1	0.7037	25.1538	0.0000	0.6743	0.7305	692.1413	0.0000	0.1071	92.7538	13.8003
Soler et al. (2013).2	0.7022	25.2705	0.0000	0.6729	0.7289	688.3836	0.0000	0.1050	92.6198	13.5498
Stenseng et al. (2015_study2)	0.7056	25.3958	0.0000	0.6765	0.7321	670.3343	0.0000	0.1057	92.4906	13.3166
Cook (2011)	0.7035	25.0971	0.0000	0.6739	0.7303	692.0810	0.0000	0.1072	92.6744	13.6507
North (2011)	0.7039	25.0941	0.0000	0.6744	0.7307	691.5988	0.0000	0.1075	92.5805	13.4779
Parnell (2011)	0.7047	25.2926	0.0000	0.6755	0.7314	690.6489	0.0000	0.1066	92.7392	13.7726
Pollock (2014)	0.7068	25.8344	0.0000	0.6782	0.7328	663.6825	0.0000	0.1026	92.3928	13.1455

EDS-21 Continuance

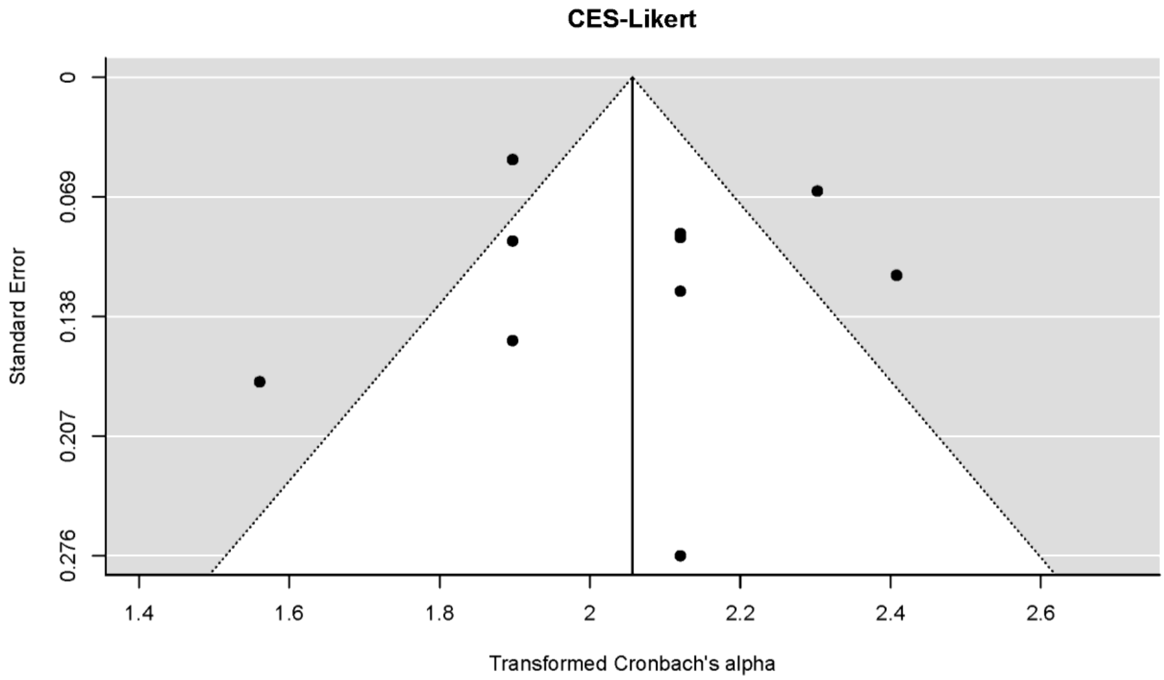
	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Alchieri et al. (2015_sample1)	0.8324	32.9678	0.0000	0.8136	0.8492	592.8035	0.0000	0.1112	93.2027	14.7118
Alchieri et al. (2015_sample2)	0.8339	32.5559	0.0000	0.8149	0.8509	611.3019	0.0000	0.1155	93.3583	15.0565
Allegre (2008)	0.8354	33.0983	0.0000	0.8168	0.8521	592.1977	0.0000	0.1126	93.2090	14.7255
Badau & Badau (2018)	0.8374	35.5314	0.0000	0.8203	0.8529	551.9249	0.0000	0.0978	92.3906	13.1416
Chang et al. (2018)	0.8341	32.6331	0.0000	0.8152	0.8511	611.4422	0.0000	0.1153	93.4771	15.3307
Compte et al. (2018)	0.8349	32.8956	0.0000	0.8162	0.8517	607.6149	0.0000	0.1140	93.4126	15.1805
Cook (2011)	0.8323	32.9700	0.0000	0.8136	0.8492	589.6787	0.0000	0.1111	93.1767	14.6557
Costa et al. (2012a)	0.8359	33.5054	0.0000	0.8176	0.8524	574.9866	0.0000	0.1100	93.0598	14.4087
Costa et al. (2012b)	0.8362	33.7961	0.0000	0.8181	0.8525	571.4853	0.0000	0.1082	92.9922	14.2698
Costa et al. (2013)	0.8359	33.4931	0.0000	0.8176	0.8523	582.9570	0.0000	0.1101	93.1121	14.5182
Costa et al. (2014)	0.8350	32.8874	0.0000	0.8162	0.8518	606.4561	0.0000	0.1140	93.3889	15.1260
Costa et al. (2015)	0.8331	32.7102	0.0000	0.8142	0.8501	608.2500	0.0000	0.1139	93.4234	15.2055
Divine et al. (2016)	0.8327	32.7906	0.0000	0.8138	0.8497	599.7228	0.0000	0.1128	93.2911	14.9055
Downs et al. (2004_study1)	0.8315	33.6247	0.0000	0.8131	0.8481	560.1668	0.0000	0.1057	92.8448	13.9759
Downs et al. (2004_study2)	0.8319	33.2696	0.0000	0.8132	0.8486	535.6231	0.0000	0.1084	92.8218	13.9311
Duffy et al. (2018)	0.8330	32.6614	0.0000	0.8141	0.8500	600.7829	0.0000	0.1139	93.2726	14.8645
González-Cutre & Sicilia (2012a)	0.8346	32.6956	0.0000	0.8157	0.8515	607.9671	0.0000	0.1150	93.3349	15.0035
Guíu-Carrera & Leyton-Román (2019)	0.8349	33.0270	0.0000	0.8163	0.8516	609.7495	0.0000	0.1135	93.4439	15.2529
Hale et al. (2010)	0.8325	32.9556	0.0000	0.8137	0.8494	603.4609	0.0000	0.1116	93.3074	14.9419
Hillet al. (2015)	0.8327	32.7967	0.0000	0.8139	0.8497	602.9520	0.0000	0.1128	93.3319	14.9968
Kern (2007_study1)	0.8346	32.8954	0.0000	0.8159	0.8514	610.6363	0.0000	0.1142	93.4784	15.3337
Kern (2007_study2)	0.8345	32.8324	0.0000	0.8157	0.8513	610.9992	0.0000	0.1145	93.4919	15.3656
Kern (2007_study3)	0.8350	32.8680	0.0000	0.8163	0.8518	595.2441	0.0000	0.1140	93.1667	14.6342
Lease & Bond (2013)	0.8306	34.8722	0.0000	0.8128	0.8467	536.2442	0.0000	0.0969	92.2917	12.9731
Lindwall & Palmeira (2019_portuguese)	0.8327	32.7949	0.0000	0.8139	0.8497	602.2101	0.0000	0.1128	93.3223	14.9752
Lindwall & Palmeira (2019_swedish)	0.8336	32.6337	0.0000	0.8147	0.8506	610.9895	0.0000	0.1150	93.4830	15.3445
Lu et al. (2012)	0.8336	32.5956	0.0000	0.8147	0.8506	610.6954	0.0000	0.1151	93.4529	15.2740
Mónok et al. (2012)	0.8368	34.4887	0.0000	0.8191	0.8527	540.7906	0.0000	0.1039	92.6991	13.6970
Müller et al. (2013)	0.8341	32.5564	0.0000	0.8152	0.8511	611.0333	0.0000	0.1156	92.9432	14.1707
Murray et al. (2012)	0.8334	32.7088	0.0000	0.8146	0.8504	610.5814	0.0000	0.1145	93.4797	15.3367
Nuzzo et al.(2013)	0.8330	32.6698	0.0000	0.8141	0.8500	603.7231	0.0000	0.1139	93.3311	14.9951
Paradis et al. (2013)	0.8336	32.5607	0.0000	0.8146	0.8506	609.9466	0.0000	0.1152	93.3677	15.0777
Parastatidou et al.(2012)	0.8344	32.6267	0.0000	0.8155	0.8513	610.0486	0.0000	0.1153	93.3327	14.9986
Parastatidou et al.(2014)	0.8339	32.5579	0.0000	0.8149	0.8509	611.3119	0.0000	0.1155	93.3685	15.0795
Parnell (2011)	0.8347	32.8575	0.0000	0.8159	0.8515	610.2329	0.0000	0.1143	93.4710	15.3163
Pollock (2014)	0.8336	32.5796	0.0000	0.8147	0.8506	610.4602	0.0000	0.1152	93.4267	15.2131
Pugh & Hadjistavropoulos (2011)	0.8353	33.0915	0.0000	0.8167	0.8520	604.3234	0.0000	0.1128	93.3507	15.0393
Reche-García et al. (2018b)	0.8343	32.6689	0.0000	0.8155	0.8513	610.9155	0.0000	0.1152	93.4612	15.2934
Reche-García et al. (2020)	0.8348	32.7857	0.0000	0.8160	0.8516	606.7289	0.0000	0.1145	93.3675	15.0774
Rogers et al. (2018)	0.8330	32.6614	0.0000	0.8141	0.8500	600.7829	0.0000	0.1139	93.2726	14.8645
Scharmer et al. (2020a)	0.8336	32.6010	0.0000	0.8147	0.8506	610.7538	0.0000	0.1151	93.4593	15.2888
Sicilia et al. (2011)	0.8346	32.6959	0.0000	0.8157	0.8515	607.9947	0.0000	0.1150	93.3364	15.0070
Soler et al. (2013)	0.8351	32.9949	0.0000	0.8164	0.8518	607.4046	0.0000	0.1134	93.4053	15.1636

OEQ global score

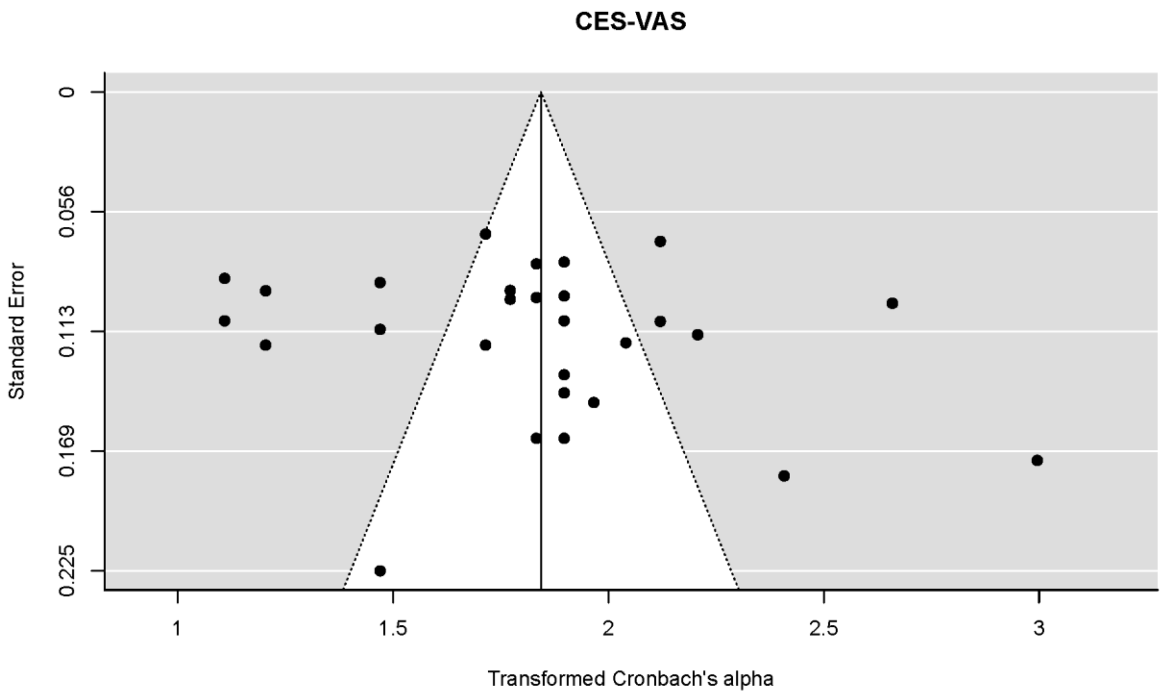
	estimate	zval	pval	ci.lb	ci.ub	Q	Qp	tau2	I2	H2
Becker (2000)	0.8697	32.1657	0.0000	0.8524	0.8849	556.5220	0.0000	0.1366	94.5995	18.5166
Bell et al. (2015)	0.8679	32.7842	0.0000	0.8509	0.8829	512.7912	0.0000	0.1290	94.2257	17.3182
Boroughs (2010)	0.8687	32.2608	0.0000	0.8514	0.8839	522.4044	0.0000	0.1344	94.1274	17.0282
Braun (2009_female)	0.8691	32.1945	0.0000	0.8518	0.8843	553.8036	0.0000	0.1357	94.5821	18.4573
Braun (2009_male)	0.8691	32.1948	0.0000	0.8518	0.8843	553.8164	0.0000	0.1357	94.5826	18.4590
Brehm & Steffen (2013_female)	0.8720	33.9327	0.0000	0.8558	0.8863	516.2538	0.0000	0.1239	94.1149	16.9921
Brehm & Steffen (2013_male)	0.8715	33.3322	0.0000	0.8550	0.8861	530.3410	0.0000	0.1284	94.3071	17.5657
Brehm (1995)	0.8704	32.3976	0.0000	0.8533	0.8855	551.0083	0.0000	0.1353	94.5508	18.3514
Cahill & Mussap (2007_female)	0.8719	33.8421	0.0000	0.8557	0.8862	529.0656	0.0000	0.1247	94.1833	17.1918
Cahill & Mussap (2007_male)	0.8707	32.6681	0.0000	0.8538	0.8856	551.7309	0.0000	0.1336	94.5690	18.4129
Coen & Ogles (1993)	0.8713	33.1024	0.0000	0.8546	0.8860	543.9506	0.0000	0.1303	94.4284	17.9481
De Young & Anderson (2009)	0.8691	32.2068	0.0000	0.8518	0.8843	554.3397	0.0000	0.1356	94.6028	18.5283
De Young & Anderson (2010)	0.8690	32.1852	0.0000	0.8518	0.8843	553.1986	0.0000	0.1357	94.5584	18.3768
Diehl et al.(1998)	0.8694	32.1820	0.0000	0.8521	0.8846	556.1113	0.0000	0.1362	94.6344	18.6374
Federay (2011)	0.8697	32.1892	0.0000	0.8524	0.8849	556.5235	0.0000	0.1364	94.6363	18.6438
Gapin & Petruzzello (2011)	0.8706	32.5284	0.0000	0.8536	0.8856	550.1575	0.0000	0.1344	94.5564	18.3703
Hausenblas &Downs (2002a_study 4)	0.8708	32.6615	0.0000	0.8540	0.8858	536.8243	0.0000	0.1333	94.4133	17.8995
Karr et al.(2013_half-marathon)	0.8704	32.3729	0.0000	0.8534	0.8855	529.7106	0.0000	0.1353	94.1089	16.9747
Karr et al.(2013_marathon)	0.8713	33.0092	0.0000	0.8546	0.8860	500.8232	0.0000	0.1307	94.1886	17.2077
Karr et al.(2013_shorter distance)	0.8697	32.1295	0.0000	0.8524	0.8849	556.5123	0.0000	0.1367	94.3540	17.7118
Knepp et al. (2015)	0.8697	32.2203	0.0000	0.8525	0.8848	556.5245	0.0000	0.1363	94.6582	18.7204
Lease & Bond (2013)	0.8697	32.1564	0.0000	0.8524	0.8849	556.5210	0.0000	0.1366	94.5738	18.4291
Magnus et al. (2009)	0.8699	32.2147	0.0000	0.8527	0.8851	555.7418	0.0000	0.1364	94.5926	18.4931
Montayne (2017)	0.8697	32.2915	0.0000	0.8525	0.8848	556.5255	0.0000	0.1360	94.6733	18.7734
Mussap (2006)	0.8708	32.6652	0.0000	0.8539	0.8857	550.2918	0.0000	0.1335	94.5523	18.3563
Mussap (2007)	0.8708	32.6645	0.0000	0.8539	0.8857	549.7568	0.0000	0.1335	94.5463	18.3360
Pasman & Thompson (1988)	0.8659	36.1300	0.0000	0.8504	0.8797	498.5796	0.0000	0.1030	93.0695	14.4290
Pritchard et al. (2012)	0.8694	32.1435	0.0000	0.8521	0.8846	555.7160	0.0000	0.1364	94.5638	18.3953
Rash (2004)	0.8687	32.2860	0.0000	0.8515	0.8839	548.8056	0.0000	0.1344	94.5214	18.2528
Rodgers et al. (2001)	0.8662	35.2950	0.0000	0.8504	0.8803	451.8267	0.0000	0.1083	93.2916	14.9066
Serier et al. (2018)	0.8694	32.2737	0.0000	0.8522	0.8846	556.3495	0.0000	0.1358	94.6673	18.7523
Taranis & Meyer (2011_study3)	0.8703	32.4442	0.0000	0.8533	0.8854	554.4441	0.0000	0.1351	94.6264	18.6095
Terry et al. (2004)	0.8687	32.2987	0.0000	0.8515	0.8839	551.0221	0.0000	0.1344	94.5579	18.3753
Uhlmann et al. (2018)	0.8683	32.4656	0.0000	0.8512	0.8835	533.7804	0.0000	0.1323	94.3776	17.7859
Velkoff et al. (2019)	0.8688	32.3448	0.0000	0.8516	0.8840	553.9192	0.0000	0.1344	94.6060	18.5391
Woods (2007)	0.8710	32.8215	0.0000	0.8543	0.8859	532.8987	0.0000	0.1321	94.3877	17.8180
Yager et al. (2017)	0.8687	32.2665	0.0000	0.8514	0.8839	537.1431	0.0000	0.1344	94.3378	17.6610
Yager & O´Dea (2010)	0.8694	32.1774	0.0000	0.8521	0.8846	556.0846	0.0000	0.1362	94.6299	18.6217

Appendix D: Publication bias analyses by PE

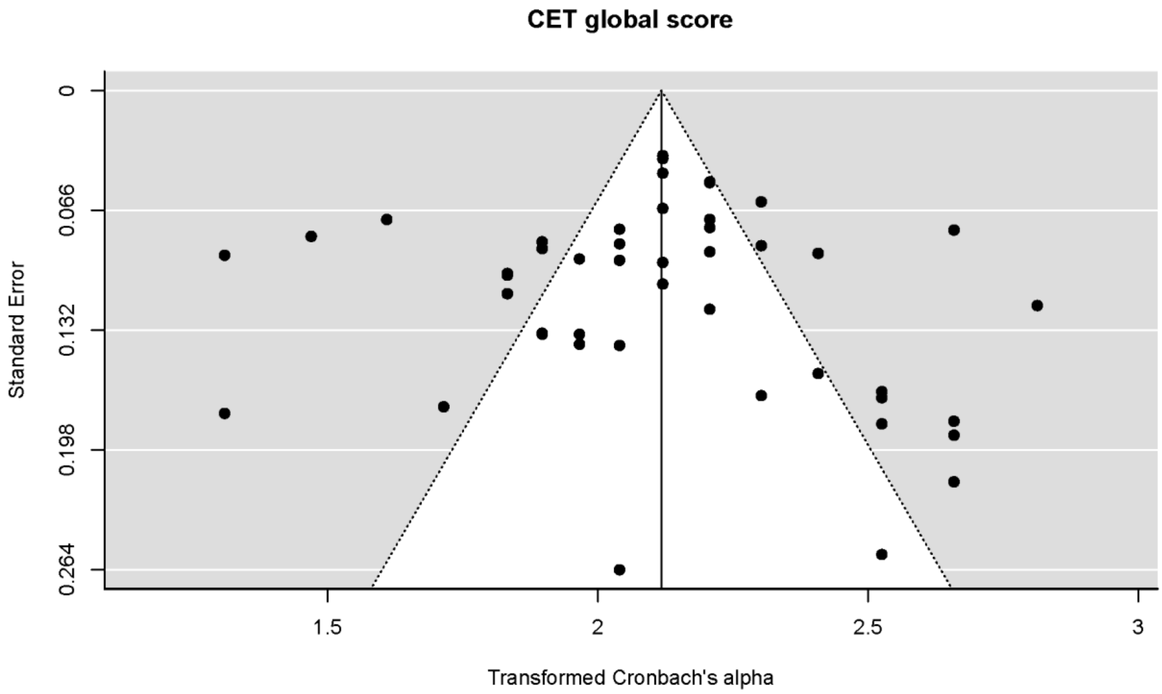
Due to unavailability of data (K< 10) publication bias analyses were not conducted in the case of EDQ subscales. Evidence of publication bias was suggested by funnel plot asymmetry and the results of Egger test both for the CET (global score, p = .084; and weight control subscale, p = .026) and the EDS-21 (global score, p = .096; and reduction in other activities subscale, p = .027) (see Appendix G). Additionally, the 'trim and fill' procedure showed differences between the pooled and the adjusted pooled estimates in the following cases: (a) the global score on the CET ($\bar{\alpha}$ = .880, p < .001; 95% CI = 868. to .891, I^2 = 92.99 vs. adjusted $\bar{\alpha}$ = .876, p < .001; 95% CI = .863 to .887, I^2 = 93.67; missing studies K = 3); (b) the weight control subscale of the CET ($\bar{\alpha}$ = .817, p < .001; 95% CI = 787. to .842, I^2 = 90.72 vs. adjusted $\bar{\alpha}$ = .792, p < .001; 95% CI = .755 to .823, I^2 = 93.31; missing studies K = 5); and (c) the reduction in other activities subscale of the EDS-21 ($\bar{\alpha}$ = .704, p < .001; 95% CI = 675. to .730, I^2 = 92.53 vs. adjusted $\bar{\alpha}$ = .730, p < .001; 95% CI = .702 to .755, I^2 = 93.59; missing studies K = 10). Conversely, no significant differences between the pooled estimate ($\bar{\alpha}$ = .930, p < .001; 95% CI = 923. to .937, I^2 = 97.76) and adjusted pooled estimate ($\bar{\alpha}$ = .930, p < .001; 95% CI = .923 to .937, I^2 = 97.76; missing studies K = 0) were found in the case of the global score on the EDS-21.

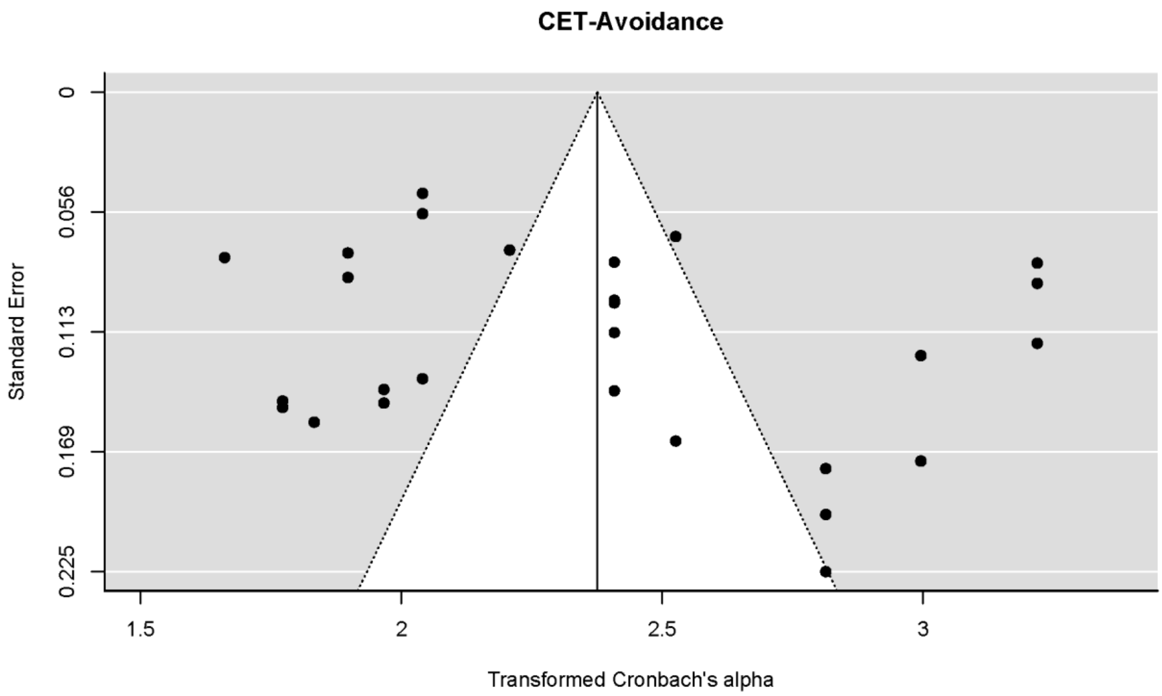


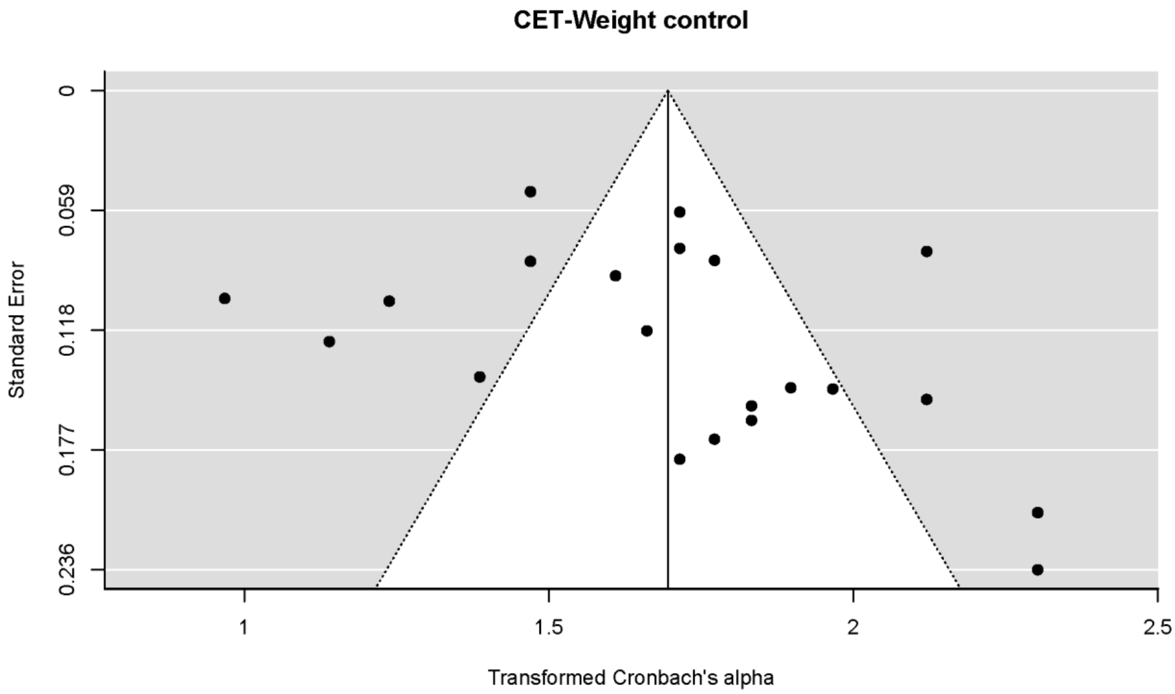
CES-Likert
Standard Error
0
0.069
0.138
0.207
0.276
1.4
1.6
1.8
2
2.2
2.4
2.6
Transformed Cronbach's alpha



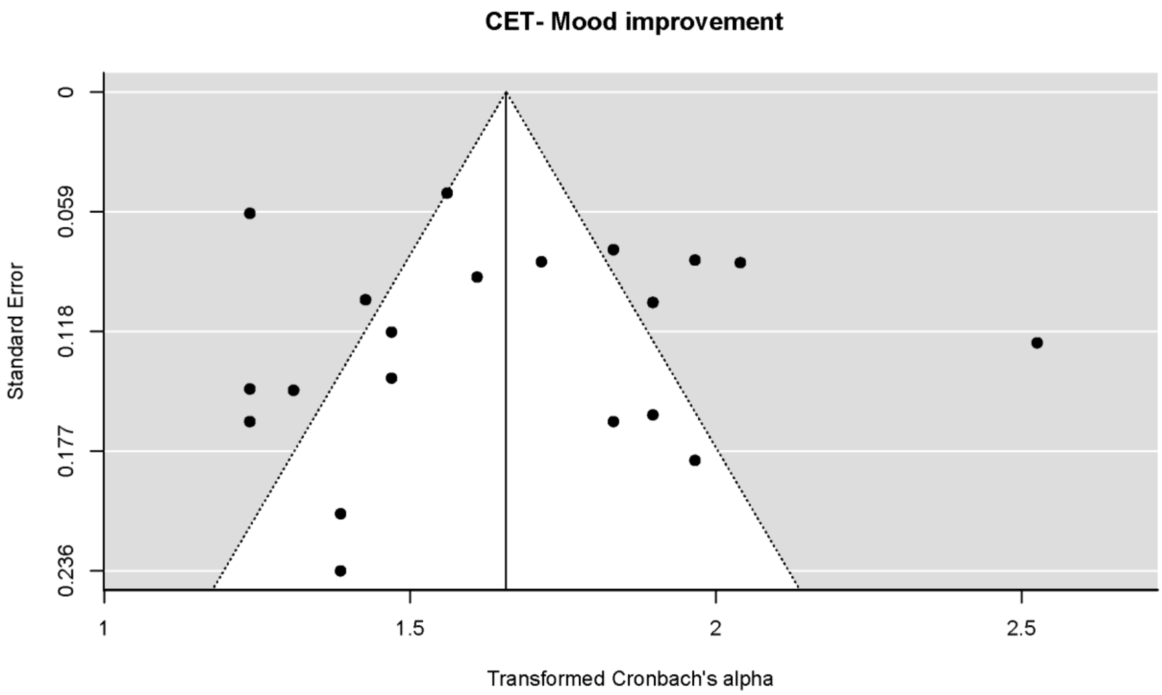
CES-VAS
Standard Error
0
0.056
0.113
0.169
0.225
1
1.5
2
2.5
3
Transformed Cronbach's alpha


CET global score
Standard Error
0
0.066
0.132
0.198
0.264
1.5
2
2.5
3
Transformed Cronbach's alpha


CET-Avoidance
Standard Error
0
0.056
0.113
0.169
0.225
1.5
2
2.5
3
Transformed Cronbach's alpha

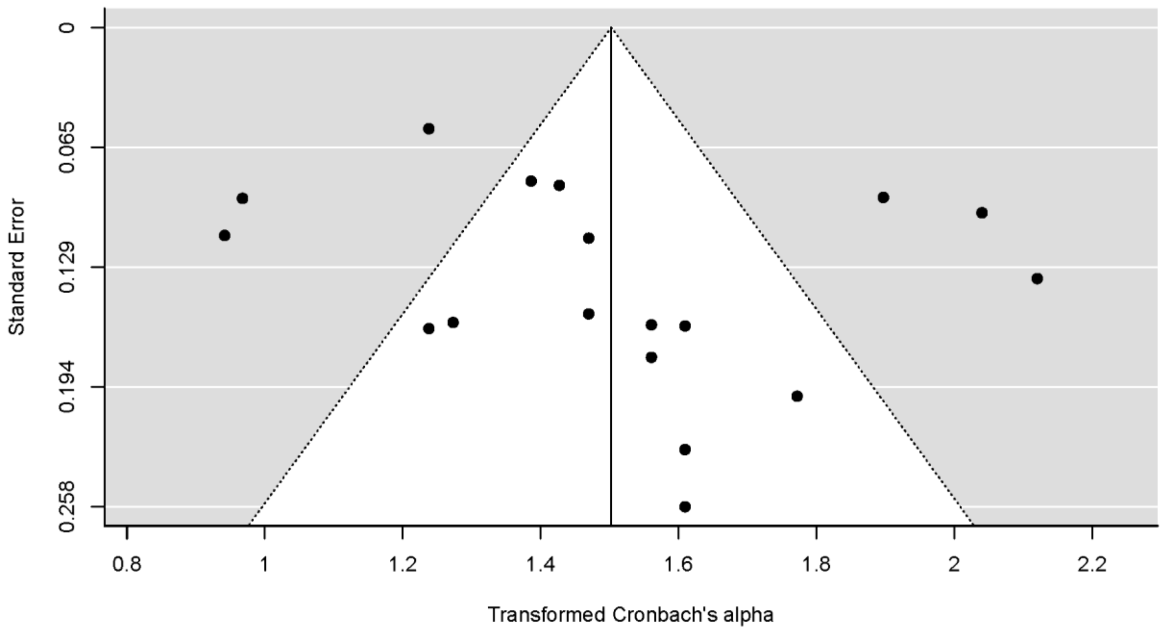


CET-Weight control
0
0.059
0.118
0.177
0.236
Standard Error
1
1.5
2
2.5
Transformed Cronbach's alpha

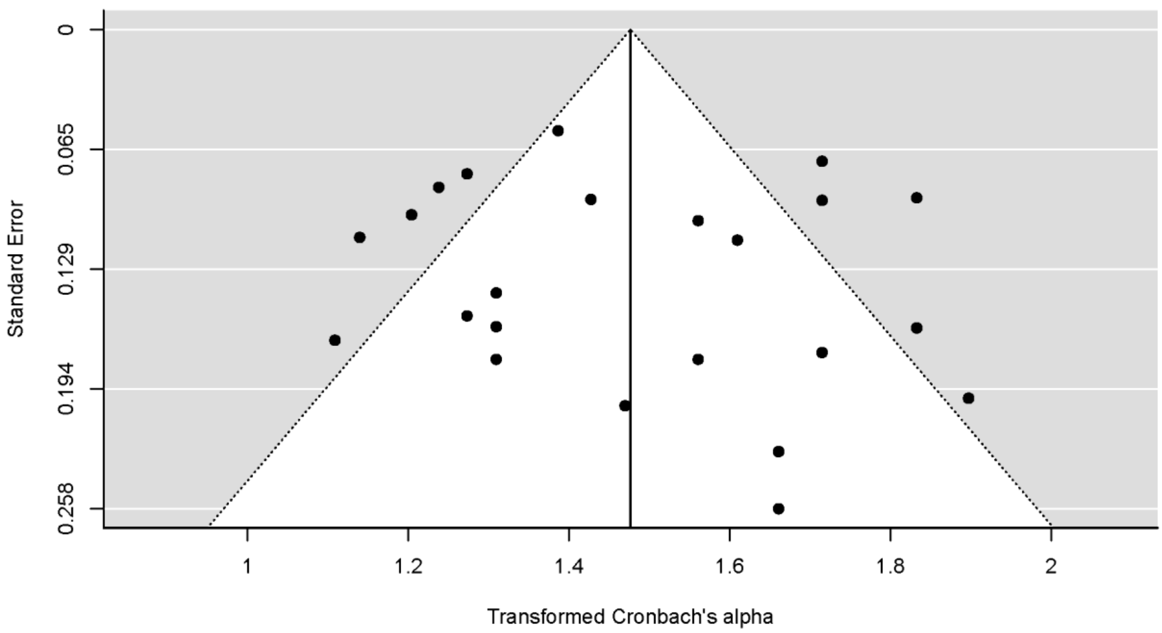


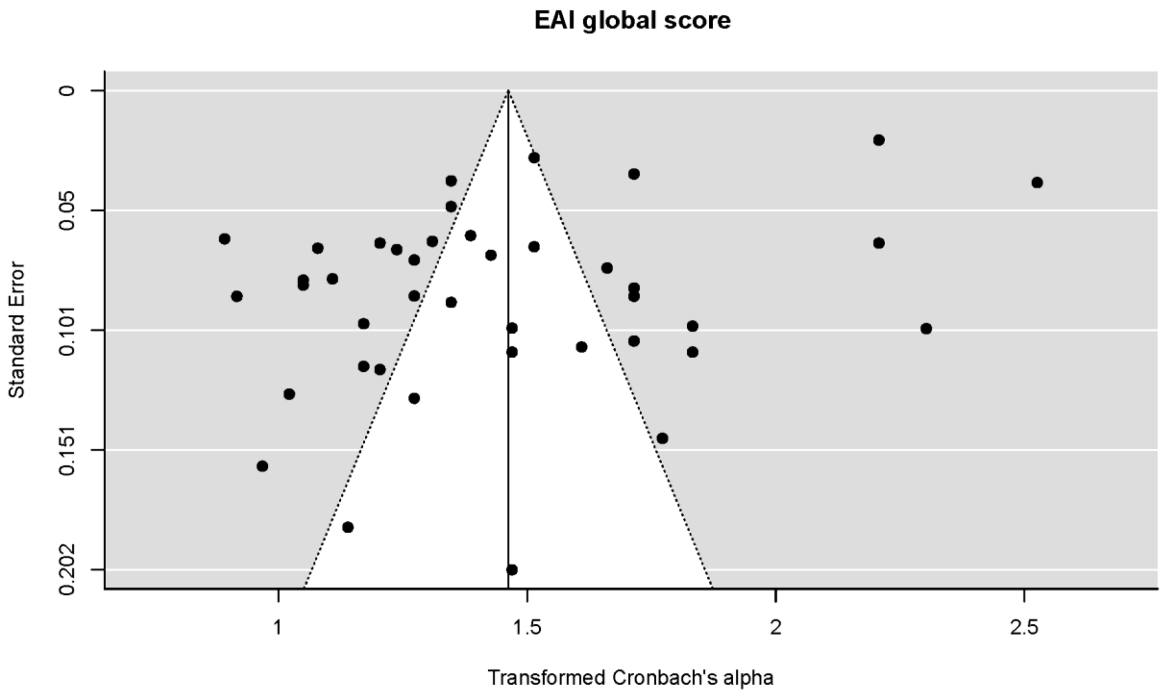
CET- Mood improvement
0
0.059
0.118
0.177
0.236
Standard Error
1
1.5
2
2.5
Transformed Cronbach's alpha

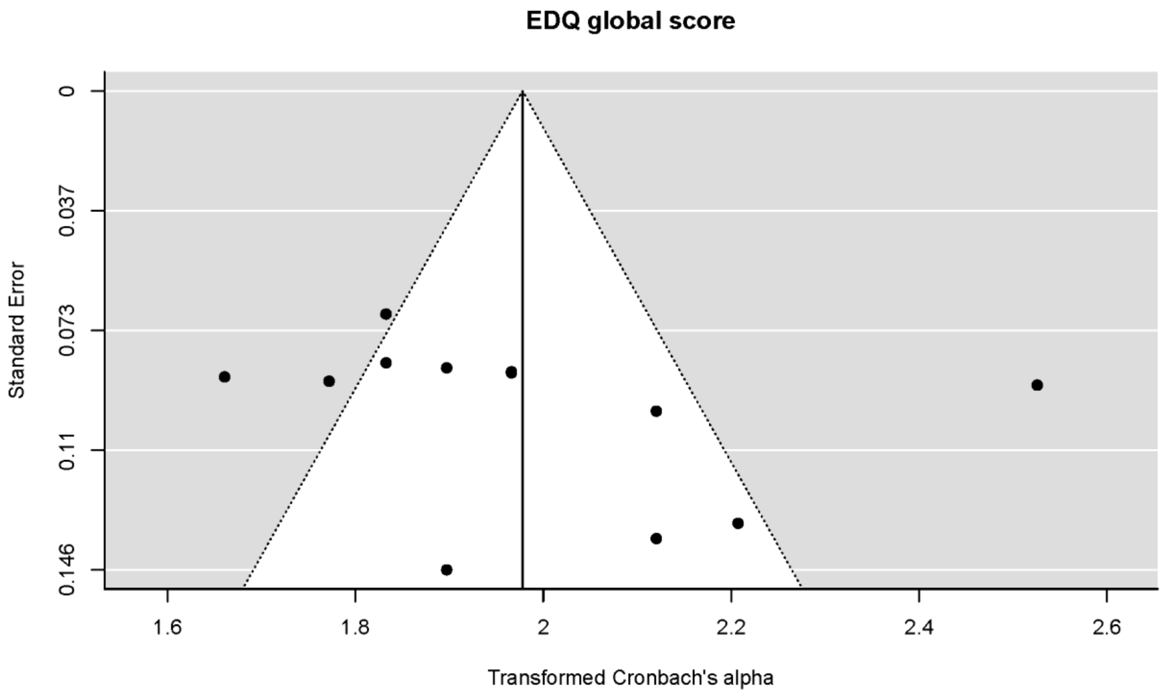
CET-Lack of enjoyment

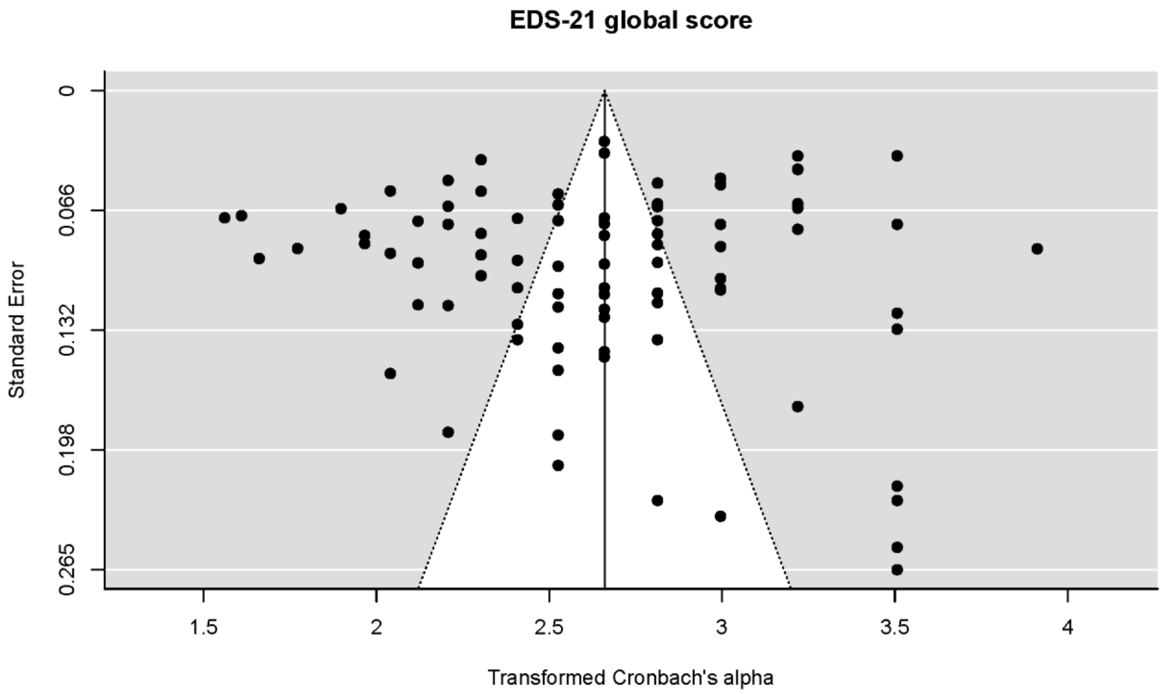


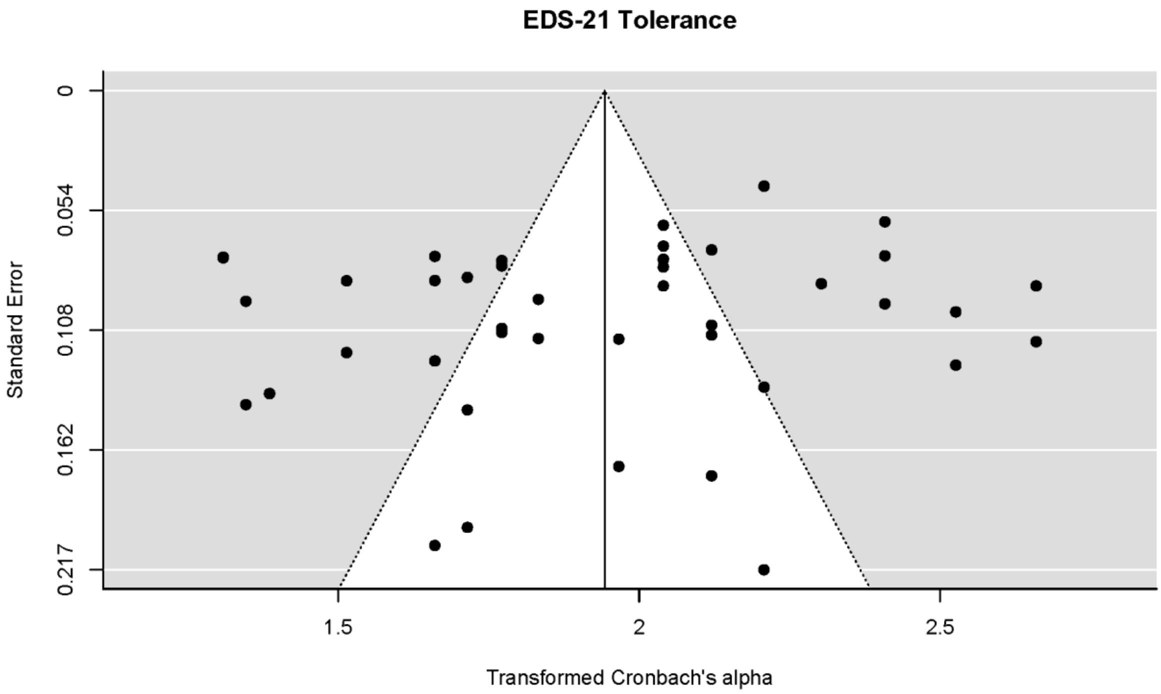
CET- Rigidity

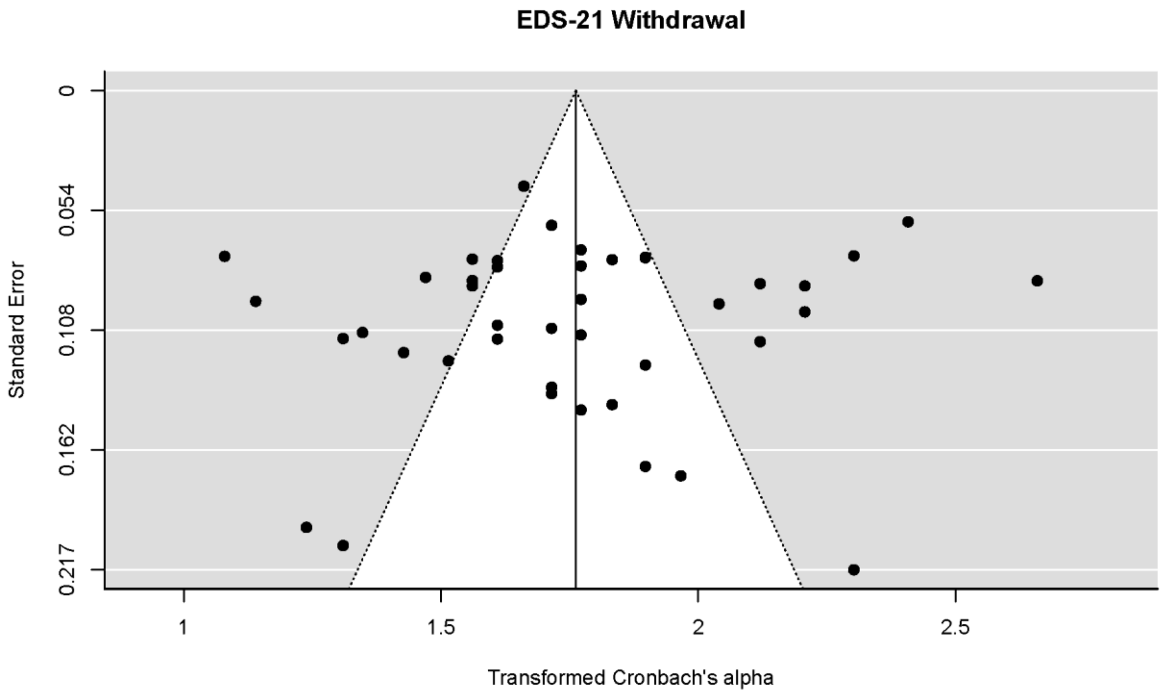


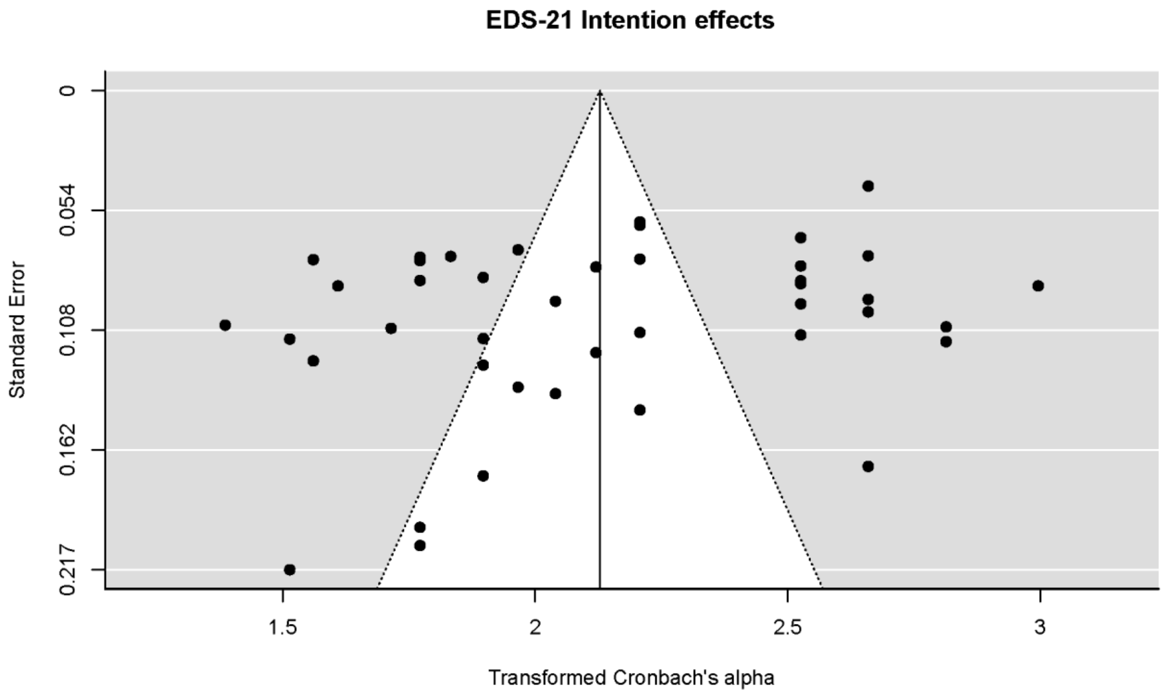

EAI global score
Standard Error
0
0.05
0.101
0.151
0.202
1
1.5
2
2.5
Transformed Cronbach's alpha

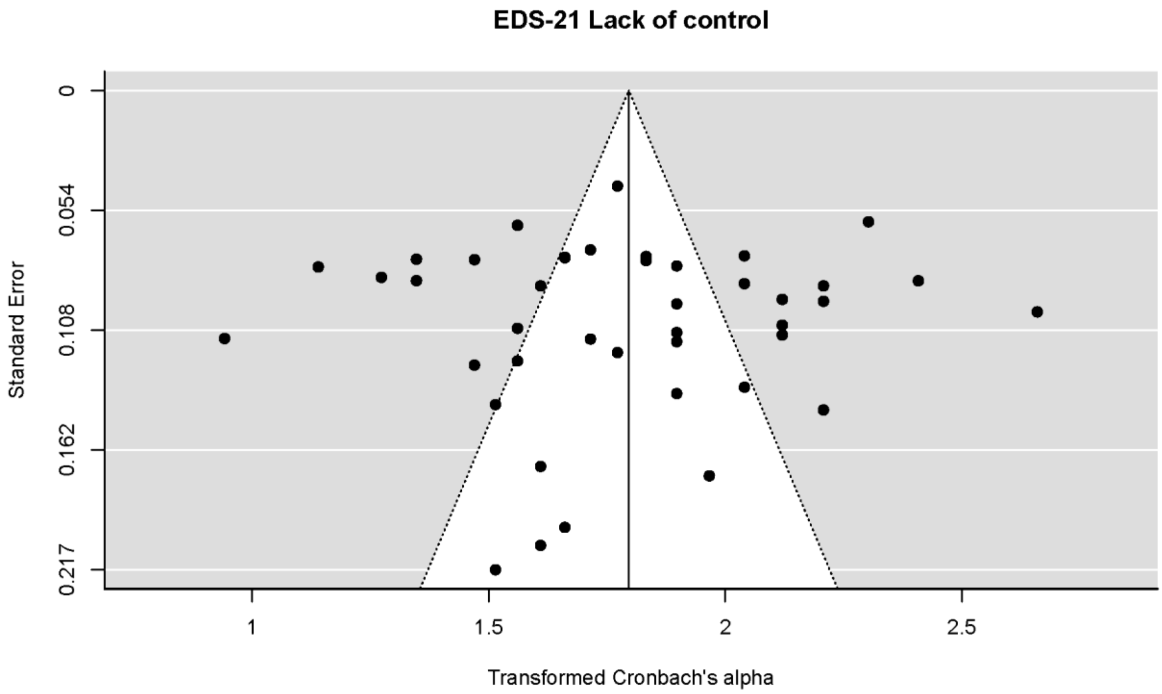

EDQ global score
Standard Error
0
0.037
0.073
0.11
0.146
1.6
1.8
2
2.2
2.4
2.6
Transformed Cronbach's alpha

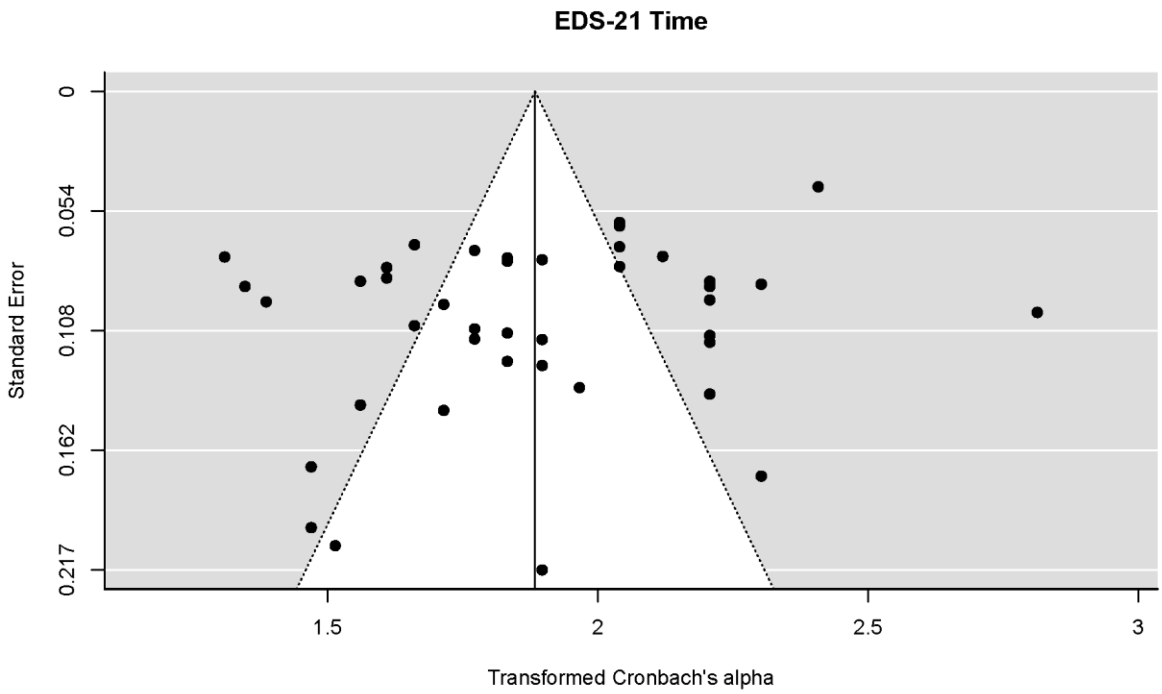

EDS-21 global score
Standard Error
0
0.066
0.132
0.198
0.265
1.5
2
2.5
3
3.5
4
Transformed Cronbach's alpha

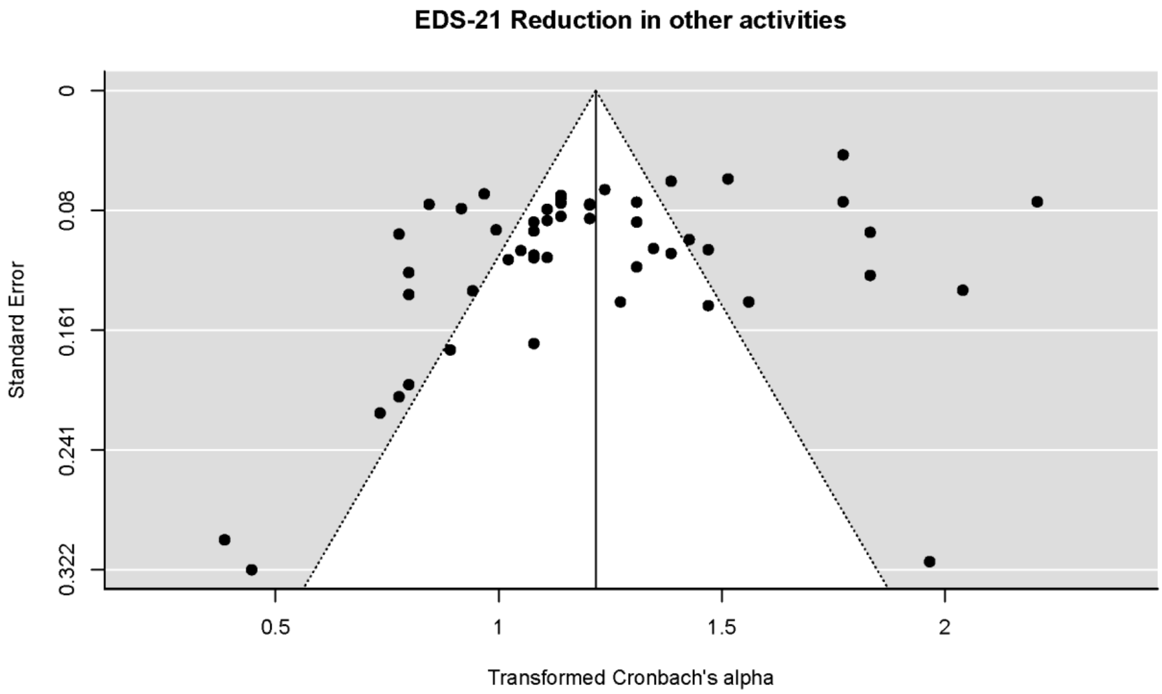

EDS-21 Tolerance
Standard Error
0
0.054
0.108
0.162
0.217
1.5
2
2.5
Transformed Cronbach's alpha

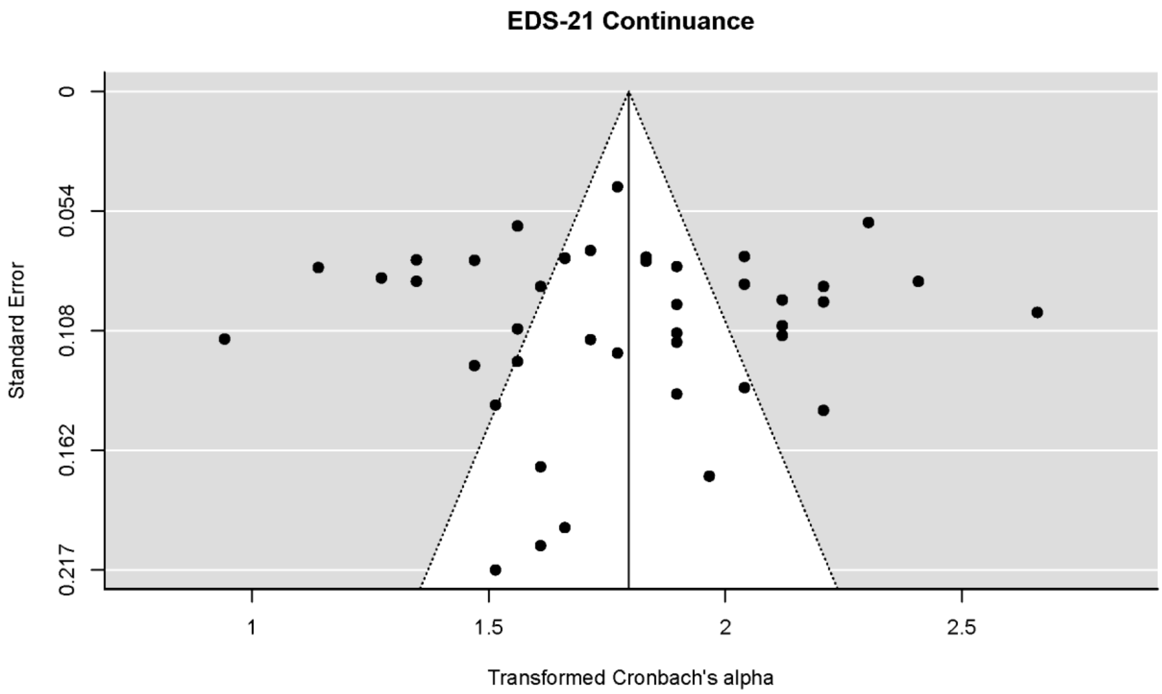

EDS-21 Withdrawal
Standard Error
0
0.054
0.108
0.162
0.217
1
1.5
2
2.5
Transformed Cronbach's alpha

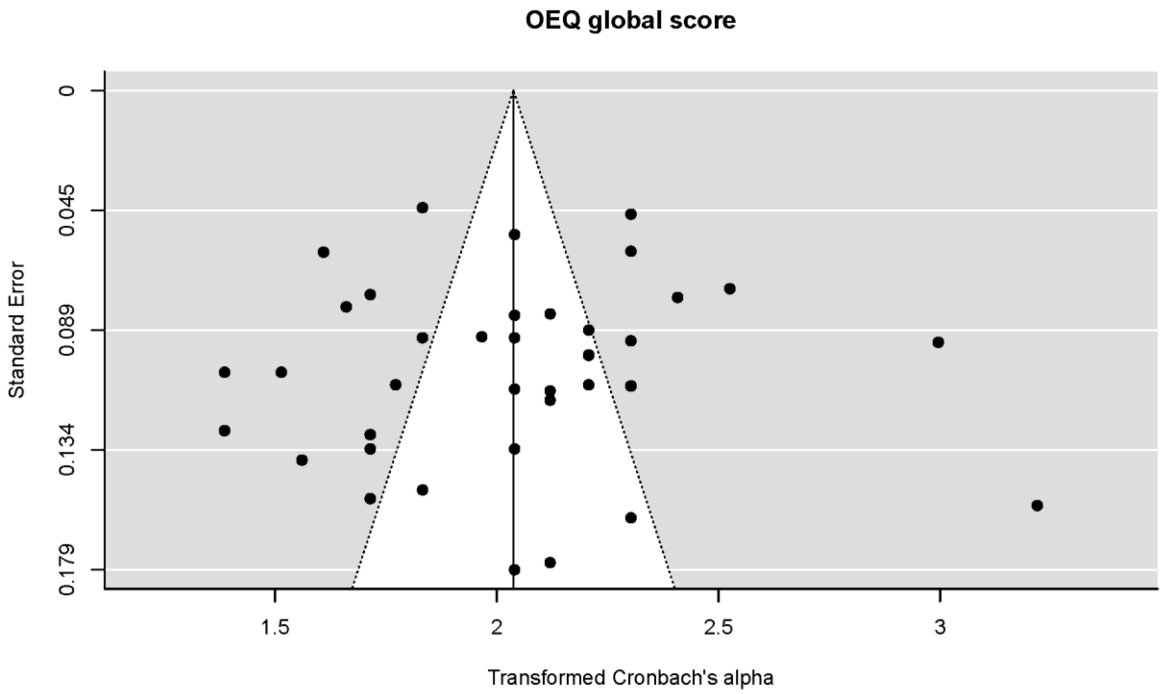

EDS-21 Intention effects
Standard Error
0
0.054
0.108
0.162
0.217
1.5
2
2.5
3
Transformed Cronbach's alpha


EDS-21 Lack of control
Standard Error
0
0.054
0.108
0.162
0.217
1
1.5
2
2.5
Transformed Cronbach's alpha


EDS-21 Time
Standard Error
0
0.054
0.108
0.162
0.217
1.5
2
2.5
3
Transformed Cronbach's alpha

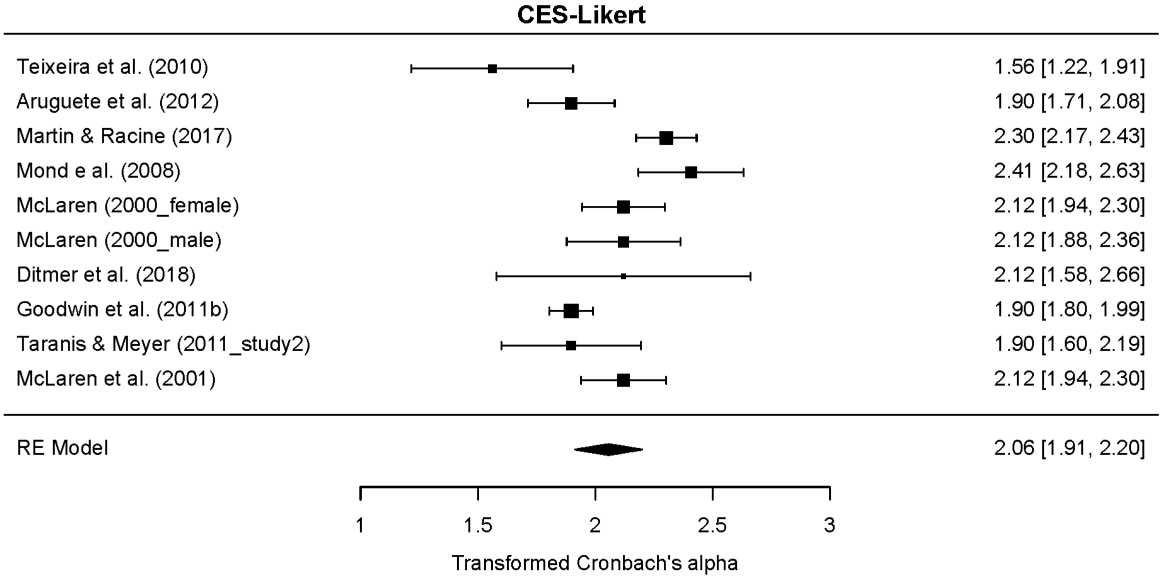

EDS-21 Reduction in other activities
Standard Error
0
0.08
0.161
0.241
0.322
0.5
1
1.5
2
Transformed Cronbach's alpha

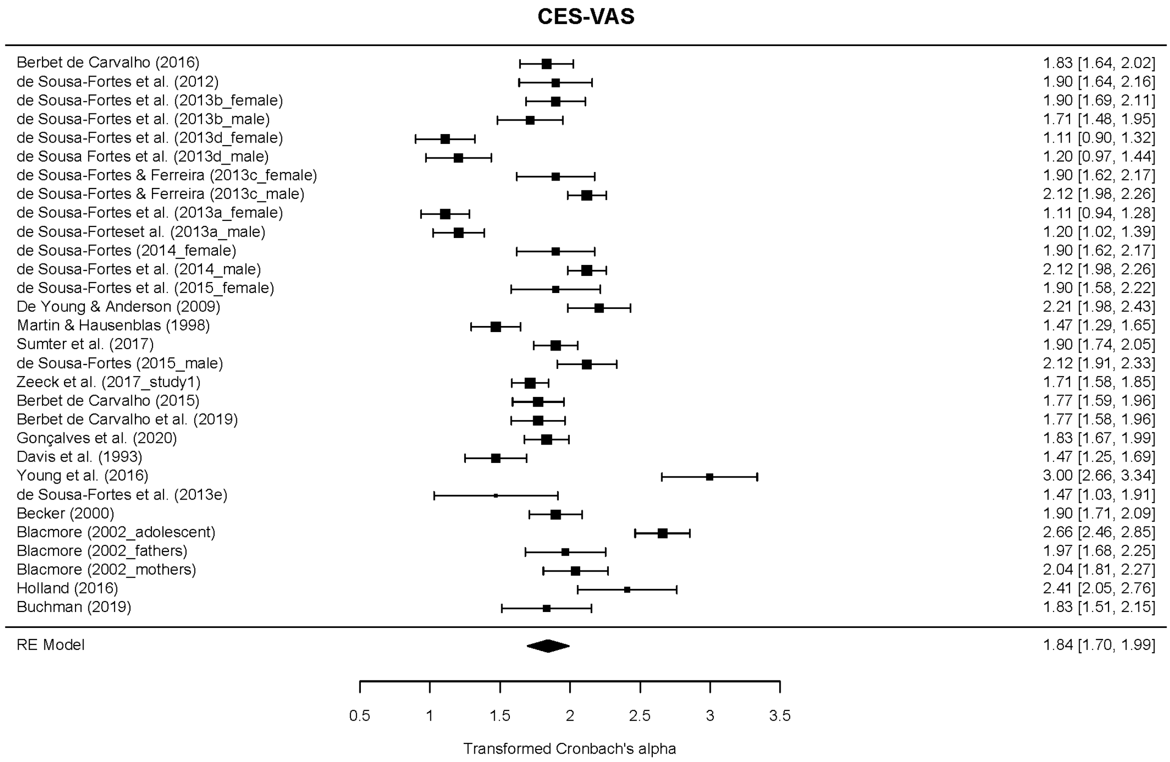

EDS-21 Continuance
Standard Error
0
0.054
0.108
0.162
0.217
1
1.5
2
2.5
Transformed Cronbach's alpha

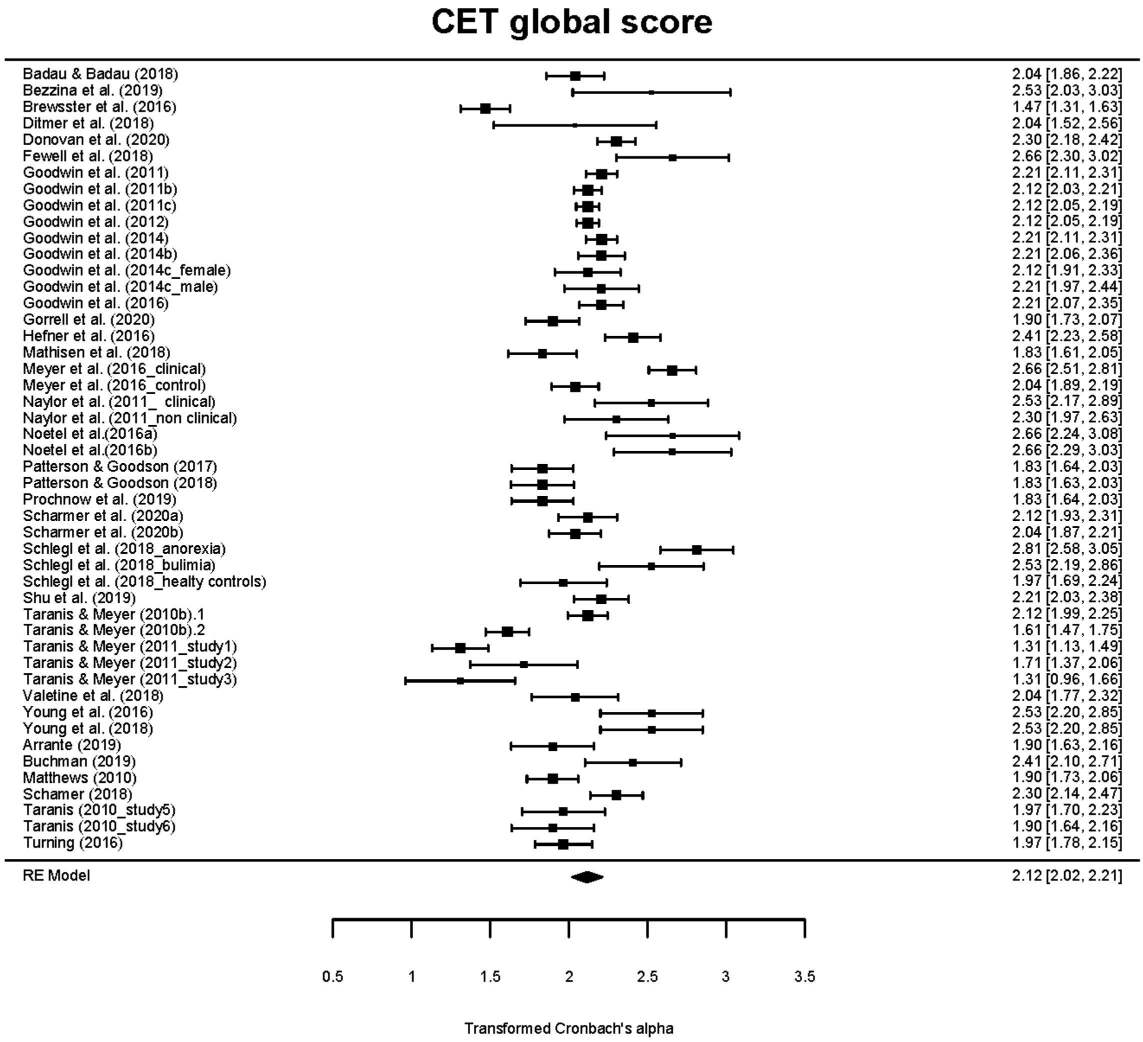


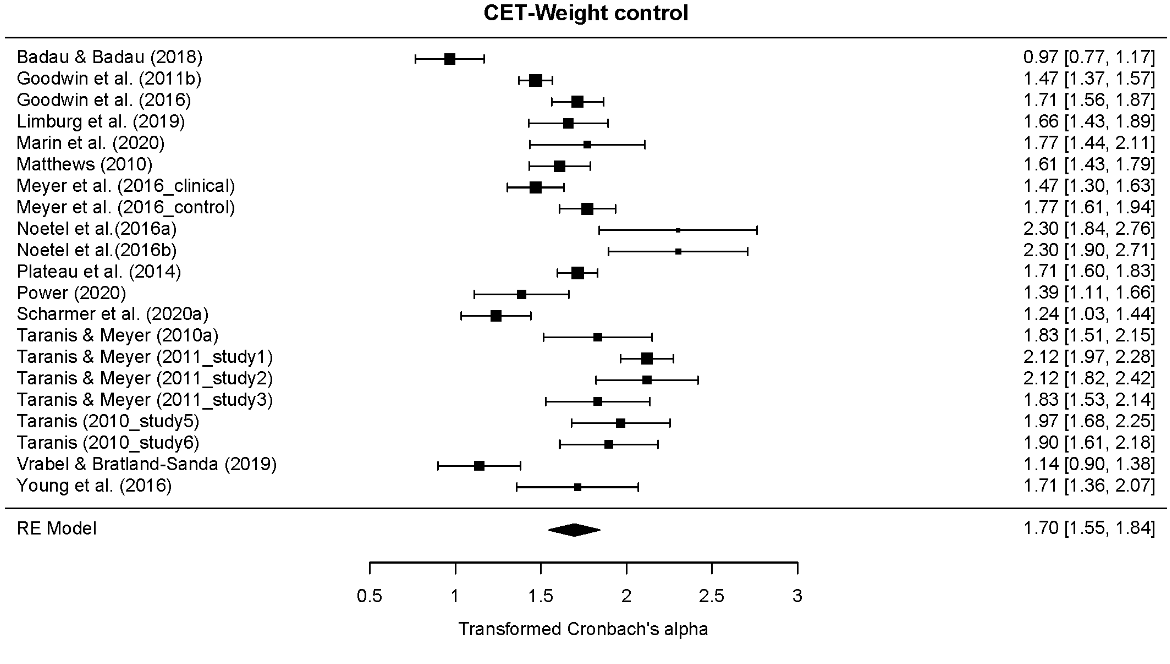
OEQ global score
Standard Error
0
0.045
0.089
0.134
0.179
1.5
2
2.5
3
Transformed Cronbach's alpha

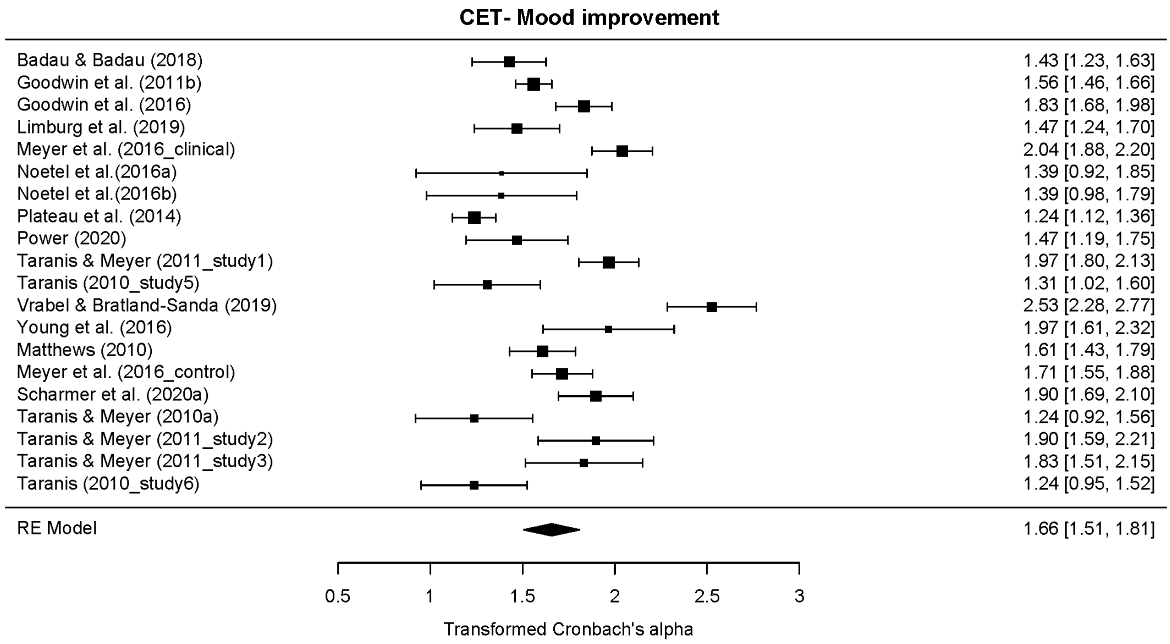
Appendix E: Forest plots by PE

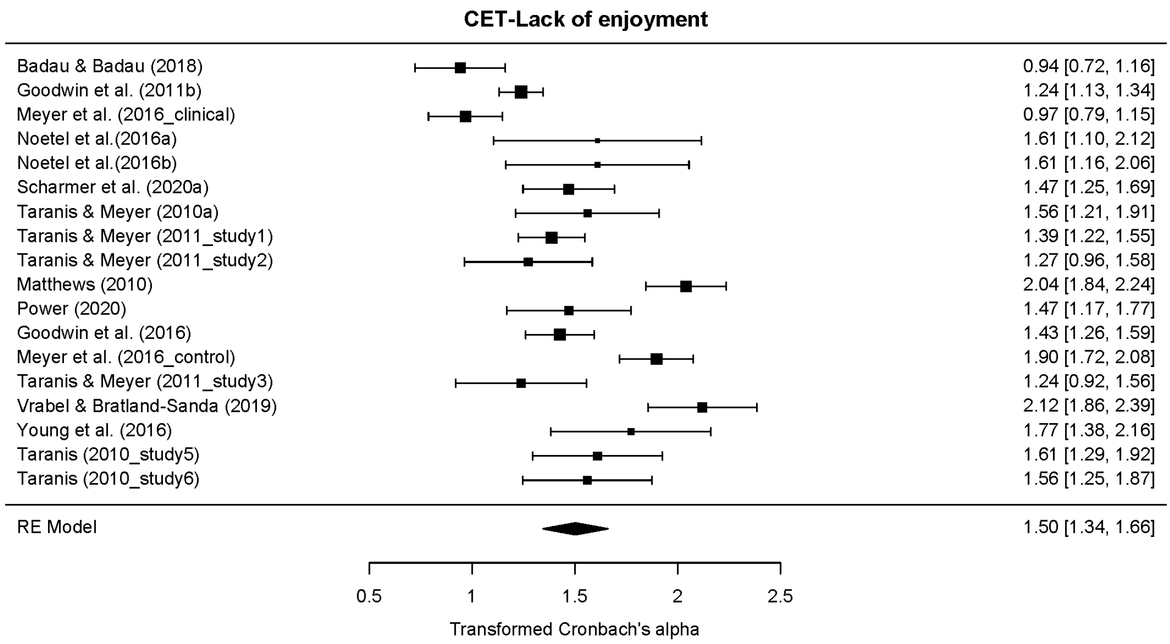


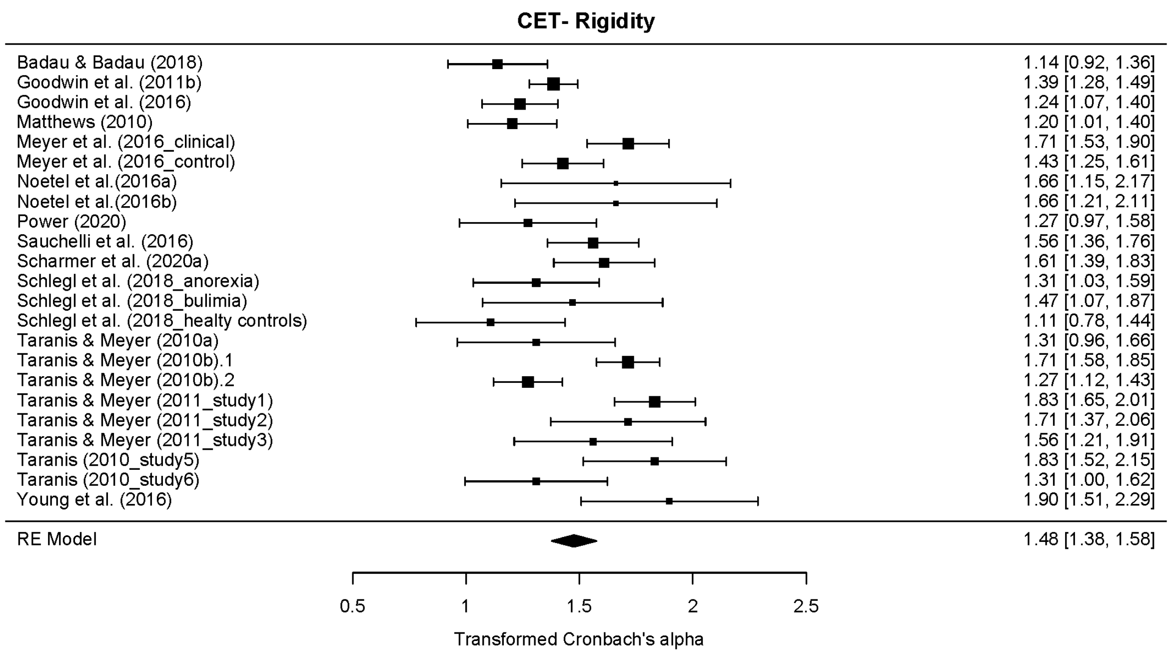



CET global score
Badau & Badau (2018) 2.04 [1.86, 2.22]
Bezzina et al. (2019) 2.53 [2.03, 3.03]
Brewsster et al. (2016) 1.47 [1.31, 1.63]
Ditmer et al. (2018) 2.04 [1.52, 2.56]
Donovan et al. (2020) 2.30 [2.18, 2.42]
Fewell et al. (2018) 2.66 [2.30, 3.02]
Goodwin et al. (2011) 2.21 [2.11, 2.31]
Goodwin et al. (2011b) 2.12 [2.03, 2.21]
Goodwin et al. (2011c) 2.12 [2.05, 2.19]
Goodwin et al. (2012) 2.12 [2.05, 2.19]
Goodwin et al. (2014) 2.21 [2.11, 2.31]
Goodwin et al. (2014b) 2.21 [2.06, 2.36]
Goodwin et al. (2014c_female) 2.12 [1.91, 2.33]
Goodwin et al. (2014c_male) 2.21 [1.97, 2.44]
Goodwin et al. (2016) 2.21 [2.07, 2.35]
Gorrell et al. (2020) 1.90 [1.73, 2.07]
Hefner et al. (2016) 2.41 [2.23, 2.58]
Mathisen et al. (2018) 1.83 [1.61, 2.05]
Meyer et al. (2016_clinical) 2.66 [2.51, 2.81]
Meyer et al. (2016_control) 2.04 [1.89, 2.19]
Naylor et al. (2011_ clinical) 2.53 [2.17, 2.89]
Naylor et al. (2011_non clinical) 2.30 [1.97, 2.63]
Noetel et al.(2016a) 2.66 [2.24, 3.08]
Noetel et al.(2016b) 2.66 [2.29, 3.03]
Patterson & Goodson (2017) 1.83 [1.64, 2.03]
Patterson & Goodson (2018) 1.83 [1.63, 2.03]
Prochnow et al. (2019) 1.83 [1.64, 2.03]
Scharmer et al. (2020a) 2.12 [1.93, 2.31]
Scharmer et al. (2020b) 2.04 [1.87, 2.21]
Schlegl et al. (2018_anorexia) 2.81 [2.58, 3.05]
Schlegl et al. (2018_bulimia) 2.53 [2.19, 2.86]
Schlegl et al. (2018_healty controls) 1.97 [1.69, 2.24]
Shu et al. (2019) 2.21 [2.03, 2.38]
Taranis & Meyer (2010b).1 2.12 [1.99, 2.25]
Taranis & Meyer (2010b).2 1.61 [1.47, 1.75]
Taranis & Meyer (2011_study1) 1.31 [1.13, 1.49]
Taranis & Meyer (2011_study2) 1.71 [1.37, 2.06]
Taranis & Meyer (2011_study3) 1.31 [0.96, 1.66]
Valetine et al. (2018) 2.04 [1.77, 2.32]
Young et al. (2016) 2.53 [2.20, 2.85]
Young et al. (2018) 2.53 [2.20, 2.85]
Arrante (2019) 1.90 [1.63, 2.16]
Buchman (2019) 2.41 [2.10, 2.71]
Matthews (2010) 1.90 [1.73, 2.06]
Schamer (2018) 2.30 [2.14, 2.47]
Taranis (2010_study5) 1.97 [1.70, 2.23]
Taranis (2010_study6) 1.90 [1.64, 2.16]
Turning (2016) 1.97 [1.78, 2.15]
RE Model 2.12 [2.02, 2.21]
0.5 1 1.5 2 2.5 3 3.5
Transformed Cronbach's alpha

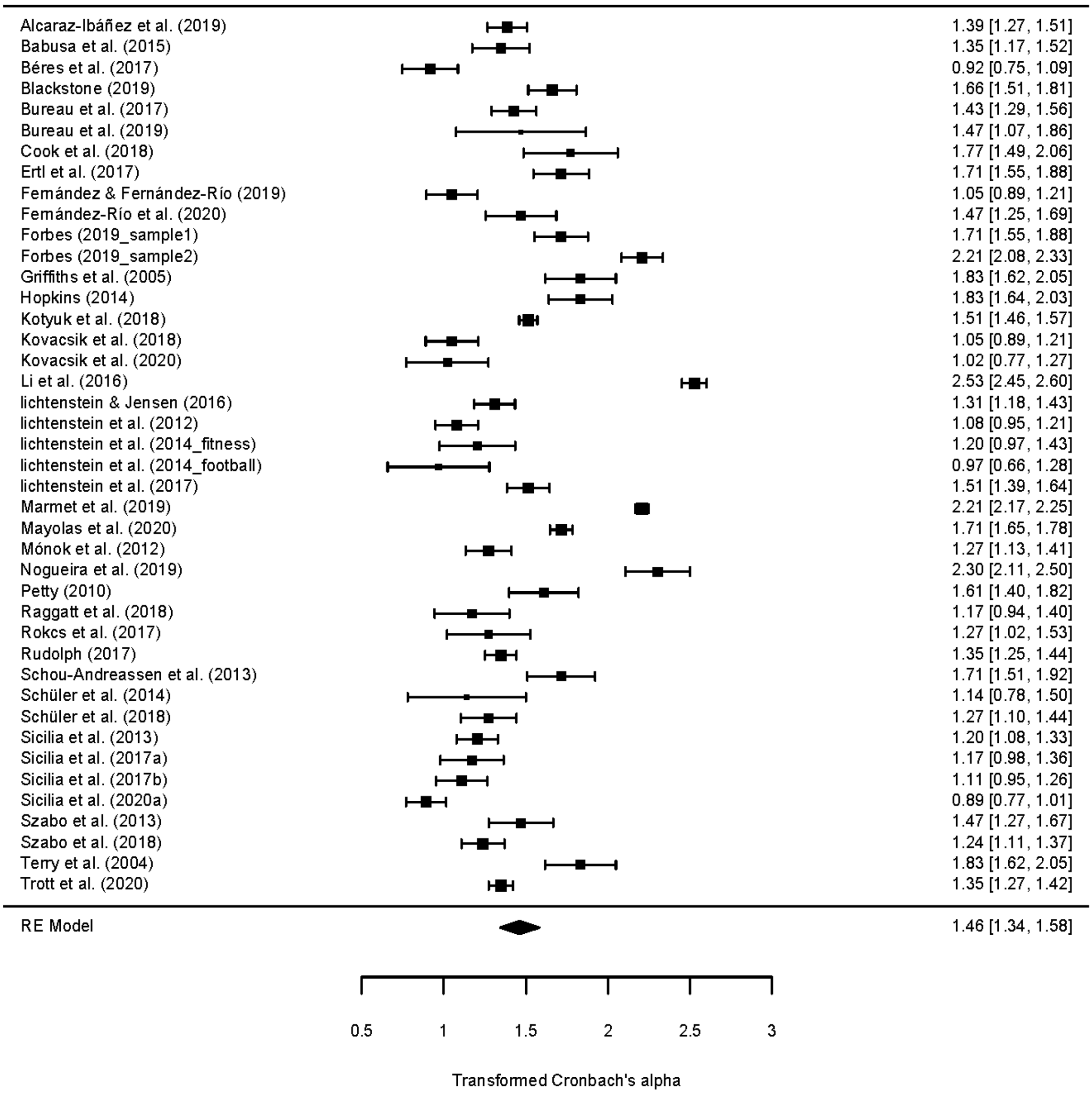

CET-Weight control
Badau & Badau (2018) 0.97 [0.77, 1.17]
Goodwin et al. (2011b) 1.47 [1.37, 1.57]
Goodwin et al. (2016) 1.71 [1.56, 1.87]
Limburg et al. (2019) 1.66 [1.43, 1.89]
Marin et al. (2020) 1.77 [1.44, 2.11]
Matthews (2010) 1.61 [1.43, 1.79]
Meyer et al. (2016_clinical) 1.47 [1.30, 1.63]
Meyer et al. (2016_control) 1.77 [1.61, 1.94]
Noetel et al.(2016a) 2.30 [1.84, 2.76]
Noetel et al.(2016b) 2.30 [1.90, 2.71]
Plateau et al. (2014) 1.71 [1.60, 1.83]
Power (2020) 1.39 [1.11, 1.66]
Scharmer et al. (2020a) 1.24 [1.03, 1.44]
Taranis & Meyer (2010a) 1.83 [1.51, 2.15]
Taranis & Meyer (2011_study1) 2.12 [1.97, 2.28]
Taranis & Meyer (2011_study2) 2.12 [1.82, 2.42]
Taranis & Meyer (2011_study3) 1.83 [1.53, 2.14]
Taranis (2010_study5) 1.97 [1.68, 2.25]
Taranis (2010_study6) 1.90 [1.61, 2.18]
Vrabel & Bratland-Sanda (2019) 1.14 [0.90, 1.38]
Young et al. (2016) 1.71 [1.36, 2.07]
RE Model 1.70 [1.55, 1.84]
0.5 1 1.5 2 2.5 3
Transformed Cronbach's alpha

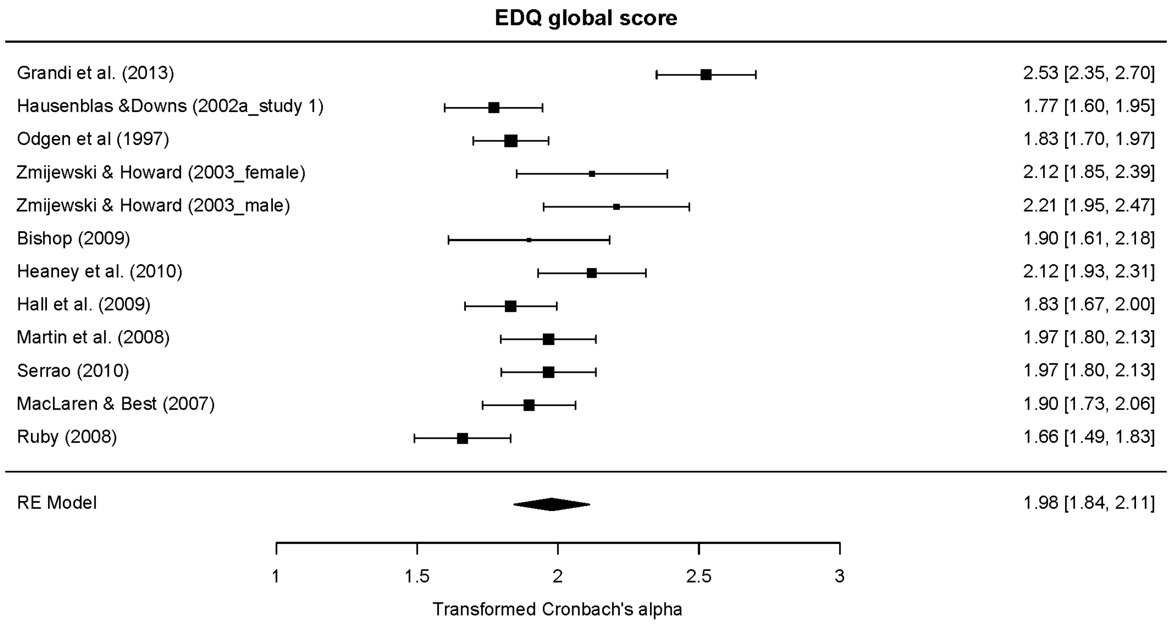

CET- Mood improvement
Badau & Badau (2018) 1.43 [1.23, 1.63]
Goodwin et al. (2011b) 1.56 [1.46, 1.66]
Goodwin et al. (2016) 1.83 [1.68, 1.98]
Limburg et al. (2019) 1.47 [1.24, 1.70]
Meyer et al. (2016_clinical) 2.04 [1.88, 2.20]
Noetel et al.(2016a) 1.39 [0.92, 1.85]
Noetel et al.(2016b) 1.39 [0.98, 1.79]
Plateau et al. (2014) 1.24 [1.12, 1.36]
Power (2020) 1.47 [1.19, 1.75]
Taranis & Meyer (2011_study1) 1.97 [1.80, 2.13]
Taranis (2010_study5) 1.31 [1.02, 1.60]
Vrabel & Bratland-Sanda (2019) 2.53 [2.28, 2.77]
Young et al. (2016) 1.97 [1.61, 2.32]
Matthews (2010) 1.61 [1.43, 1.79]
Meyer et al. (2016_control) 1.71 [1.55, 1.88]
Scharmer et al. (2020a) 1.90 [1.69, 2.10]
Taranis & Meyer (2010a) 1.24 [0.92, 1.56]
Taranis & Meyer (2011_study2) 1.90 [1.59, 2.21]
Taranis & Meyer (2011_study3) 1.83 [1.51, 2.15]
Taranis (2010_study6) 1.24 [0.95, 1.52]
RE Model 1.66 [1.51, 1.81]
0.5 1 1.5 2 2.5 3
Transformed Cronbach's alpha

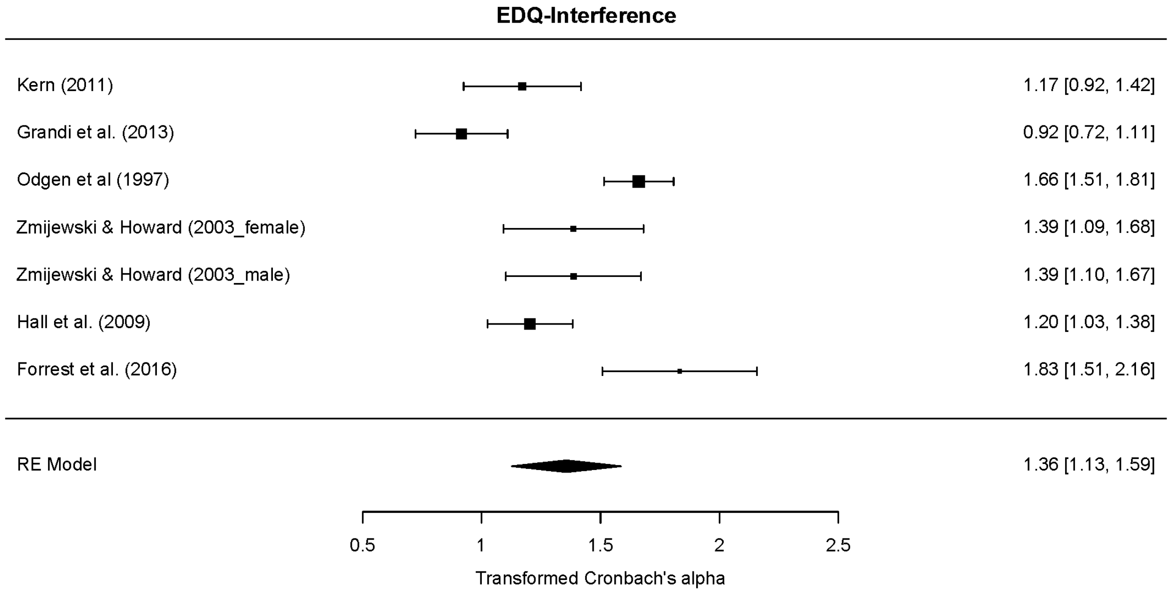

CET-Lack of enjoyment
Badau & Badau (2018) 0.94 [0.72, 1.16]
Goodwin et al. (2011b) 1.24 [1.13, 1.34]
Meyer et al. (2016_clinical) 0.97 [0.79, 1.15]
Noetel et al.(2016a) 1.61 [1.10, 2.12]
Noetel et al.(2016b) 1.61 [1.16, 2.06]
Scharmer et al. (2020a) 1.47 [1.25, 1.69]
Taranis & Meyer (2010a) 1.56 [1.21, 1.91]
Taranis & Meyer (2011_study1) 1.39 [1.22, 1.55]
Taranis & Meyer (2011_study2) 1.27 [0.96, 1.58]
Matthews (2010) 2.04 [1.84, 2.24]
Power (2020) 1.47 [1.17, 1.77]
Goodwin et al. (2016) 1.43 [1.26, 1.59]
Meyer et al. (2016_control) 1.90 [1.72, 2.08]
Taranis & Meyer (2011_study3) 1.24 [0.92, 1.56]
Vrabel & Bratland-Sanda (2019) 2.12 [1.86, 2.39]
Young et al. (2016) 1.77 [1.38, 2.16]
Taranis (2010_study5) 1.61 [1.29, 1.92]
Taranis (2010_study6) 1.56 [1.25, 1.87]
RE Model 1.50 [1.34, 1.66]
0.5 1 1.5 2 2.5
Transformed Cronbach's alpha

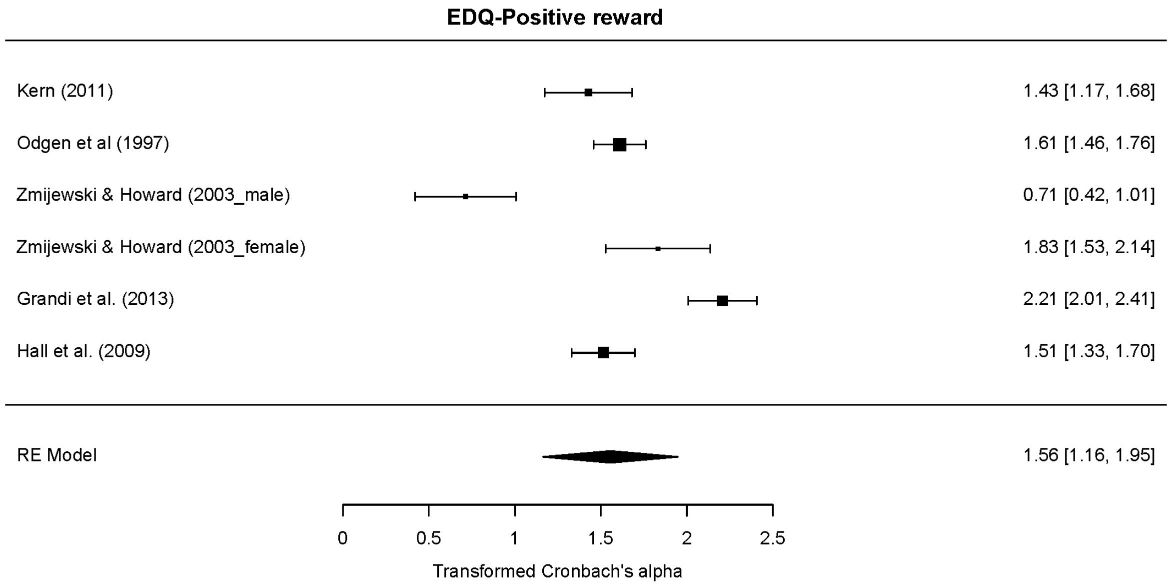

CET- Rigidity
Badau & Badau (2018) 1.14 [0.92, 1.36]
Goodwin et al. (2011b) 1.39 [1.28, 1.49]
Goodwin et al. (2016) 1.24 [1.07, 1.40]
Matthews (2010) 1.20 [1.01, 1.40]
Meyer et al. (2016_clinical) 1.71 [1.53, 1.90]
Meyer et al. (2016_control) 1.43 [1.25, 1.61]
Noetel et al.(2016a) 1.66 [1.15, 2.17]
Noetel et al.(2016b) 1.66 [1.21, 2.11]
Power (2020) 1.27 [0.97, 1.58]
Sauchelli et al. (2016) 1.56 [1.36, 1.76]
Scharmer et al. (2020a) 1.61 [1.39, 1.83]
Schlegl et al. (2018_anorexia) 1.31 [1.03, 1.59]
Schlegl et al. (2018_bulimia) 1.47 [1.07, 1.87]
Schlegl et al. (2018_healty controls) 1.11 [0.78, 1.44]
Taranis & Meyer (2010a) 1.31 [0.96, 1.66]
Taranis & Meyer (2010b).1 1.71 [1.58, 1.85]
Taranis & Meyer (2010b).2 1.27 [1.12, 1.43]
Taranis & Meyer (2011_study1) 1.83 [1.65, 2.01]
Taranis & Meyer (2011_study2) 1.71 [1.37, 2.06]
Taranis & Meyer (2011_study3) 1.56 [1.21, 1.91]
Taranis (2010_study5) 1.83 [1.52, 2.15]
Taranis (2010_study6) 1.31 [1.00, 1.62]
Young et al. (2016) 1.90 [1.51, 2.29]
RE Model 1.48 [1.38, 1.58]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

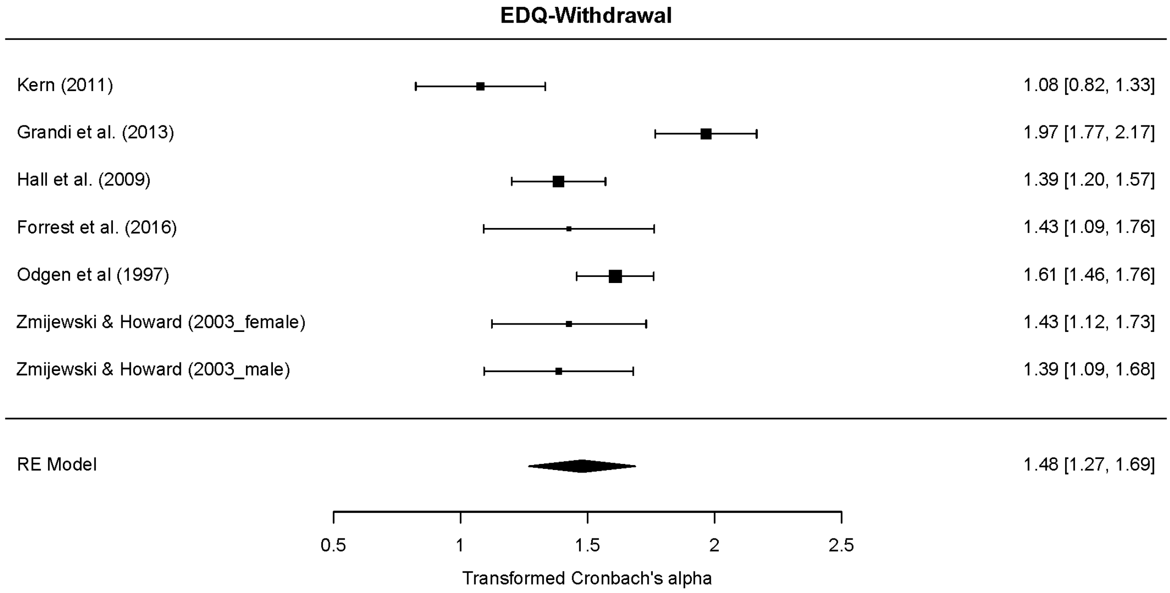
EAI global score

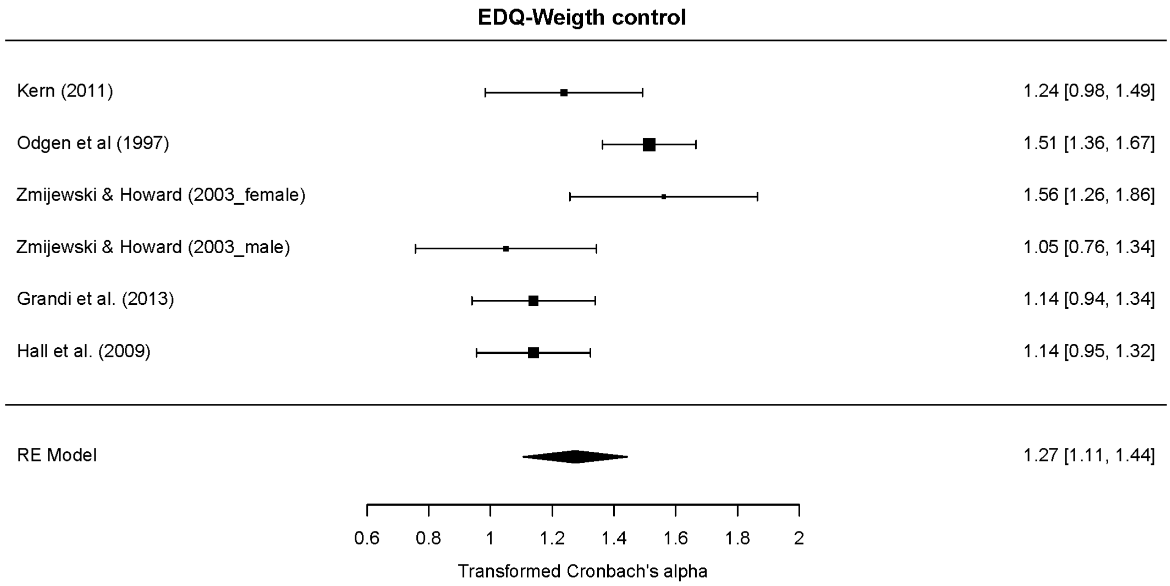


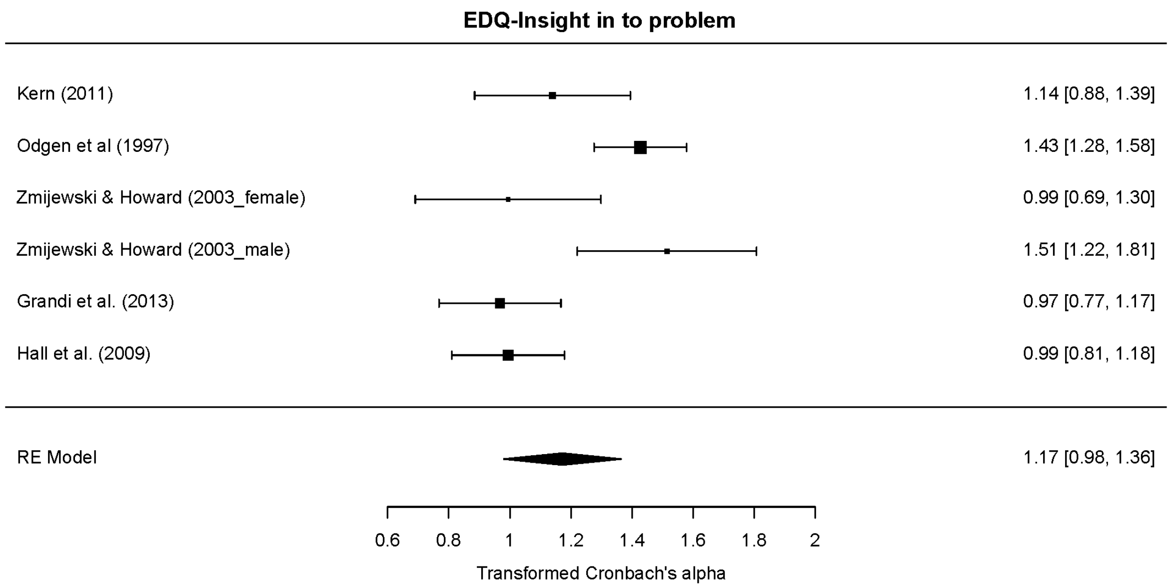

EDQ global score
Grandi et al. (2013) 2.53 [2.35, 2.70]
Hausenblas &Downs (2002a_study 1) 1.77 [1.60, 1.95]
Odgen et al (1997) 1.83 [1.70, 1.97]
Zmijewski & Howard (2003_female) 2.12 [1.85, 2.39]
Zmijewski & Howard (2003_male) 2.21 [1.95, 2.47]
Bishop (2009) 1.90 [1.61, 2.18]
Heaney et al. (2010) 2.12 [1.93, 2.31]
Hall et al. (2009) 1.83 [1.67, 2.00]
Martin et al. (2008) 1.97 [1.80, 2.13]
Serrao (2010) 1.97 [1.80, 2.13]
MacLaren & Best (2007) 1.90 [1.73, 2.06]
Ruby (2008) 1.66 [1.49, 1.83]
RE Model 1.98 [1.84, 2.11]
1
1.5
2
2.5
3
Transformed Cronbach's alpha

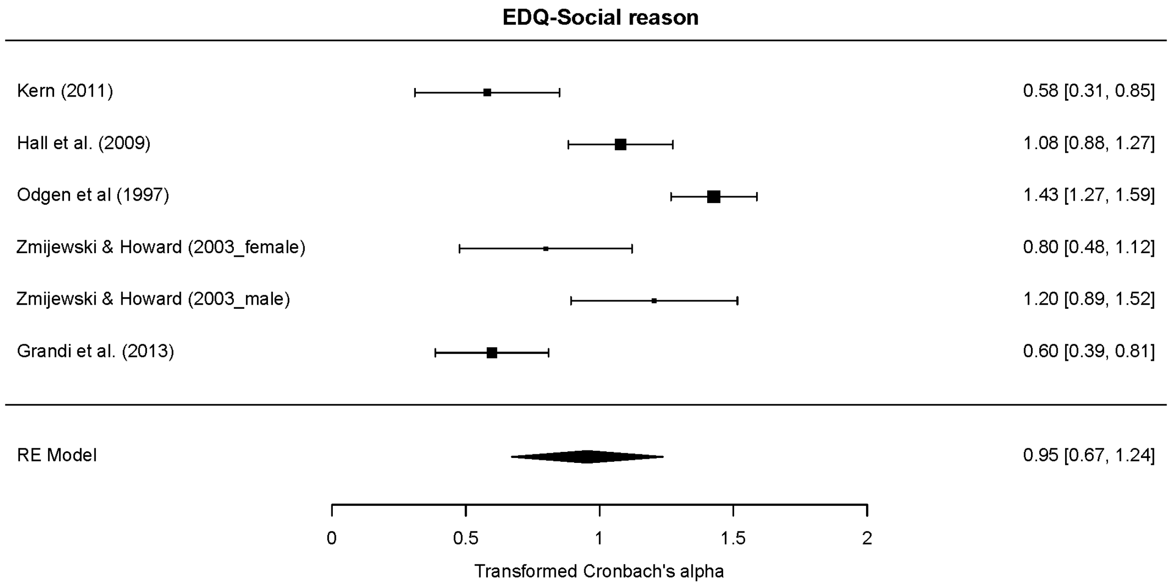

EDQ-Interference
Kern (2011) 1.17 [0.92, 1.42]
Grandi et al. (2013) 0.92 [0.72, 1.11]
Odgen et al (1997) 1.66 [1.51, 1.81]
Zmijewski & Howard (2003_female) 1.39 [1.09, 1.68]
Zmijewski & Howard (2003_male) 1.39 [1.10, 1.67]
Hall et al. (2009) 1.20 [1.03, 1.38]
Forrest et al. (2016) 1.83 [1.51, 2.16]
RE Model 1.36 [1.13, 1.59]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

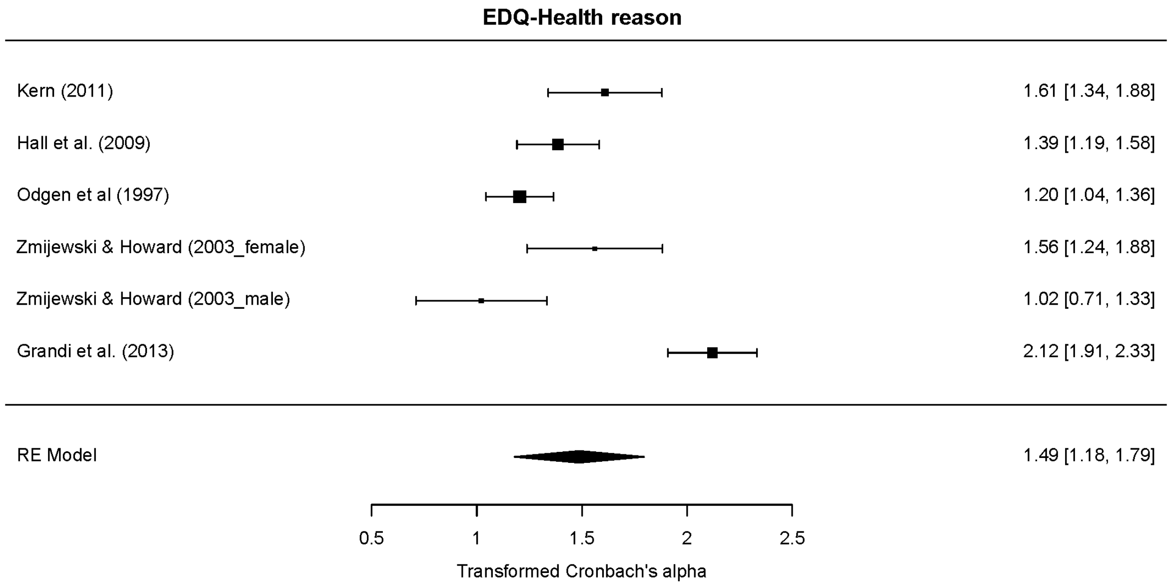

EDQ-Positive reward
Kern (2011)
1.43 [1.17, 1.68]
Odgen et al (1997)
1.61 [1.46, 1.76]
Zmijewski & Howard (2003_male)
0.71 [0.42, 1.01]
Zmijewski & Howard (2003_female)
1.83 [1.53, 2.14]
Grandi et al. (2013)
2.21 [2.01, 2.41]
Hall et al. (2009)
1.51 [1.33, 1.70]
RE Model
1.56 [1.16, 1.95]
0
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

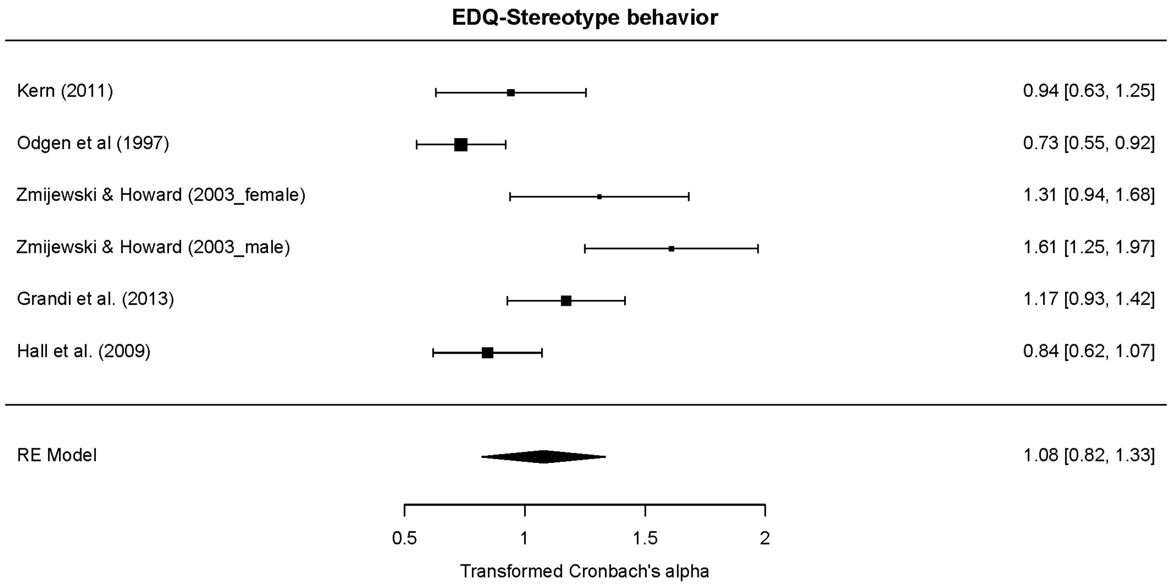

EDQ-Withdrawal
Kern (2011)
1.08 [0.82, 1.33]
Grandi et al. (2013)
1.97 [1.77, 2.17]
Hall et al. (2009)
1.39 [1.20, 1.57]
Forrest et al. (2016)
1.43 [1.09, 1.76]
Odgen et al (1997)
1.61 [1.46, 1.76]
Zmijewski & Howard (2003_female)
1.43 [1.12, 1.73]
Zmijewski & Howard (2003_male)
1.39 [1.09, 1.68]
RE Model
1.48 [1.27, 1.69]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

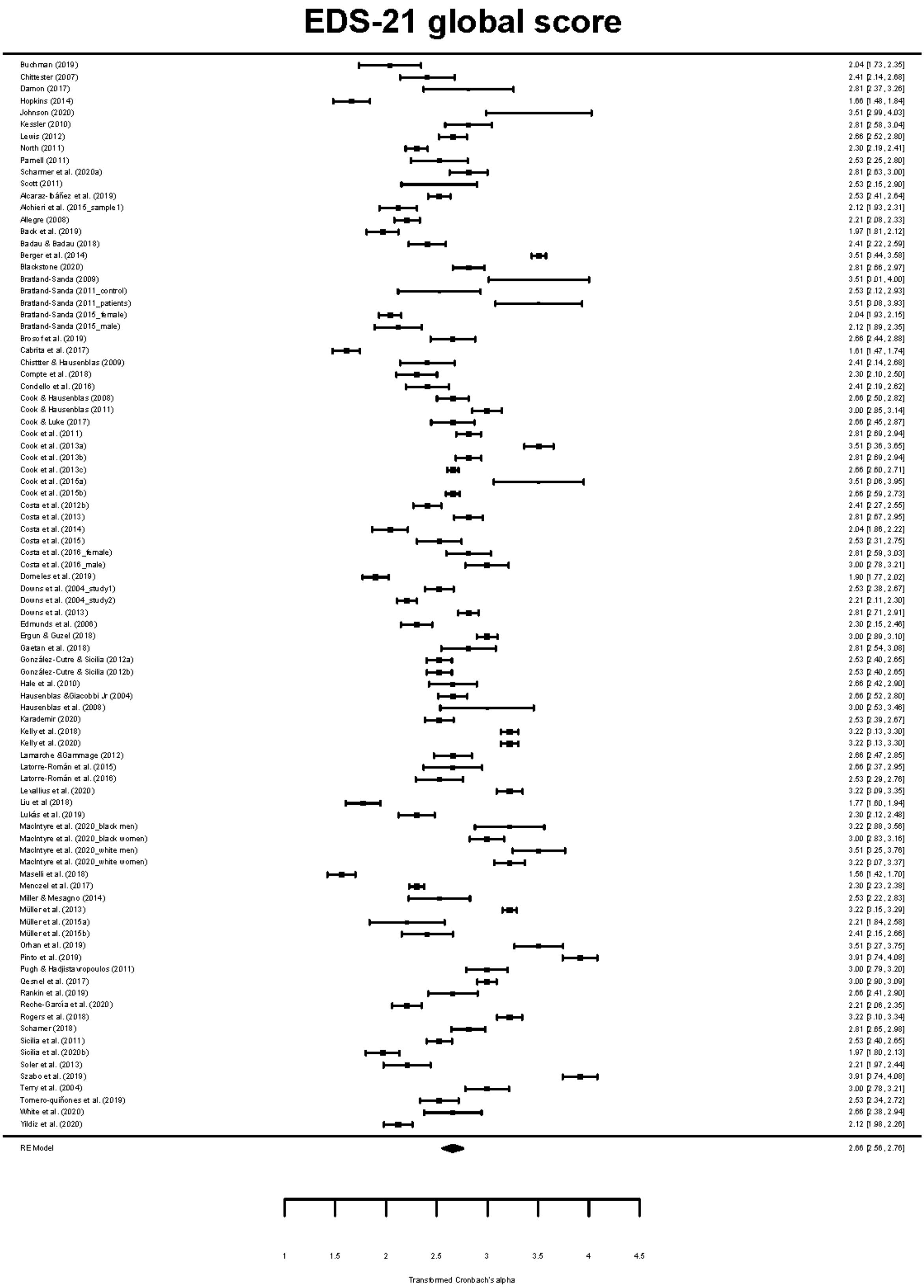

EDQ-Weigth control
Kern (2011)
Odgen et al (1997)
Zmijewski & Howard (2003_female)
Zmijewski & Howard (2003_male)
Grandi et al. (2013)
Hall et al. (2009)
RE Model
1.24 [0.98, 1.49]
1.51 [1.36, 1.67]
1.56 [1.26, 1.86]
1.05 [0.76, 1.34]
1.14 [0.94, 1.34]
1.14 [0.95, 1.32]
1.27 [1.11, 1.44]
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Transformed Cronbach's alpha

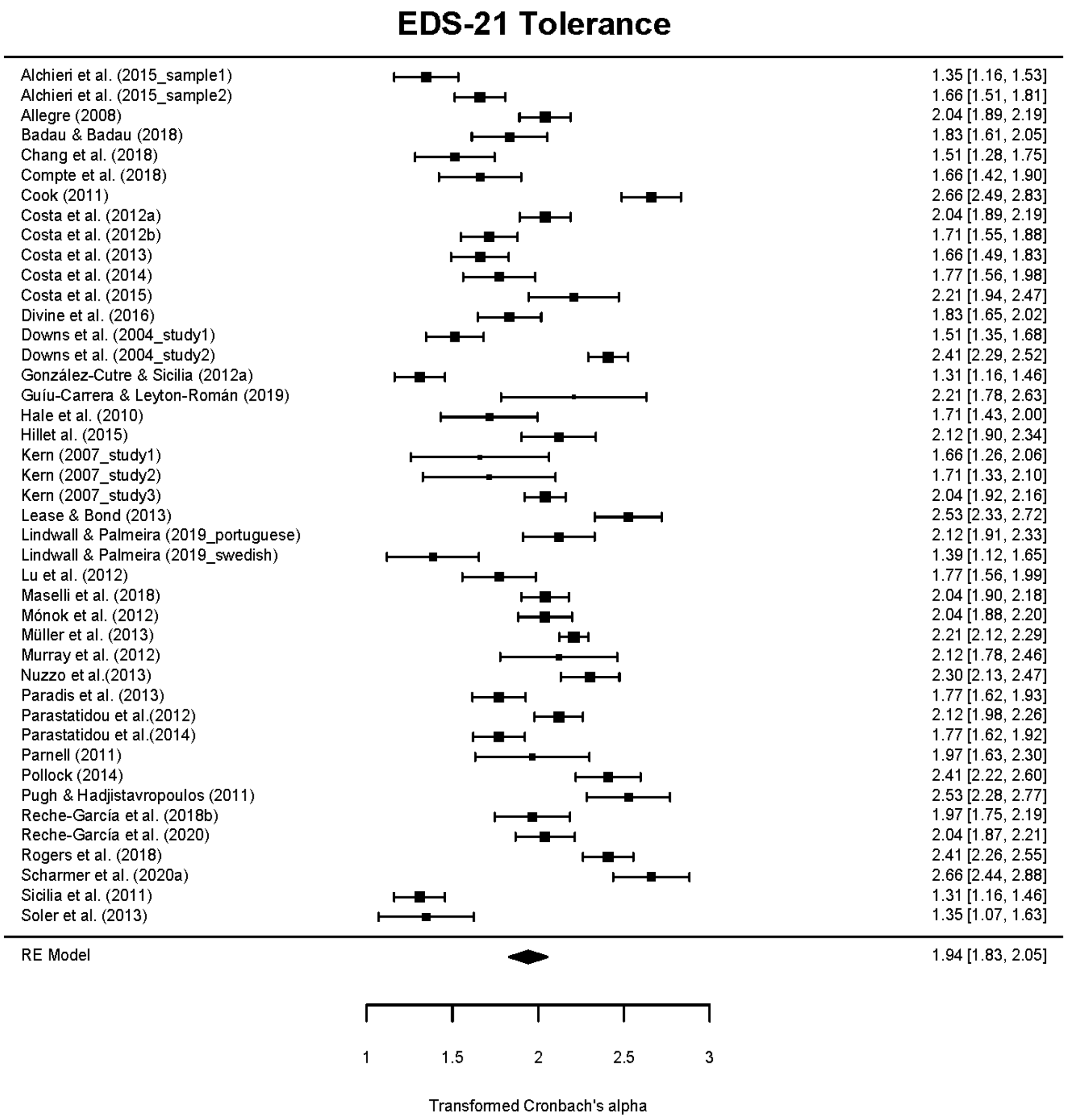

EDQ-Insight in to problem
Kern (2011)
Odgen et al (1997)
Zmijewski & Howard (2003_female)
Zmijewski & Howard (2003_male)
Grandi et al. (2013)
Hall et al. (2009)
RE Model
1.14 [0.88, 1.39]
1.43 [1.28, 1.58]
0.99 [0.69, 1.30]
1.51 [1.22, 1.81]
0.97 [0.77, 1.17]
0.99 [0.81, 1.18]
1.17 [0.98, 1.36]
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Transformed Cronbach's alpha

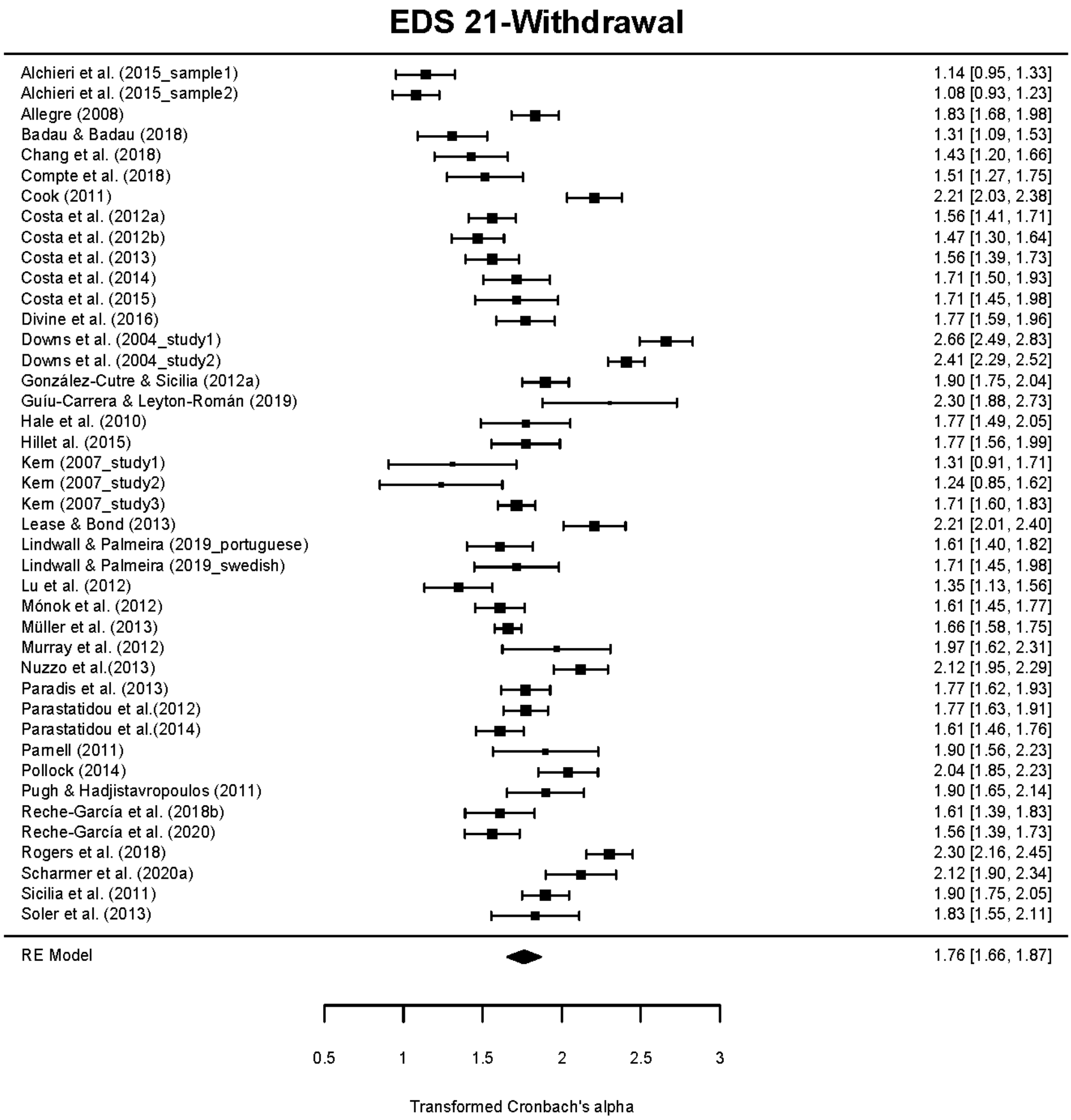

EDQ-Social reason
Kern (2011)
0.58 [0.31, 0.85]
Hall et al. (2009)
1.08 [0.88, 1.27]
Odgen et al (1997)
1.43 [1.27, 1.59]
Zmijewski & Howard (2003_female)
0.80 [0.48, 1.12]
Zmijewski & Howard (2003_male)
1.20 [0.89, 1.52]
Grandi et al. (2013)
0.60 [0.39, 0.81]
RE Model
0.95 [0.67, 1.24]
0
0.5
1
1.5
2
Transformed Cronbach's alpha


EDQ-Health reason
Kern (2011)
1.61 [1.34, 1.88]
Hall et al. (2009)
1.39 [1.19, 1.58]
Odgen et al (1997)
1.20 [1.04, 1.36]
Zmijewski & Howard (2003_female)
1.56 [1.24, 1.88]
Zmijewski & Howard (2003_male)
1.02 [0.71, 1.33]
Grandi et al. (2013)
2.12 [1.91, 2.33]
RE Model
1.49 [1.18, 1.79]
0.5
1
1.5
2
2.5
Transformed Cronbach's alpha

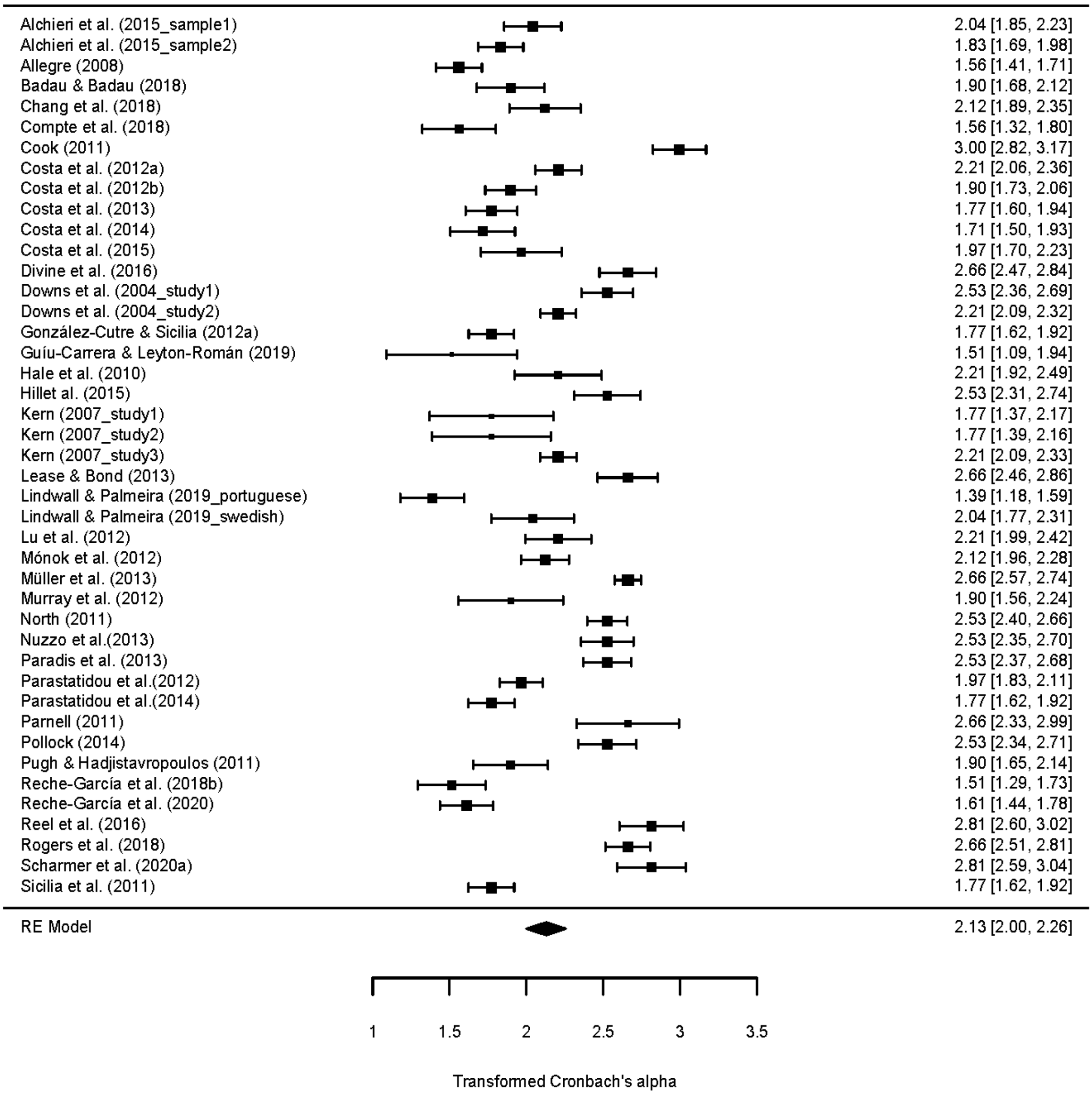

EDQ-Stereotype behavior
Kern (2011)
0.94 [0.63, 1.25]
Odgen et al (1997)
0.73 [0.55, 0.92]
Zmijewski & Howard (2003_female)
1.31 [0.94, 1.68]
Zmijewski & Howard (2003_male)
1.61 [1.25, 1.97]
Grandi et al. (2013)
1.17 [0.93, 1.42]
Hall et al. (2009)
0.84 [0.62, 1.07]
RE Model
1.08 [0.82, 1.33]
0.5
1
1.5
2
Transformed Cronbach's alpha


EDS-21 global score
Buchman (2019) 2.04 [1.73, 2.35]
Chittester (2007) 2.41 [2.14, 2.68]
Damon (2017) 2.81 [2.37, 3.26]
Hopkins (2014) 1.66 [1.48, 1.84]
Johnson (2020) 3.51 [2.99, 4.03]
Kessler (2010) 2.81 [2.58, 3.04]
Lewis (2012) 2.66 [2.52, 2.80]
North (2011) 2.30 [2.19, 2.41]
Parnell (2011) 2.53 [2.25, 2.80]
Scharmer et al. (2020a) 2.81 [2.63, 3.00]
Scott (2011) 2.53 [2.15, 2.90]
Alcaraz-Ibáñez et al. (2019) 2.53 [2.41, 2.64]
Alchieri et al. (2015_sample1) 2.12 [1.93, 2.31]
Allegre (2008) 2.21 [2.08, 2.33]
Back et al. (2019) 1.97 [1.81, 2.12]
Badau & Badau (2018) 2.41 [2.22, 2.59]
Berger et al. (2014) 3.51 [3.44, 3.58]
Blackstone (2020) 2.81 [2.66, 2.97]
Bratland-Sanda (2009) 3.51 [3.01, 4.00]
Bratland-Sanda (2011_control) 2.53 [2.12, 2.93]
Bratland-Sanda (2011_patients) 3.51 [3.08, 3.93]
Bratland-Sanda (2015_female) 2.04 [1.93, 2.15]
Bratland-Sanda (2015_male) 2.12 [1.89, 2.35]
Brosof et al. (2019) 2.66 [2.44, 2.88]
Cabrita et al. (2017) 1.61 [1.47, 1.74]
Chisttter & Hausenblas (2009) 2.41 [2.14, 2.68]
Compte et al. (2018) 2.30 [2.10, 2.50]
Condello et al. (2016) 2.41 [2.19, 2.62]
Cook & Hausenblas (2008) 2.66 [2.50, 2.82]
Cook & Hausenblas (2011) 3.00 [2.85, 3.14]
Cook & Luke (2017) 2.66 [2.45, 2.87]
Cook et al. (2011) 2.81 [2.69, 2.94]
Cook et al. (2013a) 3.51 [3.36, 3.65]
Cook et al. (2013b) 2.81 [2.69, 2.94]
Cook et al. (2013c) 2.66 [2.60, 2.71]
Cook et al. (2015a) 3.51 [3.06, 3.95]
Cook et al. (2015b) 2.66 [2.59, 2.73]
Costa et al. (2012b) 2.41 [2.27, 2.55]
Costa et al. (2013) 2.81 [2.67, 2.95]
Costa et al. (2014) 2.04 [1.86, 2.22]
Costa et al. (2015) 2.53 [2.31, 2.75]
Costa et al. (2016_female) 2.81 [2.59, 3.03]
Costa et al. (2016_male) 3.00 [2.78, 3.21]
Dorneles et al. (2019) 1.90 [1.77, 2.02]
Downs et al. (2004_study1) 2.53 [2.38, 2.67]
Downs et al. (2004_study2) 2.21 [2.11, 2.30]
Downs et al. (2013) 2.81 [2.71, 2.91]
Edmunds et al. (2006) 2.30 [2.15, 2.46]
Ergun & Guzel (2018) 3.00 [2.89, 3.10]
Gaetan et al. (2018) 2.81 [2.54, 3.08]
González-Cutre & Sicilia (2012a) 2.53 [2.40, 2.65]
González-Cutre & Sicilia (2012b) 2.53 [2.40, 2.65]
Hale et al. (2010) 2.66 [2.42, 2.90]
Hausenblas &Giacobbi Jr (2004) 2.66 [2.52, 2.80]
Hausenblas et al. (2008) 3.00 [2.53, 3.46]
Karademir (2020) 2.53 [2.39, 2.67]
Kelly et al. (2018) 3.22 [3.13, 3.30]
Kelly et al. (2020) 3.22 [3.13, 3.30]
Lamarche &Gammage (2012) 2.66 [2.47, 2.85]
Latorre-Román et al. (2015) 2.66 [2.37, 2.95]
Latorre-Román et al. (2016) 2.53 [2.29, 2.76]
Levallius et al. (2020) 3.22 [3.09, 3.35]
Liu et al (2018) 1.77 [1.60, 1.94]
Lukás et al. (2019) 2.30 [2.12, 2.48]
MacIntyre et al. (2020_black men) 3.22 [2.88, 3.56]
MacIntyre et al. (2020_black women) 3.00 [2.83, 3.16]
MacIntyre et al. (2020_white men) 3.51 [3.25, 3.76]
MacIntyre et al. (2020_white women) 3.22 [3.07, 3.37]
Maselli et al. (2018) 1.56 [1.42, 1.70]
Menczel et al. (2017) 2.30 [2.23, 2.38]
Miller & Mesagno (2014) 2.53 [2.22, 2.83]
Müller et al. (2013) 3.22 [3.15, 3.29]
Müller et al. (2015a) 2.21 [1.84, 2.58]
Müller et al. (2015b) 2.41 [2.15, 2.66]
Orhan et al. (2019) 3.51 [3.27, 3.75]
Pinto et al. (2019) 3.91 [3.74, 4.08]
Pugh & Hadjistavropoulos (2011) 3.00 [2.79, 3.20]
Qesnel et al. (2017) 3.00 [2.90, 3.09]
Rankin et al. (2019) 2.66 [2.41, 2.90]
Reche-García et al. (2020) 2.21 [2.06, 2.35]
Rogers et al. (2018) 3.22 [3.10, 3.34]
Scharmer (2018) 2.81 [2.65, 2.98]
Sicilia et al. (2011) 2.53 [2.40, 2.65]
Sicilia et al. (2020b) 1.97 [1.80, 2.13]
Soler et al. (2013) 2.21 [1.97, 2.44]
Szabo et al. (2019) 3.91 [3.74, 4.08]
Terry et al. (2004) 3.00 [2.78, 3.21]
Tornero-quiñones et al. (2019) 2.53 [2.34, 2.72]
White et al. (2020) 2.66 [2.38, 2.94]
Yildiz et al. (2020) 2.12 [1.98, 2.26]
RE Model 2.66 [2.56, 2.76]
1
1.5
2
2.5
3
3.5
4
4.5
Transformed Cronbach's alpha

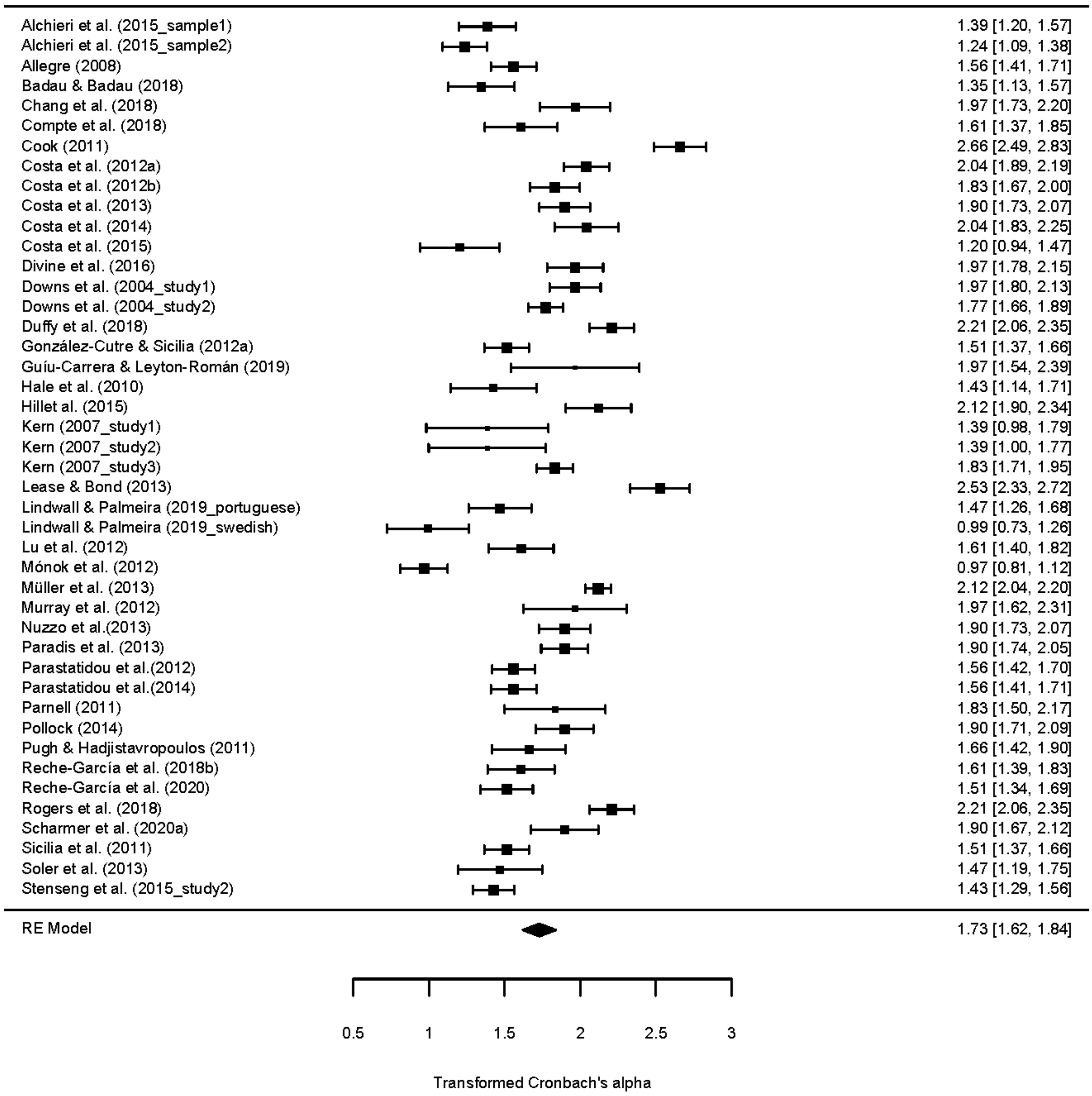

EDS-21 Tolerance
Alchieri et al. (2015_sample1) 1.35 [1.16, 1.53]
Alchieri et al. (2015_sample2) 1.66 [1.51, 1.81]
Allegre (2008) 2.04 [1.89, 2.19]
Badau & Badau (2018) 1.83 [1.61, 2.05]
Chang et al. (2018) 1.51 [1.28, 1.75]
Compte et al. (2018) 1.66 [1.42, 1.90]
Cook (2011) 2.66 [2.49, 2.83]
Costa et al. (2012a) 2.04 [1.89, 2.19]
Costa et al. (2012b) 1.71 [1.55, 1.88]
Costa et al. (2013) 1.66 [1.49, 1.83]
Costa et al. (2014) 1.77 [1.56, 1.98]
Costa et al. (2015) 2.21 [1.94, 2.47]
Divine et al. (2016) 1.83 [1.65, 2.02]
Downs et al. (2004_study1) 1.51 [1.35, 1.68]
Downs et al. (2004_study2) 2.41 [2.29, 2.52]
González-Cutre & Sicilia (2012a) 1.31 [1.16, 1.46]
Guíu-Carrera & Leyton-Román (2019) 2.21 [1.78, 2.63]
Hale et al. (2010) 1.71 [1.43, 2.00]
Hillet al. (2015) 2.12 [1.90, 2.34]
Kern (2007_study1) 1.66 [1.26, 2.06]
Kern (2007_study2) 1.71 [1.33, 2.10]
Kern (2007_study3) 2.04 [1.92, 2.16]
Lease & Bond (2013) 2.53 [2.33, 2.72]
Lindwall & Palmeira (2019_portuguese) 2.12 [1.91, 2.33]
Lindwall & Palmeira (2019_swedish) 1.39 [1.12, 1.65]
Lu et al. (2012) 1.77 [1.56, 1.99]
Maselli et al. (2018) 2.04 [1.90, 2.18]
Mónok et al. (2012) 2.04 [1.88, 2.20]
Müller et al. (2013) 2.21 [2.12, 2.29]
Murray et al. (2012) 2.12 [1.78, 2.46]
Nuzzo et al.(2013) 2.30 [2.13, 2.47]
Paradis et al. (2013) 1.77 [1.62, 1.93]
Parastatidou et al.(2012) 2.12 [1.98, 2.26]
Parastatidou et al.(2014) 1.77 [1.62, 1.92]
Parnell (2011) 1.97 [1.63, 2.30]
Pollock (2014) 2.41 [2.22, 2.60]
Pugh & Hadjistavropoulos (2011) 2.53 [2.28, 2.77]
Reche-García et al. (2018b) 1.97 [1.75, 2.19]
Reche-García et al. (2020) 2.04 [1.87, 2.21]
Rogers et al. (2018) 2.41 [2.26, 2.55]
Scharmer et al. (2020a) 2.66 [2.44, 2.88]
Sicilia et al. (2011) 1.31 [1.16, 1.46]
Soler et al. (2013) 1.35 [1.07, 1.63]
RE Model 1.94 [1.83, 2.05]
1
1.5
2
2.5
3
Transformed Cronbach's alpha

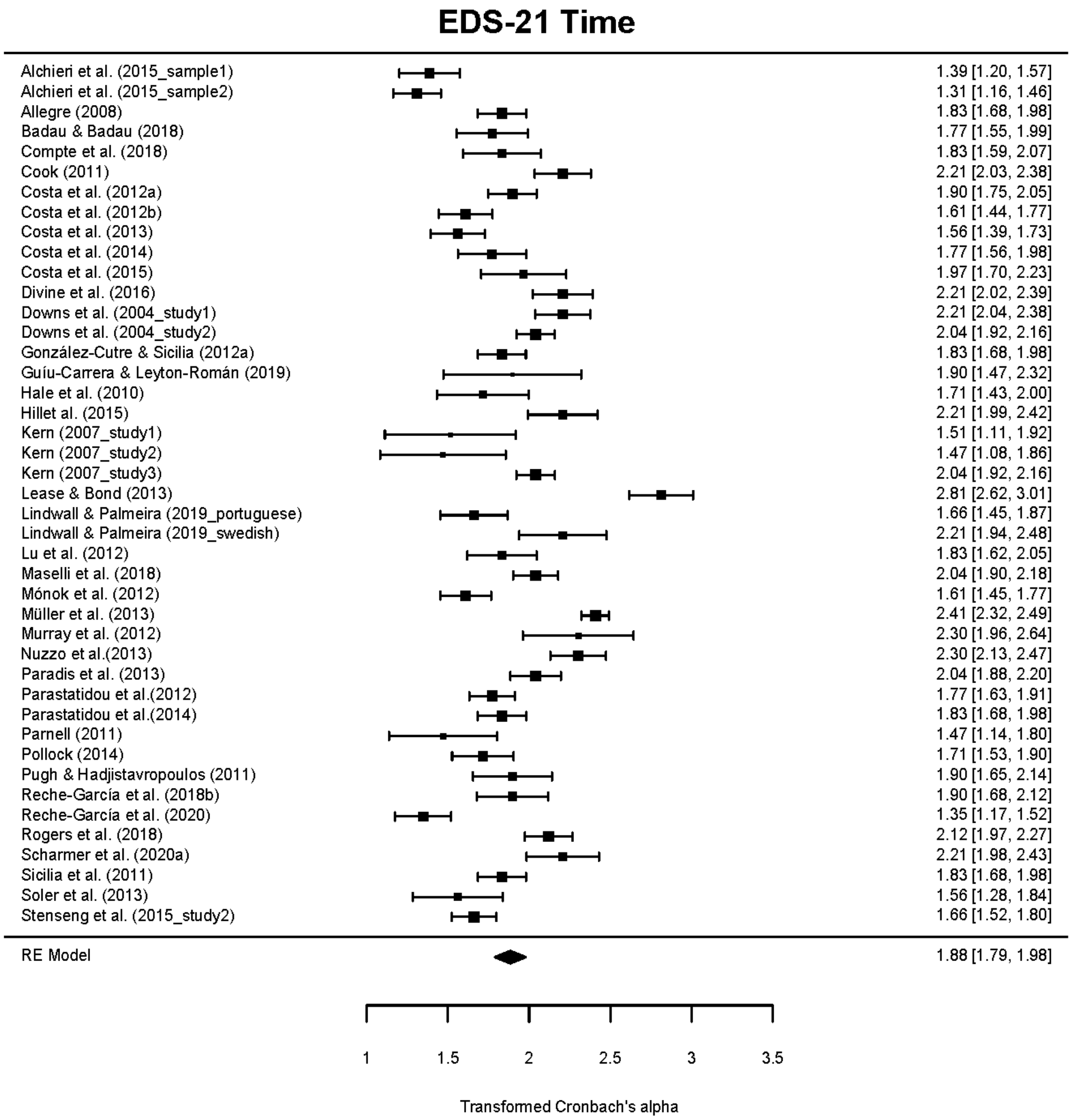

EDS 21-Withdrawal
Alchieri et al. (2015_sample1) 1.14 [0.95, 1.33]
Alchieri et al. (2015_sample2) 1.08 [0.93, 1.23]
Allegre (2008) 1.83 [1.68, 1.98]
Badau & Badau (2018) 1.31 [1.09, 1.53]
Chang et al. (2018) 1.43 [1.20, 1.66]
Compte et al. (2018) 1.51 [1.27, 1.75]
Cook (2011) 2.21 [2.03, 2.38]
Costa et al. (2012a) 1.56 [1.41, 1.71]
Costa et al. (2012b) 1.47 [1.30, 1.64]
Costa et al. (2013) 1.56 [1.39, 1.73]
Costa et al. (2014) 1.71 [1.50, 1.93]
Costa et al. (2015) 1.71 [1.45, 1.98]
Divine et al. (2016) 1.77 [1.59, 1.96]
Downs et al. (2004_study1) 2.66 [2.49, 2.83]
Downs et al. (2004_study2) 2.41 [2.29, 2.52]
González-Cutre & Sicilia (2012a) 1.90 [1.75, 2.04]
Guíu-Carrera & Leyton-Román (2019) 2.30 [1.88, 2.73]
Hale et al. (2010) 1.77 [1.49, 2.05]
Hillet al. (2015) 1.77 [1.56, 1.99]
Kern (2007_study1) 1.31 [0.91, 1.71]
Kern (2007_study2) 1.24 [0.85, 1.62]
Kern (2007_study3) 1.71 [1.60, 1.83]
Lease & Bond (2013) 2.21 [2.01, 2.40]
Lindwall & Palmeira (2019_portuguese) 1.61 [1.40, 1.82]
Lindwall & Palmeira (2019_swedish) 1.71 [1.45, 1.98]
Lu et al. (2012) 1.35 [1.13, 1.56]
Mónok et al. (2012) 1.61 [1.45, 1.77]
Müller et al. (2013) 1.66 [1.58, 1.75]
Murray et al. (2012) 1.97 [1.62, 2.31]
Nuzzo et al.(2013) 2.12 [1.95, 2.29]
Paradis et al. (2013) 1.77 [1.62, 1.93]
Parastatidou et al.(2012) 1.77 [1.63, 1.91]
Parastatidou et al.(2014) 1.61 [1.46, 1.76]
Parnell (2011) 1.90 [1.56, 2.23]
Pollock (2014) 2.04 [1.85, 2.23]
Pugh & Hadjistavropoulos (2011) 1.90 [1.65, 2.14]
Reche-García et al. (2018b) 1.61 [1.39, 1.83]
Reche-García et al. (2020) 1.56 [1.39, 1.73]
Rogers et al. (2018) 2.30 [2.16, 2.45]
Scharmer et al. (2020a) 2.12 [1.90, 2.34]
Sicilia et al. (2011) 1.90 [1.75, 2.05]
Soler et al. (2013) 1.83 [1.55, 2.11]
RE Model 1.76 [1.66, 1.87]
0.5
1
1.5
2
2.5
3
Transformed Cronbach's alpha

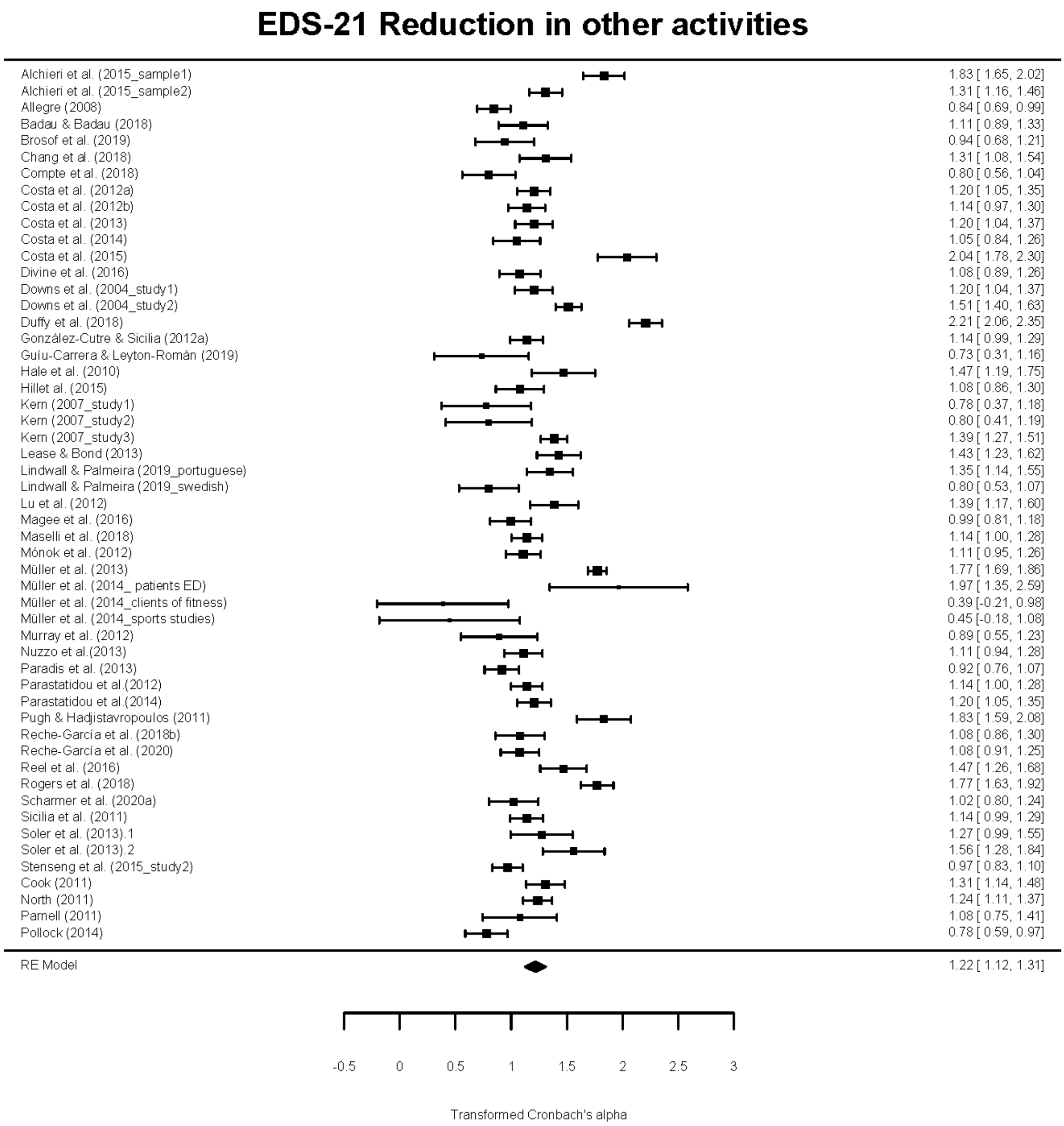
EDS-21 Intention effects



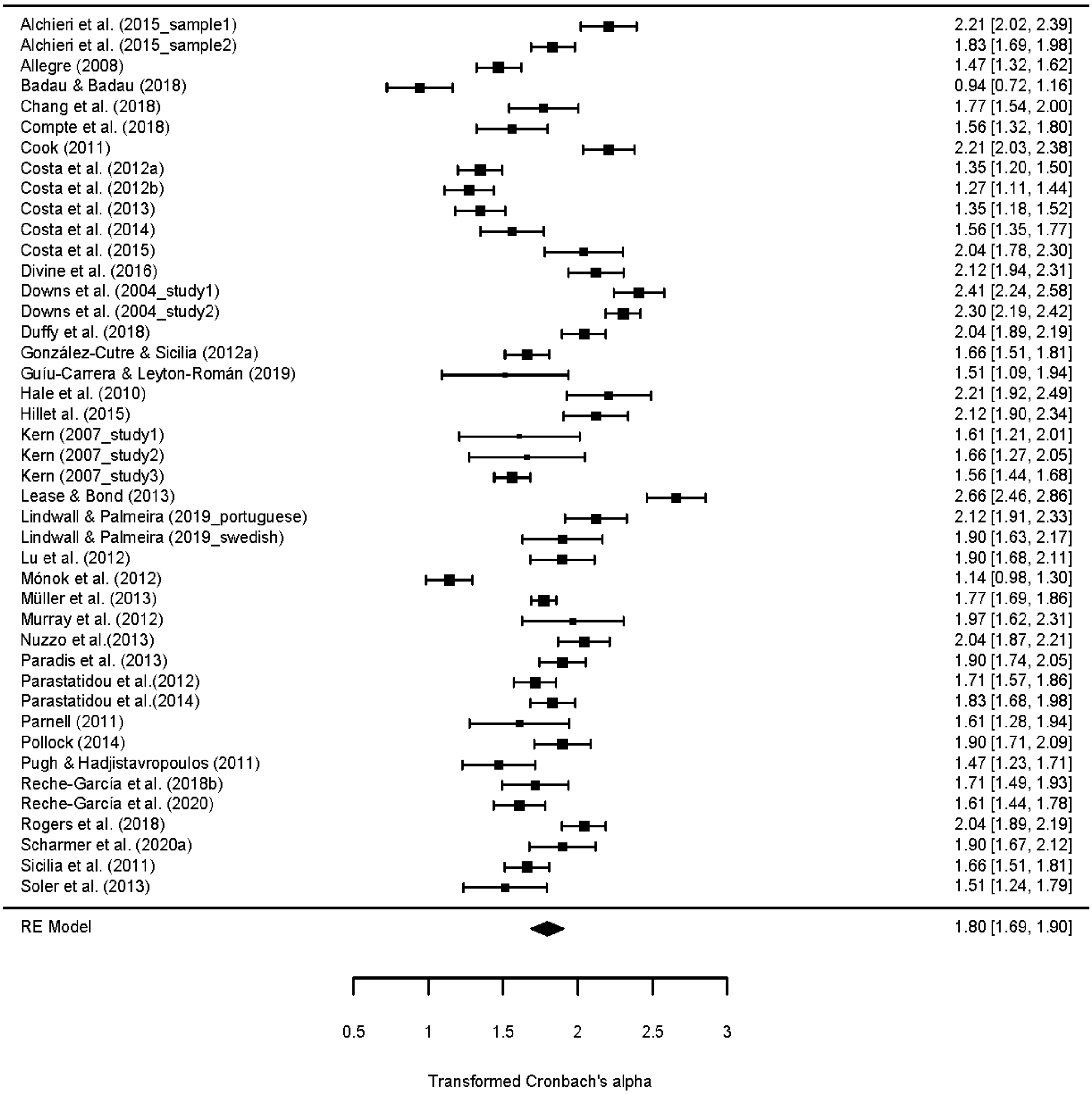
EDS-21 Lack of control



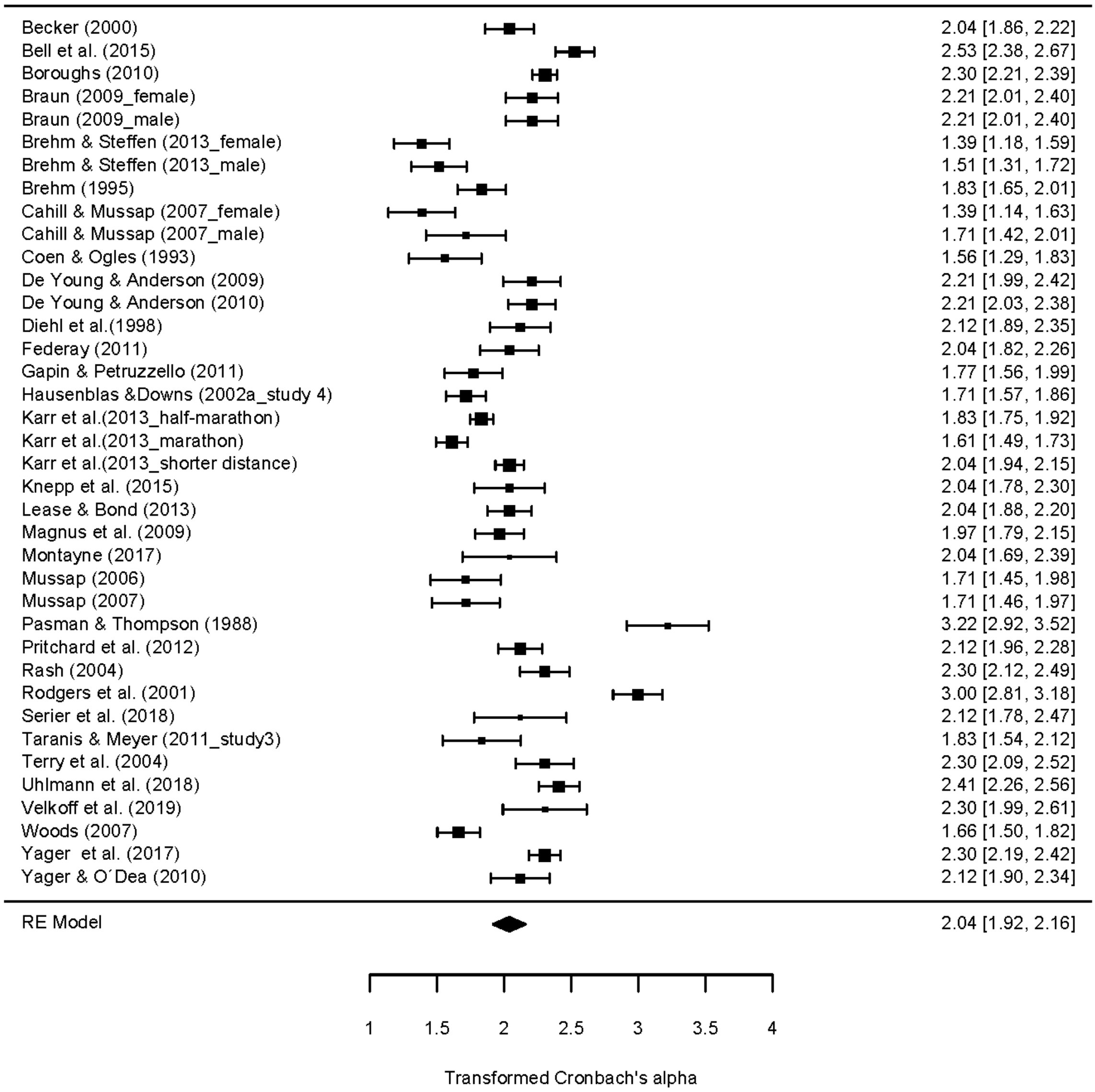

EDS-21 Time
Alchieri et al. (2015_sample1) 1.39 [1.20, 1.57]
Alchieri et al. (2015_sample2) 1.31 [1.16, 1.46]
Allegre (2008) 1.83 [1.68, 1.98]
Badau & Badau (2018) 1.77 [1.55, 1.99]
Compte et al. (2018) 1.83 [1.59, 2.07]
Cook (2011) 2.21 [2.03, 2.38]
Costa et al. (2012a) 1.90 [1.75, 2.05]
Costa et al. (2012b) 1.61 [1.44, 1.77]
Costa et al. (2013) 1.56 [1.39, 1.73]
Costa et al. (2014) 1.77 [1.56, 1.98]
Costa et al. (2015) 1.97 [1.70, 2.23]
Divine et al. (2016) 2.21 [2.02, 2.39]
Downs et al. (2004_study1) 2.21 [2.04, 2.38]
Downs et al. (2004_study2) 2.04 [1.92, 2.16]
González-Cutre & Sicilia (2012a) 1.83 [1.68, 1.98]
Guíu-Carrera & Leyton-Román (2019) 1.90 [1.47, 2.32]
Hale et al. (2010) 1.71 [1.43, 2.00]
Hillet al. (2015) 2.21 [1.99, 2.42]
Kern (2007_study1) 1.51 [1.11, 1.92]
Kern (2007_study2) 1.47 [1.08, 1.86]
Kern (2007_study3) 2.04 [1.92, 2.16]
Lease & Bond (2013) 2.81 [2.62, 3.01]
Lindwall & Palmeira (2019_portuguese) 1.66 [1.45, 1.87]
Lindwall & Palmeira (2019_swedish) 2.21 [1.94, 2.48]
Lu et al. (2012) 1.83 [1.62, 2.05]
Maselli et al. (2018) 2.04 [1.90, 2.18]
Mónok et al. (2012) 1.61 [1.45, 1.77]
Müller et al. (2013) 2.41 [2.32, 2.49]
Murray et al. (2012) 2.30 [1.96, 2.64]
Nuzzo et al.(2013) 2.30 [2.13, 2.47]
Paradis et al. (2013) 2.04 [1.88, 2.20]
Parastatidou et al.(2012) 1.77 [1.63, 1.91]
Parastatidou et al.(2014) 1.83 [1.68, 1.98]
Parnell (2011) 1.47 [1.14, 1.80]
Pollock (2014) 1.71 [1.53, 1.90]
Pugh & Hadjistavropoulos (2011) 1.90 [1.65, 2.14]
Reche-García et al. (2018b) 1.90 [1.68, 2.12]
Reche-García et al. (2020) 1.35 [1.17, 1.52]
Rogers et al. (2018) 2.12 [1.97, 2.27]
Scharmer et al. (2020a) 2.21 [1.98, 2.43]
Sicilia et al. (2011) 1.83 [1.68, 1.98]
Soler et al. (2013) 1.56 [1.28, 1.84]
Stenseng et al. (2015_study2) 1.66 [1.52, 1.80]
RE Model 1.88 [1.79, 1.98]
1
1.5
2
2.5
3
3.5
Transformed Cronbach's alpha


EDS-21 Reduction in other activities
Alchieri et al. (2015_sample1) 1.83 [1.65, 2.02]
Alchieri et al. (2015_sample2) 1.31 [1.16, 1.46]
Allegre (2008) 0.84 [0.69, 0.99]
Badau & Badau (2018) 1.11 [0.89, 1.33]
Brosof et al. (2019) 0.94 [0.68, 1.21]
Chang et al. (2018) 1.31 [1.08, 1.54]
Compte et al. (2018) 0.80 [0.56, 1.04]
Costa et al. (2012a) 1.20 [1.05, 1.35]
Costa et al. (2012b) 1.14 [0.97, 1.30]
Costa et al. (2013) 1.20 [1.04, 1.37]
Costa et al. (2014) 1.05 [0.84, 1.26]
Costa et al. (2015) 2.04 [1.78, 2.30]
Divine et al. (2016) 1.08 [0.89, 1.26]
Downs et al. (2004_study1) 1.20 [1.04, 1.37]
Downs et al. (2004_study2) 1.51 [1.40, 1.63]
Duffy et al. (2018) 2.21 [2.06, 2.35]
González-Cutre & Sicilia (2012a) 1.14 [0.99, 1.29]
Guíu-Carrera & Leyton-Román (2019) 0.73 [0.31, 1.16]
Hale et al. (2010) 1.47 [1.19, 1.75]
Hillet al. (2015) 1.08 [0.86, 1.30]
Kern (2007_study1) 0.78 [0.37, 1.18]
Kern (2007_study2) 0.80 [0.41, 1.19]
Kern (2007_study3) 1.39 [1.27, 1.51]
Lease & Bond (2013) 1.43 [1.23, 1.62]
Lindwall & Palmeira (2019_portuguese) 1.35 [1.14, 1.55]
Lindwall & Palmeira (2019_swedish) 0.80 [0.53, 1.07]
Lu et al. (2012) 1.39 [1.17, 1.60]
Magee et al. (2016) 0.99 [0.81, 1.18]
Maselli et al. (2018) 1.14 [1.00, 1.28]
Mónok et al. (2012) 1.11 [0.95, 1.26]
Müller et al. (2013) 1.77 [1.69, 1.86]
Müller et al. (2014_ patients ED) 1.97 [1.35, 2.59]
Müller et al. (2014_clients of fitness) 0.39 [-0.21, 0.98]
Müller et al. (2014_sports studies) 0.45 [-0.18, 1.08]
Murray et al. (2012) 0.89 [0.55, 1.23]
Nuzzo et al.(2013) 1.11 [0.94, 1.28]
Paradis et al. (2013) 0.92 [0.76, 1.07]
Parastatidou et al.(2012) 1.14 [1.00, 1.28]
Parastatidou et al.(2014) 1.20 [1.05, 1.35]
Pugh & Hadjistavropoulos (2011) 1.83 [1.59, 2.08]
Reche-García et al. (2018b) 1.08 [0.86, 1.30]
Reche-García et al. (2020) 1.08 [0.91, 1.25]
Reel et al. (2016) 1.47 [1.26, 1.68]
Rogers et al. (2018) 1.77 [1.63, 1.92]
Scharmer et al. (2020a) 1.02 [0.80, 1.24]
Sicilia et al. (2011) 1.14 [0.99, 1.29]
Soler et al. (2013).1 1.27 [0.99, 1.55]
Soler et al. (2013).2 1.56 [1.28, 1.84]
Stenseng et al. (2015_study2) 0.97 [0.83, 1.10]
Cook (2011) 1.31 [1.14, 1.48]
North (2011) 1.24 [1.11, 1.37]
Parnell (2011) 1.08 [0.75, 1.41]
Pollock (2014) 0.78 [0.59, 0.97]
RE Model 1.22 [1.12, 1.31]
-0.5
0
0.5
1
1.5
2
2.5
3
Transformed Cronbach's alpha

EDS-21 Continuance



OEQ global score



Appendix F: Meta-Analysis Coding Sheet

Citation and year of publication

Insert citation and year of study

Sample size

N used to compute α

Exercise modality

1. Unknown (e.g., undergraduate)
2. Unclear (e.g., gym users)
3. Power disciplines
4. Non-endurance
5. Multiple sports
6. Fitness & health
7. Endurance

Eating disorders

1. Unknown
2. At-risk
3. Not at-risk
4. Mixed
5. Clinical

Report of Leisure Time Exercise (Report of LTE)

1. Yes
2. No

Regular exercisers

1. Unknown
2. Yes (i.e., exercise at least once a week)

Region

1. Unknown
2. South America
3. Oceania
4. North America
5. Mixed
6. Europe
7. Asia

Test version

1. Original
2. Linguistically adapted

Study design

1. Psychometric
2. Applied

Type of survey

1. Unknown
2. Paper-pencil
3. On-line
4. Both

Publication status

1. Published
2. Unpublished

Problematic Exercise measure

1. Commitment Exercise Scale (CES-Likert)
2. Commitment Exercise Scale (CES- VAS)
3. Compulsive Exercise Test (CET)
   - 3.1. Avoidance subscale of Compulsive Exercise Test
   - 3.2. Weight control subscale of Compulsive Exercise Test
   - 3.3. Mood improvement subscale of Compulsive Exercise Test
   - 3.4. Lack of enjoyment subscale of Compulsive Exercise Test
   - 3.5. Rigidity subscale of Compulsive Exercise Test
4. Exercise Addiction Inventory (EAI)
5. Exercise Dependence Questionnaire (EDQ)
   - 5.1. Interference subscale of Exercise Dependence Questionnaire
   - 5.2. Positive reward subscale of Exercise Dependence Questionnaire
   - 5.3. Withdrawal subscale of Exercise Dependence Questionnaire
   - 5.4. Weight control subscale of Exercise Dependence Questionnaire
   - 5.5. Insight into problem subscale of Exercise Dependence Questionnaire
   - 5.6. Social reasons subscale of Exercise Dependence Questionnaire
   - 5.7. Health reasons subscale of Exercise Dependence Questionnaire
   - 5.8. Stereotyped behaviour subscale of Exercise Dependence Questionnaire
6. Exercise Dependence Scale-21 (EDS-21)
   - 6.1. Tolerance subscale of Exercise Dependence Scale-21
   - 6.2. Withdrawal of Exercise Dependence Scale-21
   - 6.3. Intention effects of Exercise Dependence Scale-21
   - 6.4. Lack of control of Exercise Dependence Scale-21
   - 6.5. Time of Exercise Dependence Scale-21
   - 6.6. Reduction in other activities of Exercise Dependence Scale-21
   - 6.7. Continuance of Exercise Dependence Scale-21
7. Obligatory Exercise Questionnaire (OEQ)

Mean PE
Insert mean total scores of Problematic Exercise measure

Standard deviation PE
Insert mean *SD* of Problematic Exercise measure

Mean age
Insert mean age

Standard deviation age
Insert *SD* age

Percentage of whites
Insert % of whites

Percentage of females
Insert % of females

Appendix G: Studies included in meta-analysis and systematic review

Adkins, E. C., & Keel, P. K. (2005). Does "excessive" or "compulsive" best describe exercise as a symptom of bulimia nervosa? *International Journal of Eating Disorders, 38*(1), 24–29. https://doi.org/10.1002/eat.20140

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