

**RESEARCH METHODOLOGY:
DISCUSSION PAPER - METHODOLOGY**

Spanish version of the Self-Care of Chronic Illness Inventory: A validation study amongst community-dwelling older adults with chronic multimorbidity

José Manuel Hernández-Padilla¹   | Iria Dobarrio-Sanz¹   |
Cayetano Fernández-Sola^{1,2}   | María del Mar Jiménez-Lasserrotte¹  |
Matías Correa-Casado^{1,3}  | María Dolores Ruiz-Fernández¹  

¹Department of Nursing, Physiotherapy and Medicine, University of Almería, Almería, Spain

²Facultad de Ciencias de la Salud, Universidad Autónoma de Chile, Santiago, Chile

³Andalusian Health Service, Almería Health District, Almería, Spain

Correspondence

Iria Dobarrio-Sanz, Department of Nursing, Physiotherapy and Medicine, University of Almería, Almería, Spain.
Email: ids135@ual.es

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Abstract

Aim: To psychometrically assess the Spanish version of the Self-Care of Chronic Illness Inventory (SC-CII-Sp) in community-dwelling older adults with chronic multimorbidity.

Design: A methodological study.

Method: A total of 1260 older adults participated in the study between May 2020 and February 2022. The data were analysed using SPSS Statistics® 26 and AMOS® 24. The items' content validity index and the Fleiss' kappa were calculated to assess the SC-CII-Sp's content validity. Convergent validity was assessed by calculating the Pearson correlation coefficient between the participants' scores on the SC-CII-Sp and their scores on the Spanish Chronic Disease Self-Efficacy scale (SCD-SE). Construct validity was tested by performing a confirmatory factor analysis (CFA). The SC-CII-Sp's reliability was tested by computing the Cronbach's alpha.

Results: The SC-CII-Sp showed good content and convergent validity. The CFA showed that the SC-CII-Sp has three sub-scales. The 8-item Self-Care Maintenance sub-scale has good internal consistency and is comprised of two dimensions: illness-related and health-promoting behaviour. The Self-Care Monitoring sub-scale had excellent internal consistency and its five loaded items belonged to a single dimension. The 6-item Self-Care Management sub-scale has adequate internal consistency and two dimensions: autonomous and consulting behaviour.

Conclusion: The Spanish version of SC-CII is a valid and reliable instrument to be used in the assessment of self-care behaviours amongst Spanish-speaking, community-dwelling older adults with chronic multimorbidity.

Implications for the Profession: Nurses need valid and reliable tools to assess self-care behaviours in Spanish-speaking community-dwelling older adults with chronic multimorbidity. This study provides a 19-item tool that allows for the comprehensive evaluation of self-care behaviours in healthy and ill states.

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Impact: Using the SC-CII-Sp in clinical or research settings could help nurses to examine the effects of different interventions on self-care behaviours amongst Spanish-speaking, community-dwelling older adults with chronic multimorbidity.

Patient or Public Contribution: None to be reported.

KEYWORDS

chronic illness, comorbidity, elderly, multimorbidity, psychometrics, self-care, validity

1 | INTRODUCTION

Globally, between 50% and 90% of older adults suffer from chronic multimorbidity, which can be defined as the co-occurrence of more than one chronic illness (Siah et al., 2022). In Spain, between 88% and 97% of older adults have been diagnosed with at least one chronic illness (National Statistics Institute, 2018). Suffering from chronic multimorbidity negatively affects older adults' health and quality of life (Bao et al., 2019; Chiaranai et al., 2018). Caring for community-dwelling older adults with multimorbidity poses a challenge for healthcare systems (Juul-Larsen et al., 2020). Evidence suggests that self-care behaviours could improve symptoms, complications, hospitalizations, mortality (Calero-Molina et al., 2022; Caro-Bautista et al., 2020), mental health, social support and quality of life (Chica-Pérez, Dobarrio-Sanz, Ruiz-Fernández, et al., 2023; Park et al., 2021; Patrick et al., 2022) amongst community-dwelling older adults with chronic multimorbidity. Therefore, it is important that nurses implement interventions both to promote and assess self-care behaviours amongst community-dwelling older adults with chronic multimorbidity (De Maria et al., 2022; Dobarrio-Sanz et al., 2023; Ma et al., 2021).

1.1 | Background

1.1.1 | The consequences of chronic multimorbidity

Chronic illnesses are defined as long-duration and slow-progression illnesses (WHO, 2018). Chronic illnesses can negatively affect older adults' biopsychosocial well-being (Chiaranai et al., 2018). Older adults with chronic multimorbidity not only suffer from lower quality of life (Bao et al., 2019) but are also more likely to be admitted to hospital (Wang et al., 2020) and present higher mortality rates (Julsing et al., 2016). Older adults with chronic multimorbidity also make more use of healthcare services and this could contribute to increasing social expenditure (Juul-Larsen et al., 2020). Furthermore, suffering from multiple chronic conditions is associated with polypharmacy (Gutiérrez-Valencia et al., 2019). In fact, it is estimated that around 50% of older adults with chronic illnesses take at least 5 prescribed medicines and 20% take 10 or more medicines (Herr et al., 2015; Hovstadius et al., 2014). Suffering from chronic multimorbidity and polypharmacy increases frailty (Veronese et al., 2017) and leads to more complex therapeutic regimes (Foo et al., 2020). Consequently, older adults with chronic multimorbidity

face difficulties in implementing and maintaining effective self-care behaviours (Juul-Larsen et al., 2020).

1.1.2 | The need to validate the SC-CII in Spanish

According to the middle-range theory of self-care of chronic illness (MRT-SCCI), self-care can be defined as 'a process of maintaining health-promoting practices and managing illness' (Riegel et al., 2012). The MRT-SCCI maintains that implementing self-care behaviours requires skills in three domains: self-care maintenance (i.e. behaviours used to maintain well-being), self-care monitoring (i.e. behaviours used to identify signs and symptoms) and self-care management (i.e. behaviours used to respond to signs and symptoms) (Riegel et al., 2012; Riegel, Jaarsma et al., 2019). The MRT-SCCI also argues that individuals' motivation to engage in self-care is influenced by their ability to detect, interpret and manage symptoms, as well as their skills, experience, self-efficacy, cognitive and functional abilities, social support and access to healthcare (Riegel, Jaarsma et al., 2019). Self-care is not only a complex, multifactorial process but also a unique phenomenon influenced by each individual's reality (de Maria et al., 2022; de Maria, Ferro, et al., 2021; Zeng et al., 2021).

In the process of fostering effective self-care amongst community-dwelling older adults with chronic multimorbidity, nurses should perform a comprehensive assessment of individuals' skills, self-efficacy, commitment and implementation of health-promoting behaviours (Chica-Pérez, Dobarrio-Sanz, Correa-Casado, et al., 2023; LeBlanc & Jacelon, 2018). In this regard, nurses could use validated tools to standardize the assessment of individuals' self-care behaviours so that the results in different contexts can be compared. A recent scoping review found 40 validated tools that measure different constructs related to self-care or self-management amongst people with chronic conditions (Lawless et al., 2023). However, only three tools were non-disease-specific and focused on assessing self-care behaviours (Lawless et al., 2023). Out of these three tools, the *Self-Care of Chronic Illness Inventory* (SC-CII) is particularly useful as it considers that self-care behaviours are performed in both healthy and ill states, and it includes items that assess people's self-care behaviours in maintaining health, monitoring symptoms and managing these symptoms (Riegel et al., 2018). The SC-CII was developed based on the MRT-SCCI (de Maria, Matarese, et al., 2021; Riegel et al., 2018) and includes 20 items that assess the frequency or the likelihood with which people implement self-care behaviours (Riegel et al., 2018). The SC-CII is composed of three independent sub-scales

that coincide with the three domains of self-care identified in the MRT-SCCI: the self-care maintenance sub-scale (8 items measuring 'health-promoting behaviour' and 'illness-related behaviour'), the self-care monitoring sub-scale (5 items measuring 'self-care monitoring behaviour') and the self-care management sub-scale (7 items measuring 'autonomous behaviour' and 'consulting behaviour') (de Maria, Matarese, et al., 2021; Riegel et al., 2018). The SC-CII has been cross-validated in adult samples from Sweden, Italy, the United States (De Maria et al., 2019), China (Jin et al., 2023), Thailand (Bunsuk et al., 2023) and Albania (Arapi et al., 2023), and it has been used to assess self-care behaviours in controlled randomized trials and other observational studies worldwide (Iovino et al., 2023; Massimo et al., 2023; Osokpo et al., 2022; Riegel, Hanlon et al., 2019; Säfström et al., 2022). However, it remains unclear whether this tool is reliable and valid to assess self-care behaviours amongst Spanish-speaking, community-dwelling older adults with chronic multimorbidity. The aim of the present study was to psychometrically assess the Spanish version of the SC-CII in community-dwelling older adults with chronic multimorbidity.

2 | METHODS

2.1 | Study design and setting

We conducted an observational cross-sectional methodological study in four phases. In the first phase, we translated the SC-CII into Spanish. In the second phase, we conducted a pilot study to test the tool's reliability (internal consistency) and content validity. In the third phase, we conducted exploratory factor analysis to test the tool's dimensionality. In the fourth phase, we conducted a final validation study in which we tested the validity, reliability and legibility of the Spanish version of the SC-CII (from now on referred to as SC-CII-Sp). The study was conducted in five health districts in the southeast of Spain.

2.2 | Participants and sampling

Using a convenience sampling method, we recruited a total sample of 1260 community-dwelling older adults to participate in the study. The sample size was decided based on the experts' recommendations to recruit around 50 participants for a pilot study, 10 participants per instrument's item for the exploratory factor analysis and 20 participants per instrument's item for the final validation study, which included a confirmatory factor analysis (Streiner & Kottner, 2014). Participants in the pilot study ($n=59$) were not included in the exploratory factor analysis ($n=337$), nor in the final validation study ($n=864$). All participants met the following inclusion criteria: (1) to be at least 65 years old, (2) to have been diagnosed with more than 1 chronic illness, (3) to live at home and (4) not to suffer cognitive impairment that would impede understanding and completing the survey.

2.3 | Ethical considerations

The study was approved by the Ethics and Research Board of the Nursing, Physiotherapy and Medicine Department at the University of Almería (EFM-07/19). All participants received information about the study and their right to withdraw participation at any point. We treated all data according to the European legislation on data protection to protect the participants' anonymity and confidentiality. All participants signed an informed consent before taking part in the study.

2.4 | Data collection

Data were collected in 10 community centres in five health districts in the southeast of Spain between May 2020 and February 2022. Two members of the research team administered the data collection questionnaire to older adults who attended the community centres and volunteered to participate. The data collection questionnaire comprised three sections. The first section aimed to collect sociodemographic information about the participants. The second section was used to present the SC-CII-Sp. The third section included the Spanish Chronic Disease Self-Efficacy scale (SCD-SE) for later convergent validity analysis (Ritter & Lorig, 2014).

2.4.1 | Phase 1: Translation of the SC-CII into Spanish

Before commencing the study, we sought permission from the authors who originally developed the SC-CII (Riegel et al., 2018). Once permission was granted, the original English version of the SC-CII was translated into Spanish following a forward-backward translation procedure (Epstein et al., 2015). Two independent bilingual translators (native Spanish and proficient in English) separately translated the English version of the SC-CII into Spanish. The minor differences that existed between both translators' versions were reconciled, and they agreed upon the final Spanish version of the SC-CII. Then, an independent bilingual translator (native English, proficient in Spanish) performed a blind back-translation of the Spanish version of the SC-CII into English. The translations and back-translation were reviewed by the researchers and the authors of the original SC-CII, who agreed on the fact that the SC-CII-Sp respected the meanings of the original tool.

2.4.2 | Phase 2: Pilot study of the SC-CII-Sp

In the second phase, we conducted a pilot study to test the SC-CII-Sp's reliability. We pilot tested the reliability of the sub-scales comprising SC-CII-Sp by assessing their internal consistency. We examined the three sub-scales' internal consistency by computing their Cronbach's alpha (α), the corrected item-total correlation for

each item (C-ITC) and the scales' α if an item had been removed. We considered that the sub-scales comprising the SC-CII-Sp presented acceptable internal consistency if their $\alpha > 0.7$. We also considered that the items contributed to the tools' internal consistency if their C-ITC > 0.3 and the sub-scales' α did not increase significantly after removing them.

2.4.3 | Phase 3: Initial dimensionality test

To test the SC-CII-Sp's dimensionality, we administered the inventory to a sample of 337 participants and conducted a confirmatory factor analysis (CFA) that showed the poor fit of the SC-CII's original model in our dataset. Subsequently, we conducted an exploratory factor analysis (EFA) using principal axis factoring and Varimax rotation to extract the underlying dimensional model of the Spanish version of the SC-CII. First, we tested the appropriateness of conducting an EFA on the database by computing the Kaiser–Mayer–Olkin (KMO) test and the Bartlett test of sphericity (BTS). We considered it appropriate to conduct an EFA if the KMO ≥ 0.70 and the BTS was significant ($p < .05$) (Coaley, 2014; Polit & Beck, 2020; Tabachnick & Fidell, 2018). For extracted factors to be considered latent dimensions of the sub-scales comprising the SC-CII-Sp, they had to have an eigenvalue ≥ 1 ; for items to be considered to contribute to a factor, they had to present a factor loading value ≥ 0.40 on only one factor (Coaley, 2014; Tabachnick & Fidell, 2018).

2.4.4 | Phase 4: Final validation study

In the final phase of the study, we administered the SC-CII-Sp to 864 participants and tested its validity, reliability and legibility (Polit & Beck, 2020; Streiner & Kottner, 2014). All data were analysed using IBM® SPSS Statistics® 26 and SPSS AMOS® 24.

Validity

The SC-CII-Sp's validity was tested in terms of content, convergent and construct validity.

Content validity. We submitted the SC-CII-Sp to a panel of 16 independent experts from 5 different institutions for critical examination. The experts met the following criteria: (1) to be a qualified nurse; (2) to have more than 10 years' experience caring for older adults with chronic multimorbidity and (3) to have led an intervention programme to improve self-care amongst older adults with chronic multimorbidity in the community. Four of the independent experts were academics with expertise in scale development and psychometrics. The remaining 12 experts had already participated in other validation studies, meaning that they were familiar with the methods and procedures used. The experts had to grade each item as either 'not relevant', 'somewhat relevant', 'rather relevant' or 'highly relevant' for assessing self-care behaviours

amongst older people with chronic multimorbidity in our context (Polit & Beck, 2020). Following Polit and Beck's (2020) method, we calculated the items' content validity index (i-CVI) by adding the number of experts who graded each item as rather or highly relevant and dividing it by 16 (number of experts who participated). The benchmark for the i-CVI to be considered acceptable was set at 0.78 (Polit & Beck, 2020). Inter-rater agreement was assessed by computing the Fleiss' kappa (κ) for the SC-CII and its three sub-scales. The level of agreement was interpreted as follows: slight ($\kappa \leq 0.20$), fair ($\kappa = 0.21-0.40$), moderate ($\kappa = 0.41-0.60$), substantial ($\kappa = 0.61-0.80$), almost perfect ($\kappa = 0.81-0.99$) and perfect ($\kappa = 1$) (Landis & Koch, 1977).

Convergent validity. To test the SC-CII-Sp's convergent validity, we decided to explore the relationship between the participants' scores on the SC-CII-Sp and their scores on the Spanish Chronic Disease Self-Efficacy scale (SCD-SE) (Ritter & Lorig, 2014). The SCD-SE measures people's self-efficacy to carry out certain actions to manage their chronic conditions effectively (Ritter & Lorig, 2014). Although the SC-CII-Sp and the SCD-SE do not measure the same construct, the latter was chosen for convergent validity analysis for two reasons: (1) we could not find a gold standard instrument to assess the frequency or likelihood with which people with multimorbidity implement self-care behaviours, and (2) evidence suggests that self-efficacy plays an important role in implementing self-care behaviours (Riegel, Jaarsma et al., 2019; Tharek et al., 2018). The psychometric properties of the Spanish version of the SCD-SE have been tested, and the tool has shown good validity and reliability results (Ritter & Lorig, 2014). Nevertheless, we calculated the SCD-SE's internal consistency amongst the sample of our study by computing its Cronbach's alpha. The participants' scores on the SC-CII-Sp were correlated with their scores on the SCD-SE computing the Pearson correlation coefficient (r).

Construct validity. The SC-CII-Sp's construct validity was tested by performing a confirmatory factor analysis (CFA) to test if our data fit the models we proposed after performing the EFA. After testing for normality, we considered the data to be normally distributed when individual skewness ± 2 , kurtosis was ± 7 and multivariate kurtosis < 5 (Byrne, 2016). Consequently, we chose the maximum-likelihood method for parameter estimation (Brown, 2015). In order to examine the models' fit, we used the comparative fit index (CFI) and the Tucker-Lewis Index (TLI), interpreting that values ≥ 0.90 or ≥ 0.95 indicate an adequate or excellent fit, respectively (Hooper et al., 2008). We also used the root mean square error of approximation (RMSEA), interpreting that values ≤ 0.08 or ≤ 0.06 indicate an acceptable or excellent model fit, respectively (Hooper et al., 2008).

Reliability

The SC-CII-Sp's reliability was tested by examining its internal consistency using the same approach described in the pilot study section of the paper. We also tested the sub-scales' test-retest

reliability by administering the SC-CII-Sp to a subsample ($n=65$) of the final validation sample ($n=864$) twice with a 6-week interval between measurements. We analysed the test-retest reliability of the sub-scales comprising the SC-CII-Sp by calculating the intraclass correlation coefficient (ICC).

Legibility

We examined the SC-CII-Sp's legibility using the INFLESZ scale (Barrio-Cantalejo et al., 2008). The INFLESZ scale assigns a score from 0 to 100 to a given text and allows for the categorization based on its reading difficulty and understandability: very difficult (<40); quite difficult (40–55); average (55–65); quite easy (65–80) and very easy (>80).

3 | RESULTS

3.1 | Participants' characteristics

The sociodemographic characteristics of the total sample and sub-samples are presented in Table 1.

3.2 | Pilot study results

Table 2 summarizes the results of the pilot study. The Cronbach's alpha (α) was higher than 0.7 for the three sub-scales (see Table 2). Although the C-ITC for items 7, 9 and 19 was lower than 0.3 and their total sub-scale's α would have marginally increased if we had deleted these items, we decided to keep them as part of the SC-CII for the next stage of the process due to their theoretical relevance.

3.3 | Dimensionality study results

We conducted separate EFA for the three sub-scales comprising the SC-CII-Sp. In all of them, the KMO test and the Bartlett's test of sphericity showed that it was appropriate to conduct a factor analysis on the database ($n=337$) (SC-Maintenance: KMO=0.906; $\chi^2=2551.554$; $df=128$; $p<.001$. SC-Monitoring: KMO=0.922; $\chi^2=2383.272$; $df=116$; $p<.001$. SC-Management: KMO=0.837; $\chi^2=1005.038$; $df=25$; $p<.001$). The results of the EFA for the three sub-scales comprising the SC-CII-Sp are summarized in Table 3. It is important to note that the first EFA conducted for the SC-Management sub-scale

TABLE 1 Sociodemographic characteristics of the sample and subsamples.

Characteristics	Pilot study sample ($n=59$)	Dimensionality and EFA study sample ($n=337$)	Final validation study sample ($n=864$)	Test-retest reliability subsample ($n=65$)	Total sample ($N=1260$)
	$M \pm SD$	$M \pm SD$	$M \pm SD$	$M \pm SD$	$M \pm SD$
	n (%)	n (%)	n (%)	n (%)	n (%)
Age	74.56 \pm 8.03	75.65 \pm 7.96	76.15 \pm 6.78	73.51 \pm 7.93	75.86 \pm 7.21
Sex					
Female	30 (50.8)	209 (62.0)	517 (59.8)	34 (52.3)	756 (60.0)
Male	29 (49.2)	128 (38.0)	347 (40.2)	31 (47.7)	504 (40.0)
Marital status					
Single	2 (3.4)	15 (4.5)	46 (5.3)	2 (3.1)	63 (5.0)
Married	38 (64.4)	184 (54.6)	479 (55.4)	43 (66.2)	700 (55.6)
Divorced	1 (1.7)	8 (2.4)	78 (9.0)	1 (1.5)	87 (6.9)
Widowed	18 (30.5)	130 (38.6)	261 (30.2)	19 (29.2)	409 (32.5)
Lives alone					
Yes	13 (22.0)	119 (35.3)	303 (35.1)	14 (21.5)	435 (34.5)
No	46 (78.0)	218 (64.7)	561 (64.9)	51 (78.5)	825 (65.5)
Education level					
None completed	20 (33.9)	123 (36.5)	285 (33)	20 (30.8)	428 (34.0)
Primary	21 (35.6)	125 (37.1)	303 (35.1)	24 (36.9)	449 (35.6)
Secondary	4 (6.8)	24 (7.1)	119 (13.7)	7 (10.8)	147 (11.7)
Vocational training	7 (11.9)	35 (10.4)	81 (9.4)	7 (10.8)	123 (9.8)
University	7 (11.9)	30 (8.9)	76 (8.8)	7 (10.8)	113 (9.0)
Number chronic conditions	3.45 \pm 1.87	3.99 \pm 2.27	3.79 \pm 1.89	3.09 \pm 1.53	3.81 \pm 1.99
Number of medicines prescribed	4.77 \pm 2.06	5.68 \pm 3.68	5.32 \pm 3.54	4.06 \pm 2.71	5.36 \pm 3.56

Abbreviation: EFA, exploratory factor analysis.

TABLE 2 Reliability and content validity of the pilot version of the SC-CII-Sp ($n=59$).

	Cronbach's α if item deleted	C-ITC ^a	Sub-scale's Cronbach's α
Self-care maintenance sub-scale			
Item 1. How often do you make sure you get enough sleep?	0.726	0.320	
Item 2. How often do you try to avoid getting sick? (e.g. get a flu jab, wash your hands).	0.726	0.382	
Item 3. How often do you do physical activity? (e.g. take a brisk walk, use the stairs).	0.730	0.375	
Item 4. How often do you follow a special diet?	0.688	0.598	
Item 5. How often do you see your healthcare provider for routine healthcare check-ups?	0.643	0.581	0.727
Item 6. How often do you take prescribed medicines without missing a dose?	0.704	0.497	
Item 7. How often do you do something to relieve stress? (e.g. take medication, practise yoga, listen to music).	0.739	0.245	
Item 8. How often do you avoid tobacco smoke?	0.731	0.406	
Self-care monitoring sub-scale			
Item 9. How often do you monitor your condition?	0.886	0.127	
Item 10. How often do you monitor for side-effects of the medication you take?	0.746	0.713	
Item 11. How often do you pay attention to changes in how you feel?	0.811	0.559	0.839
Item 12. How often do you monitor if you get more tired than usual when doing normal activities?	0.759	0.688	
Item 13. How often do you monitor for symptoms?	0.708	0.798	
Self-care management sub-scale			
Item 14. If you have had symptoms in the last month, how quickly did you recognize it as a symptom of your condition?	0.713	0.306	
Item 15. When you have symptoms, how likely is it for you to change what you eat or drink in order to make the symptoms decrease or disappear?	0.703	0.389	
Item 16. When you have symptoms, how likely is it for you to change your activity level? (e.g. slow down, rest).	0.693	0.484	
Item 17. When you have symptoms, how likely is it for you to take the medicines that make the symptoms decrease or disappear?	0.702	0.562	0.716
Item 18. When you have symptoms, how likely is it for you to inform your healthcare professional about the symptom on your next programmed visit?	0.687	0.519	
Item 19. When you have symptoms, how likely is it for you to call your healthcare provider to get advice?	0.735	0.205	
Item 20. The last time you had symptoms, did the treatment you took make you feel better?	0.702	0.553	

^aCorrected item-total correlation.

led to the extraction of 3 factors explaining 67.68% of the variance found. However, item 19 did not meet the criterion to be kept as part of the SC-CII-Sp (factor loading <0.45 on all factors). Furthermore, when item 19 was removed, another EFA extracted only two factors explaining 68.25% of the variance found. These two factors coincided with the original model tested by Riegel et al. (2018) so we decided to remove item 19 from the model to be tested in our CFA.

3.4 | Final validation study results

3.4.1 | Validity

Content validity

The i-CVI for all the items comprising the SC-CII-Sp is presented in Table 4. The experts considered that all items were relevant to assess self-care behaviours amongst community-dwelling older adults with chronic multimorbidity (i-ICV > 0.78). The level of agreement between the experts was substantial for the SC-CII-Sp

($\kappa=0.703$; 95% CI=0.670–0.735, $p<.001$), the SC-Maintenance sub-scale ($\kappa=0.730$; 95% CI=0.678–0.782, $p<.001$), the SC-Monitoring scale ($\kappa=0.730$; 95% CI=0.678–0.782, $p<.001$) and the SC-Management scale ($\kappa=0.701$; 95% CI=0.641–0.760, $p<.001$).

Convergent validity

The SCD-SE's internal consistency in the sample of this study was excellent ($\alpha=0.904$). Our convergent validity analysis ($n=864$) showed that the participants' scores on all the sub-scales comprising the SC-CII-Sp strongly correlated to their scores on the SCD-SE (SC-Maintenance: $r=.645$; $p<.001$. SC-Monitoring: $r=.577$; $p<.001$. SC-Management: $r=.510$; $p<.001$).

Construct validity

Our normality analysis suggested it was appropriate to use the maximum likelihood method for parameter estimates (see skewness and kurtosis results in Table 4). The goodness-of-fit indexes for the models extracted from the EFA were either adequate or excellent for all

TABLE 3 Summary of the EFA results for the dimensionality study ($n=337$).

	Factor 1	Factor 2	Eigenvalue	Explained variance (%)
Self-care maintenance sub-scale				
Item 1.	0.80	0.21	4.46	39.48
Item 3.	0.83	0.13		
Item 7.	0.57	0.39		
Item 8.	0.53	0.37		
Item 2.	0.28	0.72	2.65	32.53
Item 4.	0.39	0.53		
Item 5.	0.23	0.74		
Item 6.	0.31	0.58		
Total SC-Maintenance				72.01
	Factor 1		Eigenvalue	Explained variance (%)
Self-care monitoring sub-scale				
Item 9.	0.82		7.41	72.15
Item 10.	0.86			
Item 11.	0.81			
Item 12.	0.79			
Item 13.	0.72			
Total SC-Monitoring				72.15
	Factor 1	Factor 2	Eigenvalue	Explained variance (%)
Self-care management sub-scale				
Item 14.	0.69	0.21	4.69	41.67
Item 15.	0.63	0.22		
Item 16.	0.77	0.05		
Item 20.	0.84	0.02		
Item 17.	0.27	0.64	2.14	26.55
Item 18.	0.39	0.51		
Total SC-Management				68.22

Abbreviation: EFA, exploratory factor analysis.

Numbers in bold are there to highlight that those loading factor means that the items belong to the factor in that column.

the sub-scales comprising the SC-CII-Sp (see Table 5). Figure 1 shows the latent dimensions of the three sub-scales comprising the SC-CII-Sp with their factorial loads. The SC-CII-Sp was comprised of 19 items divided into three sub-scales: the self-care maintenance sub-scale (8 items measuring 'health-promoting behaviour' and 'illness-related behaviour'), the self-care monitoring sub-scale (5 items measuring 'self-care monitoring behaviour') and the self-care management sub-scale (6 items measuring 'autonomous behaviour' and 'consulting behaviour').

3.4.2 | Reliability

Table 6 summarizes the main reliability results ($n=864$) in relation to the internal consistency of the sub-scales comprising the

SC-CII-Sp. The test-retest reliability analysis ($n=65$) showed that the *SC-Maintenance* sub-scale (average measures ICC was 0.872 with a 95% CI from 0.772 to 0.928 ($F(48,48)=7.78$, $p<.001$), the *SC-Monitoring* sub-scale (average measures ICC was 0.985 with a 95% CI from 0.973 to 0.991 ($F(48,48)=66.07$, $p<.001$), and the *SC-Management* sub-scale (average measures ICC was 0.926 with a 95% CI from 0.870 to 0.958 ($F(49,49)=13.51$, $p<.001$) were temporally stable.

3.4.3 | Legibility

The INFLESZ score for the SC-CII-Sp was 67.7 points, which means the inventory is 'quite easy' to read, understand and complete (the estimated average time for completion was 3 min).

4 | DISCUSSION

The aim of this study was to psychometrically assess the Spanish version of the SC-CII (Riegel et al., 2018) in community-dwelling older adults with chronic multimorbidity. To explore the SC-CII-Sp's ability to assess self-care behaviours in community-dwelling older adults, its reliability, legibility and content, convergent and construct validity were tested amongst a large sample ($N=1260$) in several stages. Firstly, a pilot study ($n=59$) was conducted in order to explore the SC-CII-Sp's internal consistency and content validity. Although the SC-CII-Sp was not modified after the pilot study, the ICC-IT of item-7 ('manage stress'), item-9 ('monitor condition') and item-19 ('call provider') obtained a value below the standard. However, it was decided that they would be kept for the next stage due to their theoretical relevance. We also considered that the sample used for the pilot study had a higher proportion of married people and people living together. These factors are related to different outcomes in self-care behaviours compared to those who live alone or are single (Bos-Touwen et al., 2015), which could have influenced the results of our pilot study. In the next stage ($n=337$), an EFA was conducted in order to explore the dimensionality of the three sub-scales comprising the SC-CII-Sp. The extracted factors matched the original model tested by Riegel et al. (2018). Nonetheless, item-19 did not meet the criteria to be included in any of the factors, and the overall dimensionality of the sub-scales improved if this item was deleted, so it was removed. Item 19, 'call your healthcare provider to get advice', is perhaps less relevant in the SC-CII-Sp due to the organization of the Spanish public health system, where service users can go to Primary Care Centres when needed, without it being customary to make calls to receive advice. It is also important to note that the sample in the EFA had a high mean number of chronic conditions and prescribed medicines. These characteristics could have influenced the results; as the participants require greater complexity of care, they are likely to have a more continuous and direct follow-up from their health provider without needing to make use of calls (Foo et al., 2020).

TABLE 4 Reliability and content validity of the final version of the SC-CII-Sp ($n=864$).

	i-CVI ^a	Cronbach's α if item deleted	C-ITC ^b	Sub-scale's Cronbach's α
Self-care maintenance sub-scale				
Item 1. How often do you make sure you get enough sleep?	0.81	0.749	0.629	0.812
Item 2. How often do you try to avoid getting sick? (e.g. get a flu jab, wash your hands).	0.81	0.772	0.547	
Item 3. How often do you do physical activity? (e.g. take a brisk walk, use the stairs).	1	0.744	0.620	
Item 4. How often do you follow a special diet?	0.94	0.804	0.437	
Item 5. How often do you see your healthcare provider for routine healthcare check-ups?	1	0.784	0.494	
Item 6. How often do you take prescribed medicines without missing a dose?	1	0.810	0.342	
Item 7. How often do you do something to relieve stress? (e.g. take medication, practise yoga and listen to music).	1	0.768	0.547	
Item 8. How often do you avoid tobacco smoke?	0.88	0.766	0.557	
Self-care monitoring sub-scale				
Item 9. How often do you monitor your condition?	0.94	0.912	0.583	0.920
Item 10. How often do you monitor for side-effects of the medication you take?	0.88	0.873	0.706	
Item 11. How often do you pay attention to changes in how you feel?	1	0.863	0.736	
Item 12. How often do you monitor if you get more tired than usual when doing normal activities?	0.88	0.861	0.741	
Item 13. How often do you monitor for symptoms?	0.94	0.696	0.878	
Self-care management sub-scale				
Item 14. If you have had symptoms in the last month, how quickly did you recognize it as a symptom of your condition?	0.81	0.722	0.433	0.722
Item 15. When you have symptoms, how likely is it for you to change what you eat or drink in order to make the symptoms decrease or disappear?	1	0.700	0.421	
Item 16. When you have symptoms, how likely is it for you to change your activity level? (e.g. slow down, rest).	0.88	0.675	0.491	
Item 17. When you have symptoms, how likely is it for you to take the medicines that make the symptoms decrease or disappear?	0.88	0.643	0.568	
Item 18. When you have symptoms, how likely is it for you to inform your healthcare professional about the symptom on your next programmed visit?	0.94	0.689	0.445	
Item 20. When you have symptoms, how likely is it for you to call your healthcare provider to get advice?	1	0.634	0.550	

^aItem content validity index.

^bCorrected item-total correlation.

The final stage of the study focused on testing the content, convergent and construct validity of the 19-item version SC-CII-Sp ($n=864$), as well as its reliability and legibility. The sub-scales' content validity was considered excellent by the panel of experts. This suggests that the three scales and the 19 items included in the final version of the SC-CII-Sp contribute to operationalizing self-care behaviours in community-dwelling older adults with chronic multimorbidity as a measurable construct (Polit & Beck, 2020; Tabachnick & Fidell, 2018). The results from the convergent validity analysis showed that the three scales comprising the SC-CII-Sp moderately correlated with the SCD-SE. In relation to these results, it is important to highlight that according to the MRT-SCCI, the behaviours that the SCD-SE assesses are related to maintaining well-being (Riegel et al., 2012; Riegel, Hanlon et al., 2019), and this could explain why the correlation between this tool and the SC-Maintenance scale was markedly higher. To test

the dimensionality model extracted after the EFA, the SC-CII-Sp construct validity was assessed by performing a CFA. Although the sample used for this CFA ($n=864$) comprised retired community-dwelling older adults with more chronic conditions on average and a lower educational level than the sample of the original version of the SC-CII (Riegel et al., 2018), the theoretical dimensions that make up each of the scales coincided. We also obtained the same distribution of items on each scale as in the original version. The SC-Maintenance scale is composed of four items in 'health-promoting behaviour' and three items in 'illness-related behaviour'. In this scale, item 4 'special diet' also loads onto illness-related behaviour. This may be explained by the fact that older adults could see dietary adaptation as an imposed necessity to manage their conditions and not as part of their lifelong healthy habits. In contrast to the original study, the item 'avoid smoking' was not problematic for any of the analyses. This is probably

TABLE 5 Descriptive statistics for the items and total sub-scales comprising the SC-CII-Sp ($n = 864$).

Items/Sub-scale	Mean	SD	Skewness	Kurtosis
Item 1.	3.85	1.03	-1.08	0.03
Item 3.	3.29	1.28	-0.54	-1.14
Item 7.	3.44	1.38	-0.70	-1.12
Item 8.	4.03	1.13	-1.57	0.99
Item 2.	4.05	0.95	-1.41	0.89
Item 4.	2.93	1.33	-1.16	-1.43
Item 5.	3.66	1.02	-1.03	0.22
Item 6.	4.02	1.11	-1.15	-0.01
SC-Maintenance	29.89	5.01	-	3.71 ^a
Item 9.	3.93	1.05	-1.33	-0.41
Item 10.	3.58	1.24	-0.84	-0.45
Item 11.	3.59	1.11	-0.93	-0.36
Item 12.	3.54	1.13	-0.88	-0.73
Item 13.	3.53	1.33	-0.78	0.59
SC-Monitoring	19.06	4.17	-	4.87 ^a
Item 14.	3.14	1.60	-0.50	-0.41
Item 15.	3.18	1.17	-0.86	0.87
Item 16.	3.89	0.91	-1.45	0.29
Item 20.	3.47	1.35	-1.18	-1.41
Item 17.	4.15	0.95	-1.42	-0.56
Item 18.	3.72	1.20	-1.01	-1.09
SC-Management	22.70	4.11	-	4.73 ^a

^aMultivariate Kurtosis.

due to the sociodemographic differences between the two samples. The SC-Monitoring scale had five items with only one factor. In line with the SC-CII findings, item 14 'symptom recognition' did not load on the SC-Monitoring either, despite theoretically fitting there. However, it loaded into SC-Management. This could be related to how patients think that they need to know and recognize what defines their condition first before being able to focus on assessing its progression (Sigurgeirdottir et al., 2019). Regarding the SC-Management scale, our results coincided with the original distribution of four items comprising the subscale 'autonomous behaviour' and two in 'consulting behaviour'.

Reliability was tested by examining the internal consistency (IC) of each of the scales that comprise the SC-CII-Sp. Whilst the SC-Monitoring's IC was very high, the SC-Maintenance's IC was high, and the SC-Management's IC was adequate. These findings could be related to the fact that some items do not theoretically belong to the factors on which they load. For example, item 17 of the SC-Management, 'take medicine' loads onto the subscale 'consulting behaviour', when theoretically it would fit better in 'autonomous behaviour'. Reliability was also explored in a test-retest analysis of the three scales of the SC-CII-Sp. All three scales showed good temporal stability, with the lowest score for SC-Maintenance and the highest for SC-Monitoring. This finding could reflect that self-assessment behaviours are easier to maintain once knowledge and skills are

acquired (Xie et al., 2020). On the contrary, behaviours that involve being healthy are more linked to motivation and involve effort to accomplish and therefore decline more easily over time in older adults (Juul-Larsen et al., 2020).

To ensure that the content of the inventory was understandable for the target audience, an analysis of the readability of the scale was performed (Barrio-Cantalejo et al., 2008). The readability of the SC-CII-Sp according to the INFLESZ scale was 'fairly easy'. This could explain why, despite the fact that most participants had either not completed any formal education or completed primary education, they reported no problems in understanding the content of the SC-CII-Sp.

4.1 | Limitations

Although we conducted a methodologically rigorous study, some limitations should be mentioned. The first limitation is related to the convenience sampling of the participants, which hinders the possibility of generalizing the results. Although we tried to minimize the effects of this limitation by recruiting older adults from ten community centres covering a large area in south-eastern Spain, researchers planning to use the SC-CII-Sp amongst samples with different characteristics might need to conduct a validation study beforehand. In addition, it is important to consider that the social and healthcare context of the study might have influenced the results. Secondly, although our results suggest that the SC-CII-Sp can assess the self-care behaviours of community-dwelling older adults with chronic multimorbidity, it is unclear whether its items and dimensions will be sufficient to understand how they experience the phenomenon of self-care. Future research should use mixed methods designs to explore this phenomenon from a qualitative point of view as well. Thirdly, due to organizational issues, it was not possible to administer the SC-CII-Sp twice to all the participants in the final validation study. We tried to overcome this limitation by administering the SC-CII-Sp to a manageable subsample comprising 65 participants. Other researchers should be cautious about the test-retest reliability results reported in our study. Finally, it would be incorrect to claim outright validity and reliability of the SC-CII-Sp, as reliability and validity are ongoing, incremental and never-ending processes, so psychometric properties must be established in the different circumstances in which the instrument is used (Streiner & Kottner, 2014). The authors commit to considering these limitations in future research as well as the possibility of validating this instrument in other community and clinical contexts.

4.2 | Implications for research, policy and practice

Although the SC-CII had already proven to be a valid and reliable tool to assess self-care behaviours amongst populations with chronic conditions in different languages, it was unclear whether it could be used assuredly amongst Spanish-speaking older adults with chronic multimorbidity. Our results contribute to the validity

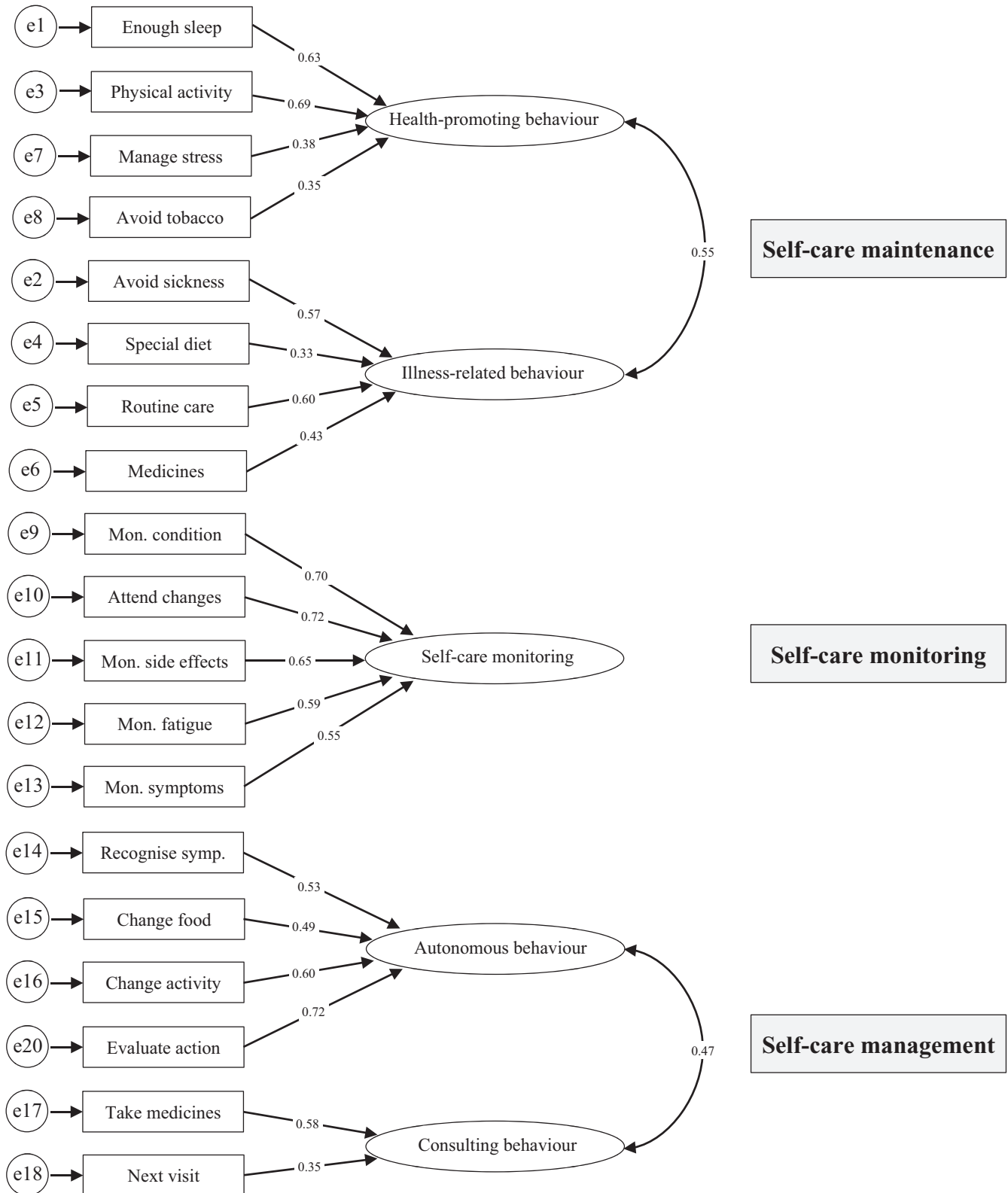


FIGURE 1 CFA models for three scales comprising the SC-CII-Sp ($n=864$). CFA, confirmatory factor analysis.

and reliability of the SC-CII to assess self-care behaviours amongst different populations. Since Spanish-speaking, community-dwelling older adults with chronic multimorbidity represent a vulnerable population worldwide and self-care behaviours are often related to

increased independence and better patient outcomes, our findings are relevant for researchers and clinicians alike. The results from this validation study enable researchers and clinicians to use the SC-CII-Sp to assess self-care behaviours amongst community-dwelling,

TABLE 6 Goodness-of-fit indexes for the sub-scales comprising the SC-CII-Sp ($n=864$).

Sub-scale	Chi-squared	CFI	TLI	RMSEA (90% CI)
SC-Maintenance	$\chi^2=358.18$ (df=19; $p<.001$)	0.918	0.901	0.068 (0.061–0.076)
SC-Monitoring	$\chi^2=30.47$ (df=5; $p<.001$)	0.975	0.950	0.057 (0.052–0.064)
SC-Management	$\chi^2=155.32$ (df=8; $p<.001$)	0.926	0.906	0.066 (0.059–0.073)

Abbreviations: CFI, comparative fit index; RMSEA, root mean square error of approximation; TLI, Tucker-Lewis Index.

Spanish-speaking older adults with chronic multimorbidity. Using the SC-CII-Sp in clinical practice could help us examine the effects of different interventions on self-care behaviours amongst community-dwelling older adults with chronic multimorbidity.

5 | CONCLUSION

Self-care behaviours are an essential element in the management of chronic conditions amongst community-dwelling older adults with multimorbidity. The results of this study suggest that the SC-CII-Sp is reliable and valid for use in the daily assessment of self-care behaviours amongst Spanish-speaking, community-dwelling older adults with chronic multimorbidity. The SC-CII-Sp addresses an important gap in related literature and is expected to be useful in research aimed at understanding and improving self-care behaviours in the growing population of community-dwelling older adults with chronic conditions. More research is needed to understand why some self-care behaviours remain unchanged across cultures. Validation in other geographical and cultural contexts would also be needed to further increase the possibility to generalize these findings.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*): (1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content. *<http://www.icmje.org/recommendations/>. JMHP, IDS, CFS, MMJL, MCC, MDRF: Made substantial contributions to conception and design, or acquisition of data or analysis and interpretation of data; Involved in drafting the manuscript or revising it critically for important intellectual content; Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; Agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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CONFLICT OF INTEREST STATEMENT

No conflict of interest has been declared by the author(s).


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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID


José Manuel Hernández-Padilla  <https://orcid.org/0000-0002-5032-9440>

Iria Dobbarrio-Sanz  <https://orcid.org/0000-0002-4405-5412>

Cayetano Fernández-Sola  <https://orcid.org/0000-0003-1721-0947>

María del Mar Jiménez-Lasserrotte  <https://orcid.org/0000-0001-8151-6866>


Matías Correa-Casado  <https://orcid.org/0000-0002-5242-5188>

María Dolores Ruiz-Fernández  <https://orcid.org/0000-0002-6454-4723>

TWITTER

José Manuel Hernández-Padilla  joseman_UAL

Iria Dobbarrio-Sanz  PhDobbarrio

Cayetano Fernández-Sola  CayetanoSola

María Dolores Ruiz-Fernández  maruferos

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