

Development and Psychometric Properties of Pictorial Vocational Interest Inventory for Indonesian Adolescents

**Firmanto Adi Nurcahyo¹, Saifuddin Azwar², Wisjnu
Martani³, Badrun Kartowagiran⁴**

^{1,2,3} Faculty of Psychology, Universitas Gadjah Mada, Yogyakarta

⁴ Graduate School, Yogyakarta State University, Yogyakarta

¹ Faculty of Psychology, Pelita Harapan University, Surabaya

Indonesia

Correspondence: Firmanto Adi Nurcahyo. Faculty of Psychology, Universitas Gadjah Mada, Bulaksumur Yogyakarta 55281. E-mail: firmanto.adi.n@mail.ugm.ac.id

© Universidad de Almería and Ilustre Colegio Oficial de la Psicología de Andalucía Oriental (Spain)

Abstract

Introduction. This study aimed to develop and establish psychometric properties of the Pictorial Vocational Interest Inventory (PVII), a vocational interest inventory for Indonesian adolescents presented in the form of picture pairs, specially developed to represent Holland's theoretical constructs.

Method. To obtain the evidence of test content, 31 experts judge the suitability of the PVII's pictures with the theory. Pictures with high Aiken's V index were selected and tested to the adolescents. The participants for PVII's testing were 826 high school students. The item analysis of PVII was performed for each interest type to select pictures with the corrected item-total correlation coefficient .30 or higher. Internal consistency and test-retest procedure were applied to obtain the reliability coefficients of the PVII. The construct validity for each type of interest was analyzed using Confirmatory Factor Analysis (CFA).

Results. Based on Aiken's V index of .80 or higher, 24 pictures were selected each with corrected item-total correlation coefficients ranging from .31 to .68. Cronbach's Alpha coefficients ranged from .60 to .79, while the test-retest reliability ranged from .71 to .82. The result of CFA showed that the factor loadings of the PVII's pictures ranged from .40 to .82; all of the factor loadings were significant at $p < .01$.

Conclusion. The findings of this study provide psychometrics support of the PVII as an adequate instrument to assess vocational interest in Indonesian adolescents.

Keywords: vocational interest; Holland's constructs; inventory development; validity

Resumen

Introducción. El objetivo de este estudio fue desarrollar y establecer las propiedades psicométricas del Pictorial Vocational Interest Inventory (PVII), un inventario de intereses vocacionales para adolescentes indonesios presentado en forma de pares de imágenes, especialmente desarrollado para representar los constructos teóricos de Holland.

Método. Para obtener la validez de contenido de la prueba, 31 expertos juzgaron la idoneidad de las imágenes del PVII con la teoría. Las imágenes con alto índice de Aiken V fueron seleccionadas y probadas para los adolescentes. Los participantes para las pruebas de PVII fueron 826 estudiantes de secundaria. El análisis de ítems de PVII se realizó para cada tipo de interés con el fin de seleccionar imágenes con un coeficiente de correlación total-ítem corregido de .30 o superior. Se aplicó el procedimiento de consistencia interna y test-retest para obtener los coeficientes de confiabilidad del PVII. La validez del constructo para cada tipo de interés se analizó mediante un análisis factorial confirmatorio (CFA).

Resultados Basándose en el índice V de Aiken de .80 o superior, se seleccionaron 24 imágenes cada una con coeficientes de correlación con el total que oscilaron entre .31 y .68. Los coeficientes alfa de Cronbach se situaron entre .60 y .79, mientras que la confiabilidad test-retest varió entre .71 y .82. El resultado del CFA mostró que las cargas factoriales de las imágenes del PVII se distribuyeron entre .40 y .82; todas las cargas factoriales fueron significativas para $p < .01$.

Conclusión. Los hallazgos de este estudio brindan apoyo psicométrico del PVII como un instrumento adecuado para evaluar los intereses vocacionales en adolescentes indonesios.

Palabras clave: interés vocacional; constructos de Holland; desarrollo de inventarios; validez

Introduction

Selecting an education major often becomes a problem for some students. It is generally experienced by Indonesian adolescents who have just graduated from the secondary education (Yogatama & Napitupulu, 2017). As a result, they have difficulties in determining the education majors at a higher level. Sadly, these cases continue to occur from year to year (Sawitri, 2009).

In relation to the above issue, there has been a necessity that the problem of Indonesian adolescents in selecting education majors is addressed. One way to overcome this problem is through a career exploration (Fouad, Cotter, & Kantamneni, 2009). A career exploration includes all activities aimed at increasing information about individuals and the environment, which can be used to assist individuals in making career decisions. One of the information sought after through career exploration is the individual vocational interest. It has been proven that the acknowledgment of adolescents' vocational interest will facilitate students in selecting an appropriate education major.

Van Iddekinge, Putka, & Campbell (2011) defined vocational interest as stable differences between individuals that influence their behavior when selecting certain work activities and environments. Vocational interest is part of an individual's disposition associated with his or her preferences for activities and which affect an individual behavior through motivational processes (Low, Yoon, Roberts, & Rounds, 2005).

Vocational interest is very important as the suitability of the interest in the student's education major determines their stay in their selected education majors. The results of the study by Allen & Robbins (2008) show that the suitability between the students' interests and their selected education majors can predict the students' retainment in their education majors. This phenomenon was also found in students with lower achievement (Leuwerke, Robbins, Sawyer, & Hovland, 2004). This persists because the students feel satisfied with their selected education major (Logue, Lounsbury, Gupta, & Leong, 2007).

There are theories on vocational interest, and one of the most popular is Holland's theoretical construct which divides individual vocational interest into six types i.e. Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). Each type of

interest has its own characteristics that distinguish one type of interest from another. Realistic-type individuals tend to prefer explicit activities on objects such as that of involving machines, tools, and animals; Investigative-type individuals are interested in observational and systematic investigation of biological and cultural phenomena; Artistic-type individuals prefer free and unsystematized activities intended to create art forms; Social-type individuals enjoy helping and understanding people; Enterprising-type individuals prefer persuasive activities to achieve economic objectives; and Conventional-type individuals are interested in working with explicit and ordered data (Holland, 1985).

Holland's theoretical construct has become the foundation for the development of many vocational interest inventories. The construct became the basis for the development of Self-Directed Search/SDS (Holland, 1985). SDS has been known as the most widely used instrument for measuring vocational interest (Poitras, Guay, & Ratelle, 2012). Holland (1985) stated that an individual vocational interest can be estimated based on his/her scores of vocational interest inventory. A profile that describes an individual's vocational interest can be generated from his/her scores.

The development of vocational interest inventories based on Holland's theoretical construct has been continuing in the last decade as those conducted by Armstrong, Allison, & Rounds (2008); Fonteyne, Wille, Duyck, & De Fruyt (2016); Leierer, Strohmer, Blackwell, Thompson, & Donnay (2008); Maree & Taylor (2016); Tracey (2010); Wetzell, Hell, & Passler (2012). The development of interest's instruments has also been conducted in many countries such as Irish (Darcy, 2005), Serbia (Hedrih, 2008), Germany (Nagy, Trautwein, & Lüdtke, 2010), Spain (Mudarra & Martínez, 2014), Philippines (Primavera et al., 2010), Korea (Tak, 2004), Japan (Long, Watanabe, & Tracey, 2006; Tracey, Watanabe, & Schneider, 1997), and China (Tang, 2001) as well as in Indonesia (Artosandi, 2015; Kumaidi, 2016; Lubis, 2008; Muhrotien, 1993; Nurcahyo & Azwar, 2008).

Unfortunately, the interest instruments which are widely used today have some shortcomings. Ting (2007) found that many students in Hong Kong do not understand some SDS items (job items) because some of the jobs such as juvenile delinquency expert, locomotive engineer, bank examiner, and social science researcher do not exist in Hong Kong. It means that there are problems in the content validation in SDS. The problem of outdated items was found on Geist Picture Interest Inventory (GPII). Sverko, Babarović, &

Međugorac (2014) indicated that many jobs in GPII items have been no longer available at this time; still GPII is widely used today as it can be used on respondents who experience reading problems.

Moreover, a problem in validation process occurs in some interest instruments. Sung, Cheng, & Wu (2016) showed that while most studies support Holland's theoretical construct, there are still debates on the application of the theory. Studies with samples comprising of Americans show more support for Holland's construct than studies with non-American samples. Some studies also show that the validation of the internal structure of the instrument has not been performed (Bogluç, Rizeanu, & Burtăverde, 2015; Nurcahyo & Azwar, 2008; Tien, 1993).

To make matter worse, many interest instruments consist of a large number of items. Unisex Edition of the ACT Interest Inventory (UNIACT), for instance, consists of 90 items, SII consists of 153 items, Vocational Preference Inventory consists of 60 items, Career Assessment Inventory consists of 150 items, Interest Profiler consists of 180 items, and SDS consists of 228 items. Interest inventory with many items requires a long time of administration which causes the participants to become exhausted or get bored (Poitras et al., 2012; Zhang, 2000).

One big issue is that most existing instruments are verbal in nature. These type of verbal instruments contains weakness which is its dependence on respondents' reading ability (Boerchi & Magnano, 2015; Enke, 2009; Šverko et al., 2014). It was why it was decided that the inventory stimuli developed in this study are in the form of pictures. It is quite different from the stimulus of interest instruments in Indonesia which are generally verbal.

There are some advantages of using items in the form of a picture. These items do not require individuals' reading ability. In addition, they can provide information about the environment as well as activities related to a particular job (Šverko, Babarović, & Međugorac, 2014). The items are also more capable of describing the real world rather than verbal items (Boerchi & Magnano, 2015). Therefore, the response obtained from the presentation of stimulus in the form of pictures is believed to depict individuals in daily life (Geist 1959).

The unintended effect of the figure presented in the picture is one of the problems with pictorial items (Šverko, et al., 2014). Individuals could prefer some items due to the gender of the depicted figure. The respondents also could identify with the items who display a similar gender role orientation (Jose, 1989). To overcome the problem of the depicted figure, two version of the inventory could be constructed each for male and male respondents.

The aforementioned problems of the current vocational interest inventory issued the needs of a new vocational interest inventory as its contribution to individuals' education is important. In addition, the shortcomings of the current interest inventory also carry the consequences of the need for developing an interest inventory with more empirical psychometric properties.

Objective

This study aimed to develop and establish psychometric properties of the Pictorial Vocational Interest Inventory (PVII), a vocational interest inventory for Indonesian adolescents. The development of PVII was conducted according to Holland's theoretical constructs for it has been widely used in various development of interest instruments (Armstrong, Rounds, et al., 2008; Fonteyne et al., 2016; Leierer et al., 2008; Liao, Armstrong, & Rounds, 2008; Maree & Taylor, 2016; Toker & Ackerman, 2012; Tracey, 2010; Wetzel et al., 2012). A good interest inventory must satisfy some psychometric properties, therefore, the psychometric properties of the PVII were investigated in this study.

Method

Participants

To obtain the evidence of test content, a panel of experts was asked to evaluate the items of PVII. 31 people, 10 men, and 21 women, act as a panel of experts who judge the suitability of the items with the theory. All of the experts have an educational background in psychology; three experts hold a doctoral degree, while 18 people hold a master's degree in psychology. They have the knowledge and experience in the development of psychological instruments.

The participants for PVII's testing were 826 high school students (259 male, 567 female, $M_{age}=16.61$ years, aged between 15 and 19). They were enrolled in class 11 and 12.

They came from seven schools with various majors of education such as engineering, pharmacy, art, nursing, marketing, and accounting.

Instrument

In this study, Pictorial Vocational Interest Inventory (PVII) was developed to assess the vocational interest of Indonesian adolescents based on Holland's theoretical construct. The items were presented in the form of pictures. Each picture represents one of the RIASEC characteristics.

PVII is a self-assessment instrument made in a book form. The pictures in PVII were arranged in pairs at each page of the book. Each pair consists of two pictures that represent two different types of interests. For the scoring purpose, each picture is coded according to the type of interest described. For example, R1 is a code for a picture that describes the Realistic type of interest. The code for each picture is placed above the picture. For the picture selection purpose, a letter (A/B) is written below each picture. Therefore each pair of pictures consists of picture A and B.

On the first page of the inventory, the individuals are asked to complete demographic data such as name, age, and gender. Below the demographic data are the inventory instructions. The instructions are "The following are pictures that describe various activities. The pictures are presented in pairs i.e. picture A and B. Each picture describes a specific activity. From each pair of pictures, select a picture that describes the activity you prefer compared to the activity described on the other picture. Give a check mark the letter below the picture you selected". The instructions of the inventory are followed by the presentation of the pairs of the pictures.

The scoring of PVII's pictures is conducted for each picture. From each pair of pictures, the selected picture is scored 1 while the unselected picture is scored 0. An individual's score for each type of interest is then calculated by summing the score of the pictures which represent the same type of interest. For example, the individual's Realistic score is the sum of his/her scores of R1, R2, R3, and R4. Since Holland divides interest types into six, there are six scores for each respondent. The higher score indicates the higher interest level for each type of interest.

Procedure

Item writing was the initial step in the item development process. The items of PVII consist of various activities developed from Holland's theoretical constructs. As described in

Holland's theory, the Realistic type individuals prefer to choose explicit activities on objects such as machines, and tools. These characteristics were then manifested in items which were repairing vehicle, operating tractor, repairing computer, driving off-road vehicle, caring for plant, fixing up electricity, and training animal. The same steps were also applied to the other interest types. For each interest type, seven items were developed so that there were 42 items in total (see Table 1).

Table 1. *Description of activities according to RIASEC type of interest*

Interest's Type	Activities describing RIASEC type
Realistic	Repairing vehicle, operating a tractor, repairing computer, driving off-road vehicle, caring for plant, fixing up electricity, training an animal
Investigative	Investigating with a microscope, investigating historical findings, observing child's behavior, investigating with a telescope, doing a chemical experiment, reading in library, investigating X-ray's photo
Artistic	Designing building, dancing, making sculpture, playing a musical instrument, painting, reading poetry, designing clothes
Social	Caring for the sick, parenting, teaching in class, training a child to walk, assisting the sick, providing psychological counseling, teaching children
Enterprising	Chairing a meeting, being a host, guiding on travel, guiding on tours, offering a house, offering a car, giving motivation
Conventional	Computing with calculator, typing, doing financial calculation, organizing library's books, collecting population data, doing archiving

Items that have been compiled were then developed in the form of pictures. For each item, pictures of male and female figures who are doing an activity were drawn. The pictures with male figures were compiled as the male version, while the pictures with female figures would be compiled as the female version of the PVII.

For each picture, the experts were asked to assess whether the picture was suitable to represent one of Holland's interest type. The experts were also asked to assess whether the picture clearly shows a specific activity (e.g., repairing vehicle, operating tractor, etc.). The range score for each assessment was one to five. A score of five indicates that the picture was very suitable or clear to describe a type of interest. In addition, the experts were requested to provide feedback and suggestions for the picture improvement.

Pictures with high Aiken's V index were selected. The selected pictures were then paired together according to the equivalency of Aiken's V index. The paired of the pictures were then tested to the respondents which were adolescents.

Item analysis was conducted based on the data of the adolescents. The item analysis of PVII was performed for each interest type to select pictures with a high corrected item-total correlation coefficient. Since the PVII was designed consists of picture pairs, the number of the selected pictures for each type should be the same.

Internal consistency and test-retest procedure were applied to get the reliability coefficients of the PVII. Reliability analysis was performed for each type of interest on the selected pictures. Cronbach's Alpha coefficients were calculated to determine the internal consistency of the inventory. Test-retest reliability was conducted to examine the stability of the PVII for a 4-week period.

The construct validity for each type of interest was analyzed using Confirmatory Factor Analysis (CFA). CFA was performed to obtain the factor loading of each picture to the construct, as well as the suitability of the model with the data.

Data Analysis

The scores of the experts were analyzed with Aiken's V formula. Pictures with Aiken's V index of .80 or higher were selected. The corrected item-total correlation coefficient and Cronbach's Alpha coefficients were calculated using SPSS 21. The item analysis of PVII was performed for each interest type to select pictures with the corrected item-total correlation coefficient .30 or higher. Pearson correlation was applied to produce a correlation coefficient which indicates the test-retest reliability. AMOS 21 was utilized to perform the CFA. The goodness of fit was based on several criteria which were $p > .05$, $1 < \text{CMIN/DF} < 2$, $\text{GFI} > .90$, $\text{RMSEA} < .08$, $\text{RMR} < .08$, $\text{NFI} > .90$ and $\text{CFI} > .90$.

Results

Picture Generation

Figure 1 is an example of the pictorial item generation for "Realistic" generated based on Holland's theoretical construct of which pairing between male and female figures was made.

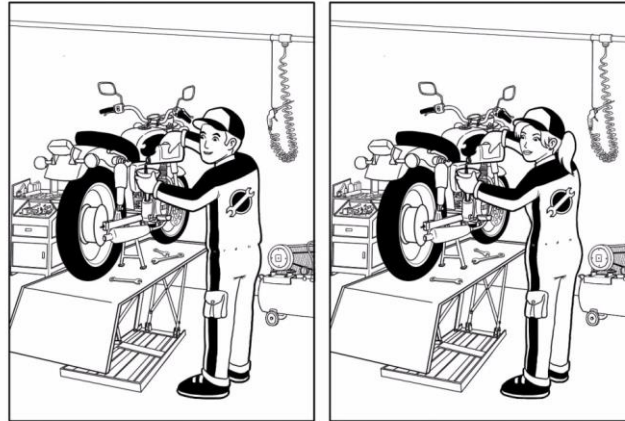


Figure 1. “Repairing vehicle” picture representing the Realistic interest type for male and female participants

Selected Pictures Based on Content Validity

Items that have good content validity are those with an Aiken’s V index approaching one and a minimum index of .80 was acceptable. Five pictures were selected for each type of interest with a minimum Aiken’s V index of .80. Some adjustments were made based on the experts’ feedback. The “travel guiding” picture which describes the Enterprising interest type was selected because it has a higher Aiken’s V index than the “tour guiding” picture. Due to its importance, the “giving motivation” picture was then added as the fifth picture despite having Aiken’s V index less than .80 (i.e., .790). Further revisions, for instance, picture E4 in which a background picture was added (see Figure 2), were made according to the suggestion of the experts. The overall five pictures selected for each interest type are shown in Table 2.

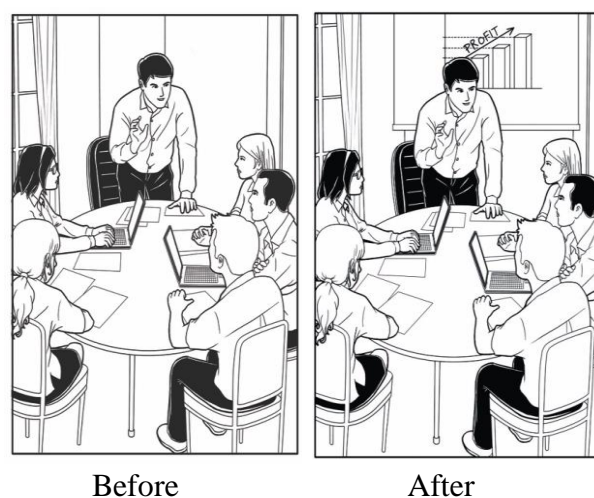


Figure 2. Example of a picture that was improved after the content validation process. The experts suggested that the picture need to add backgrounds that support enterprising activities such as sales data graphs.

Table 2. *Selected pictures based on Aiken's V index*

Type of Interest	Pictures	Aiken's V Suitability	Aiken's V Clarity
Realistic	Fixing up electricity (R1)	.976	.976
	Repairing vehicle (R2)	.960	.960
	Repairing computer (R3)	.960	.944
	Operating tractor (R4)	.927	.944
	Training animal (R5)	.879	.911
Investigative	Investigating with a microscope (I1)	.984	.976
	Doing chemical experiment (I2)	.976	.968
	Observing child's behavior (I3)	.895	.879
	Investigating with a telescope (I4)	.871	.839
	Investigating X-ray's photo (I5)	.871	.790
Artistic	Dancing (A1)	.976	.976
	Painting (A2)	.976	.976
	Playing musical instrument (A3)	.968	.968
	Designing clothes (A4)	.968	.976
	Reading poetry (A5)	.952	.887
Social	Teaching in class (S1)	.984	.992
	Assisting for the sick (S2)	.960	.968
	Caring for the sick (S3)	.952	.944
	Training a child to walk (S4)	.935	.952
	Teaching children (S5)	.935	.935
Enterprising	Offering a house (E1)	.919	.944
	Offering a car (E2)	.911	.895
	Guiding on travel (E3)	.871	.919
	Chairing a meeting (E4)	.847	.935
	Giving motivation (E5)	.790	.758
Conventional	Computing with calculator (C1)	.960	.935
	Organizing library's books (C2)	.952	.927
	Typing (C3)	.927	.944
	Doing archiving (C4)	.927	.919
	Photocopying files (C5)	.919	.960

The selected pictures were then paired together according to the equivalency of Aiken's V index. The Aiken's V difference index ranged from 0 to .137 (see Table 3). The small difference index indicates equality between the two pictures, for instance, I2 and A1 have the same Aiken's V index thus, they have no Aiken's V difference score. On the other hand, R4 and E5 have the highest Aiken's V difference index which was .137.

Table 3. Pairs of the PVII's pictures

Item	Picture 1		Picture 2		Aiken's V Difference Score
	Code	Aiken's V	Code	Aiken's V	
1	R1	.976	I1	.984	.008
2	I2	.976	A1	.976	0
3	A2	.976	S1	.984	.008
4	S2	.960	E1	.919	.041
5	E2	.911	C1	.960	.049
6	R2	.960	A3	.968	.008
7	I3	.895	S3	.952	.057
8	A4	.968	E3	.871	.097
9	S4	.935	C2	.952	.017
10	R3	.960	S5	.935	.025
11	I4	.871	E4	.847	.024
12	A5	.952	C3	.927	.025
13	R4	.927	E5	.790	.137
14	I5	.871	C4	.927	.056
15	R5	.879	C5	.919	.040

The paired of the pictures were then tested to the participants. Figure 3 is an example of PVII's items. The participants were asked to select one of the pictures showing the activity they preferred.

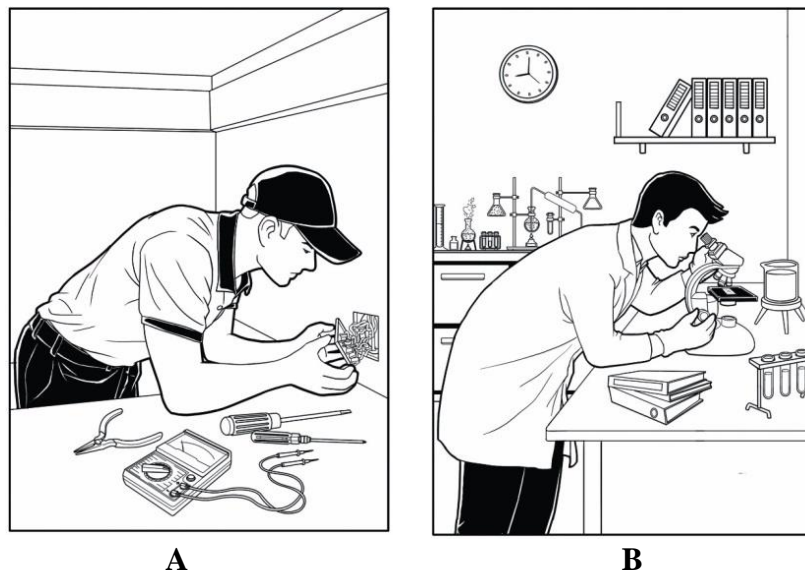


Figure 3. Example of PVII's items; picture A describes a Realistic activity, while picture B describes an Investigative activity.

Selected Pictures Based on Corrected Item-Total Correlation Coefficient

Three steps were carried out to select the pictures with good psychometric properties. Firstly, the corrected item-total correlation coefficient for each picture ranged from .201 to .684. Three pictures with a corrected item-total correlation coefficient less than .30 were I3, S4, and E2 thus decided to be removed from the instrument.

Secondly, since the PVII was designed in pairs, each interest should have the same number of items. Therefore, Realistic, Artistic, and Conventional pictures with the lowest corrected item-total correlation coefficient were also excluded (R5, A3, and C2). The final interest types consist of four pictures. Table 4 shows the selected pictures and their corrected item-total correlation coefficients. The corrected item-total correlation coefficients of the selected pictures ranged from .308 to .684.

Table 4. *Selected pictures for each type of interest*

Type of Interest	Selected Pictures
Realistic	R1(.684), R2 (.642), R3 (.619), R4 (.423)
Investigative	I1 (.339), I2 (.454), I4 (.416), I5 (.403)
Artistic	A1 (.550), A2 (.540), A4 (.486), A5 (.349)
Social	S1 (.308), S2 (.483), S3 (.430), S5 (.402)
Enterprising	E1 (.380), E3 (.337), E4 (.448), E5 (.349)
Conventional	C1 (.526), C3 (.416), C4 (.381), C5 (.611)

Thirdly, as the result of the item selection procedure, some pictures (R2, S3, C1, and C5) lose their pairs. Those pictures were then paired together. Pictures that tend to be chosen by many participants are mutually paired. Since S3 was chosen by 211 students and C1 was chosen by 281 students, both pictures were then paired together. The second pair was R2 and C5 for R2 was chosen by 183 students, while C5 was chosen by 199 students. The item selection process produced four pictures for each interest type. Thus, the total number of PVII pictures was 24, which then arranged in pairs resulting in 12 pairs of pictures.

Reliability

Cronbach's Alpha reliability was performed for each type of interest so that six Cronbach's Alpha coefficients were obtained (see Table 5). The Cronbach's Alpha coefficients of the PVII ranged from .600 to .788. The Enterprising interest has the lowest, while Realistic interest has the highest reliability coefficient.

Table 5. Reliability coefficients of the PVII

Type of Interest	Cronbach's Alpha Coefficient	Test-retest Coefficient
Realistic	.788	.820
Investigative	.630	.707
Artistic	.700	.742
Social	.628	.714
Enterprising	.600	.707
Conventional	.693	.729

The test-retest reliability of PVII ranged from .707 to .820 (see Table 5) based on the data of 341 respondents who completed the inventory twice in a different time. The Enterprising interest consistently has the lowest, while the Realistic interest has the highest reliability coefficient.

Construct Validity

The result of CFA shows that items R1, R2, R3, and R4 have a significant factor loading on Realistic construct (see Figure 4). The factor loadings of Realistic items ranged from .469 to .820 and were significant at $p < .01$. The model reached a good fit index: $p = .250$, $CMIN/DF = 1.386$, $RMR = .003$, $GFI = .997$, $CFI = .999$, $NFI = .995$, and $RMSEA = .029$. All of the criteria showed a good fit between the model and the data.

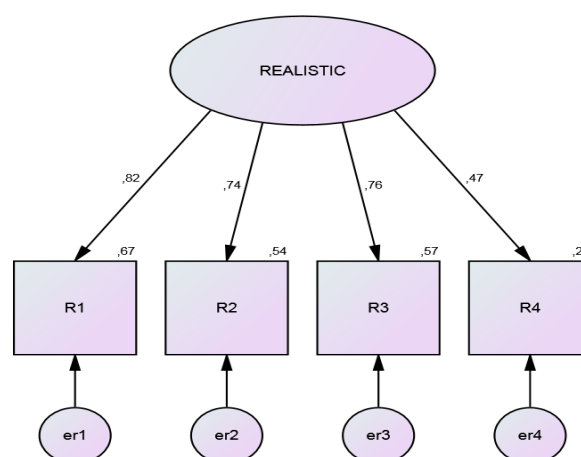


Figure 4. The result of CFA for Realistic pictures

The CFA for Investigative, Artistic, Social, Enterprising, and Conventional type also showed a good result. The factor loadings of the PVII's pictures ranged from .403 to .820; all of the factor loadings were significant at $p < .01$.

The result of the goodness of fit index also supported the unidimensional model for each type of interest. The results of the goodness of fit index for each type of interest were shown in Table 6. Of the seven criteria, each type of interest met four to seven of the criteria. Two types of interest (i.e., Realistic and Artistic interest type) met all of the criteria, while the Conventional type met four of the criteria which were RMR, GFI, CFI, and NFI.

Table 6. *The goodness of fit for each type of interest*

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
<i>p</i>	.250	.039	.156	.970	.611	.001
CMIN/DF	1.386	3.247	1.855	.030	0.493	15.960
RMR	.003	.007	.004	.001	.003	.013
GFI	.997	.993	.996	1.000	.999	.964
CFI	.999	.977	.994	1.000	1.000	.910
RMSEA	.029	.071	.044	.001	.001	.183
NFI	.995	.968	.988	1.000	.994	.905

Discussion and Conclusion

This study aimed to develop a vocational interest inventory (i.e. PVII) based on Holland's theoretical constructs with stimulus in form of picture pairs. Items in the form of pictures have been used on previous interest instruments (Boerchi & Magnano, 2015; Enke, 2009; Geist, 1959; Šverko et al., 2014). The pictures developed in this study differ from the pictures in the previous instrument such as the pictures developed by Šverko et al. (2014) were represented with photographs of people while pictures in this study were digital drawing pictures; the pictures developed by Boerchi & Magnano (2015) represent a person performing a profession, while pictures developed in this study represent a person performing an activity.

Two versions of PVII were constructed in this study i.e. male and female version. The male version of PVII consists of pictures containing male figures who are doing the activities depicted in the pictures, while the female version of PVII consists of pictures containing female figures who are doing the activities depicted in the pictures. The male version of PVII

is intended for men, while the female version of PVII is for women. Rothwell-Miller Interest Blank (RMIB) was also developed in male and female form (Miller, 1960). Items in the male form of RMIB are different from the items in the female form. However, although there are different forms of the RMIB for male and female, the basic job categories are the same (Cherry, 1974).

Psychometric properties that are important in the development of psychological instruments are reliability and validity. Those are two fundamental elements in the evaluation of an instrument (Tavakol & Dennick, 2011). Therefore, the reliability and validity of the PVII became an important element in this study.

In this study, the reliability was performed for each interest type. Tavakol and Dennick (2011) state that if a test has more than one construct, Cronbach's Alpha coefficient should be calculated per construct. The use of Cronbach's Alpha reliability produces six coefficients ranging from .600 to .788. Gable and Wolf (1993) stated that good affective instruments must have reliability as low as .70. Four of the six Cronbach's Alpha coefficients obtained in this study are still below .70. This suggests that the internal consistency reliability of the PVII were still relatively low.

The low Cronbach's Alpha coefficient of PVII is possible due to the low intercorrelation value between items, heterogeneous constructs, or the small number of items (Tavakol & Dennick, 2011). The result shows that the selected PVII's pictures have a minimum corrected item-total correlation coefficient of .308. It means that the PVII's pictures have a high intercorrelation. The internal structure of PVII has been tested by using factor analysis. The result of the CFA shows the fit of the model with the data. It proves that each type of interest is homogeneous (unidimensional). This result confirms that the problem of low Cronbach's Alpha coefficients in this study is not due to heterogeneous construct's problem.

The low Cronbach's Alpha coefficient in this study is possible due to the small number of items in each interest type. The number of items in a test or scale affects the Cronbach's Alpha coefficient (Panayides, 2013). Cronbach's Alpha coefficient will increase as a function of the length of the test. The results of the item selection in this study produced

only four items for each type of interest. Cronbach's Alpha coefficient tends to be satisfactory if an instrument consists of 20 items or more (Streiner, 2003).

In this study, the test-retest measure produced reliability coefficients $\geq .70$. Furr (2011) stated that there is no clear cut-off separating good and poor reliability, however, the value of .70 is generally viewed as sufficient for research. It confirms that PVII can be used in research involving adolescent's vocational interest construct.

The validity of PVII's interpretation was obtained through some evidence. The source of evidence obtained in this study comes from the test content and the internal structure. These two pieces of evidence are mutually supportive in providing interpretations of the PVII.

The result of the expert judgment shows that the items of PVII were able to illustrate the characteristics of Holland's constructs. It was proven by the high index of Aiken's V on most items. Jha, Singh, & Suresh (2014) used Aiken's V index above .70 in item selection. In this study, the selected items were pictures with Aiken's V index of .80 or higher. Rico, Dios, & Ruch (2012) stated that a minimum content validity index of 0.8 is needed to obtain a clear construct differentiation.

The results of CFA support a one-factor model for each type of interest. Of the seven fit model criteria, two types of interests (Realistic and Artistic) met all of the criteria, while two other (Social and Enterprising) met the six criteria. In the Investigative interest type, five criteria are met, while in the Conventional interest type four criteria are met. The factor loadings of the items on the construct were significant across all interest types. It shows that each item gave a contribution to the construct.

Taking into account the findings of this study, the PVII is an adequate instrument for exploring the vocational interest of Indonesian adolescents. It is a valid measure of Holland's RIASEC types and suitable for adolescents. PVII can be used by psychologists and education counselors to assess Indonesian adolescents' vocational interest.

This study has limitation due to the number of items. Item selection results produce four items for each interest. Item selection has an impact on the lack of coverage of activities in Holland's theoretical construct which are manifested in the items. Realistic interests

theoretically include the preference of activities with animals. However, the activity described in R5 was not selected in the PVII for it has a low total item correction coefficient. The small number of items in each interest type also affect the Cronbach's Alpha coefficient. Additional parallel items for each type of interest could improve the Cronbach's Alpha coefficient of the inventory (Azwar, 2012).

A validation is intended to obtain a strong interpretation of the data or test scores. This can be done by seeking evidence that can support inferences regarding the use of specific measures (AERA, APA, & NCME, 2014). This process is not possible to be completed at one time as it is an ongoing process (Messick, 1995). Further study can be directed to obtain the evidence of the external validity of the PVII by correlating the score of the PVII with the score of other measurements.

Acknowledgment

This work was supported by the Directorate of Research and Community Service, Ministry of Research, Technology and Higher Education of Indonesia under Research Contract Number 120/SP2H.LT/DRPM/IV/2017.

References

- AERA, APA, & NCME. (2014). *Standards for educational and psychological testing*. Washington: American Educational Research Association.
- Allen, J., & Robbins, S. B. (2008). Prediction of college major persistence based on vocational interests, academic preparation, and first-year academic performance. *Research in Higher Education*, 49(1), 62–79. <https://doi.org/10.1007/s11162-007-9064-5>
- Armstrong, P. I., Allison, W., & Rounds, J. (2008). Development and initial validation of brief public domain RIASEC marker scales. *Journal of Vocational Behavior*, 73(2), 287–299. <https://doi.org/10.1016/j.jvb.2008.06.003>
- Armstrong, P. I., Rounds, J., & Hubert, L. (2008). Re-conceptualizing the past: Historical data in vocational interest research. *Journal of Vocational Behavior*, 72(3), 284–297. <https://doi.org/10.1016/j.jvb.2007.09.004>
- Artosandi, Y. S. R. (2015). The development of vocational interest instrument for career exploration of junior high school students. Retrieved from <https://publikasiilmiah.ums.ac.id/handle/11617/6324>
- Azwar, S. (2012). *Reliabilitas dan validitas*. Yogyakarta: Pustaka Pelajar.

- Boerchi, D., & Magnano, P. (2015). Iconographic Professional Interests Inventory (3IP): A new validation study. *Europe's Journal of Psychology*, *11*(4), 571–596. <https://doi.org/10.5964/ejop.v11i4.927>
- Bogluț, A., Rizeanu, S., & Burtăverde, V. (2015). Vocational guidance for undergraduate psychology students. Psychometric properties of the questionnaire of vocational interests in psychology. *Procedia - Social and Behavioral Sciences*, *187*, 713–718. <https://doi.org/10.1016/j.sbspro.2015.03.133>
- Cherry, N. (1974). Components of occupational interest. *British Journal of Educational Psychology*, *44*(1), 22–30.
- Darcy, M. U. A. (2005). Examination of the structure of Irish students' vocational interests and competence perceptions. *Journal of Vocational Behavior*, *67*(2), 321–333. <https://doi.org/10.1016/j.jvb.2004.08.007>
- Enke, S. (2009). *A pictorial version of the RIASEC scales of the Personal Globe Inventory*. Colorado State University. Retrieved from <http://search.proquest.com/openview/f37bbeb6045991f13da9493e96edd4aa/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Fonteyne, L., Wille, B., Duyck, W., & De Fruyt, F. (2016). Exploring vocational and academic fields of study: development and validation of the Flemish SIMON Interest Inventory (SIMON-I). *International Journal for Educational and Vocational Guidance*. <https://doi.org/10.1007/s10775-016-9327-9>
- Fouad, N., Cotter, E. W., & Kantamneni, N. (2009). The effectiveness of a career decision-making course. *Journal of Career Assessment*, *17*(3), 338–347. <https://doi.org/10.1177/1069072708330678>
- Furr, R. M. (2011). *Scale construction and psychometrics for social and personality psychology*. Los Angeles ; London: Sage.
- Gable, R. K., & Wolf, M. B. (1993). *Instrument development in the affective domain*. Dordrecht: Springer Netherlands. Retrieved from <http://link.springer.com/10.1007/978-94-011-1400-4>
- Geist, H. (1959). The Geist Picture Interest Inventory: General form: Male. *Psychological Reports*, *5*(2), 413–438.
- Hedrih, V. (2008). Structure of vocational interests in Serbia: Evaluation of the spherical model. *Journal of Vocational Behavior*, *73*(1), 13–23. <https://doi.org/10.1016/j.jvb.2007.12.004>

- Holland, J. L. (1985). *Making vocational choices: a theory of vocational personalities and work environments*. USA: Prentice Hall, Inc.
- Jha, S., Singh, B., & Suresh, K. P. (2014). Consumer Perception Scale in Store Environment (CPS-SE) for measuring consumer buying behavior. *IUP Journal of Marketing Management*, 13(3), 48.
- Jose, P. E. (1989). The role of gender and gender role similarity in readers' identification with story characters. *Sex Roles*, 21(9), 697–713.
- Kumaidi. (2016, 31 Mei). *Characteristics of an instrument of vocational interest scales*. Presented at the International Conference on Educational Research and Evaluation, Universitas Negeri Yogyakarta.
- Leierer, S. J., Strohmer, D. C., Blackwell, T. L., Thompson, R. C., & Donnay, D. A. C. (2008). The Rehabilitation Counselor Scale: A new scale for the revised Strong Interest Inventory. *Rehabilitation Counseling Bulletin*, 51(2), 68–75. <https://doi.org/10.1177/0034355207311341>
- Leuwerke, W. C., Robbins, S., Sawyer, R., & Hovland, M. (2004). Predicting engineering major status from mathematics achievement and interest congruence. *Journal of Career Assessment*, 12(2), 135–149. <https://doi.org/10.1177/1069072703257756>
- Liao, H.-Y., Armstrong, P. I., & Rounds, J. (2008). Development and initial validation of public domain Basic Interest Markers. *Journal of Vocational Behavior*, 73(1), 159–183. <https://doi.org/10.1016/j.jvb.2007.12.002>
- Logue, C. T., Lounsbury, J. W., Gupta, A., & Leong, F. T. L. (2007). Vocational interest themes and personality traits in relation to college major satisfaction of business students. *Journal of Career Development*, 33(3), 269–295. <https://doi.org/10.1177/0894845306297348>
- Long, L., Watanabe, N., & Tracey, T. J. (2006). Structure of interests in Japan: Application of the personal globe inventory occupational scales. *Measurement and Evaluation in Counseling and Development*, 38(4), 222–236.
- Low, K. S. D., Yoon, M., Roberts, B. W., & Rounds, J. (2005). The stability of vocational interests from early adolescence to middle adulthood: A quantitative review of longitudinal studies. *Psychological Bulletin*, 131(5), 713–737. <https://doi.org/10.1037/0033-2909.131.5.713>
- Lubis, F. Y. (2008). Pengembangan alat ukur minat untuk pengembangan karir pada lulusan Sekolah Menengah Atas. *Abstrak*. Retrieved from <http://repository.unpad.ac.id/id/eprint/3028>

- Maree, J. G., & Taylor, N. (2016). Development of the Maree Career Matrix: a new interest inventory. *South African Journal of Psychology*, 46(4), 462–476.
- Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist*, 50(9), 741.
- Miller, K. M. (1960). The measurement of vocational interests by a stereotype ranking method. *Journal of Applied Psychology*, 44(3), 169.
- Mudarra, M. J., & Martínez, Á. L. (2014). La Clave Profesional: Validation of a vocational guidance instrument. *Electronic Journal of Research in Educational Psychology*, 12(3), 887-912.
- Muhrotien, A. (1993). *Pengembangan dan standarisasi tes minat jabatan (Vocational Preference Inventory) untuk bimbingan karier siswa kelas 1 SMA*. Universitas Gadjah Mada, Yogyakarta.
- Nagy, G., Trautwein, U., & Lüdtke, O. (2010). The structure of vocational interests in Germany: Different methodologies, different conclusions. *Journal of Vocational Behavior*, 76(2), 153–169. <https://doi.org/10.1016/j.jvb.2007.07.002>
- Nurcahyo, F. A., & Azwar, S. (2008). Pengembangan skala minat untuk penjurusan akademis di Perguruan Tinggi. *Humanitas*, 5(2), 83–96.
- Panayides, P. (2013). Coefficient Alpha: Interpret with caution. *Europe's Journal of Psychology*, 9(4), 687–696. <https://doi.org/10.5964/ejop.v9i4.653>
- Poitras, S.-C., Guay, F., & Ratelle, C. F. (2012). Using the Self-Directed Search in research: selecting a representative pool of items to measure vocational interests. *Journal of Career Development*, 39(2), 186–207. <https://doi.org/10.1177/0894845310384593>
- Primavera, M. T., Church, A. T., Katigbak, M. S., Bruna, L., White, J. R., & Peradilla, I. (2010). The structure of vocational interests in Filipino adolescents. *Journal of Vocational Behavior*, 77(2), 213–226. <https://doi.org/10.1016/j.jvb.2010.05.002>
- Rico, E. D., Dios, H. C., & Ruch, W. (2012). Content validity evidences in test development: An applied perspective. *International Journal of Clinical and Health Psychology*, 12(3), 449–460.
- Sawitri, D. R. (2009). Pengaruh status identitas dan efikasi diri keputusan karir terhadap keraguan mengambil keputusan karir pada mahasiswa tahun pertama di Universitas Diponegoro. *Jurnal Psikologi Undip*. Retrieved from <http://eprints.undip.ac.id/8345/>

- Streiner, D. L. (2003). Starting at the beginning: An introduction to coefficient Alpha and internal consistency. *Journal of Personality Assessment*, 80(1), 99–103. https://doi.org/10.1207/S15327752JPA8001_18
- Sung, Y.-T., Cheng, Y.-W., & Wu, J.-S. (2016). Constructing a situation-based career interest assessment for junior high school students and examining their interest structure. *Journal of Career Assessment*, 24(2), 347–365. <https://doi.org/10.1177/1069072715580419>
- Šverko, I., Babarović, T., & Međugorac, V. (2014). Pictorial assessment of interests: Development and evaluation of Pictorial and Descriptive Interest Inventory. *Journal of Vocational Behavior*, 84(3), 356–366. <https://doi.org/10.1016/j.jvb.2014.02.008>
- Tak, J. (2004). Structure of vocational interests for Korean college students. *Journal of Career Assessment*, 12(3), 298–311. <https://doi.org/10.1177/1069072703261555>
- Tang, M. (2001). Investigation of the structure of vocational interests of Chinese college students. *Journal of Career Assessment*, 9(4), 365–379.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Tien, H.-L. (1993). *The Development of the Chinese Vocational Interest Inventory and a comparison of Holland and Gati interest models*. The University of Iowa, Iowa.
- Ting, S.-M. R. (2007). Comparing the Chinese Career Key and the Self-Directed Search with high school girls in Hong Kong. *Journal of Career Development*, 34(2), 192–209. <https://doi.org/10.1177/0894845307307474>
- Toker, Y., & Ackerman, P. L. (2012). Utilizing occupational complexity levels in vocational interest assessments: Assessing interests for STEM areas. *Journal of Vocational Behavior*, 80(2), 524–544. <https://doi.org/10.1016/j.jvb.2011.09.001>
- Tracey, T. J. G. (2010). Development of an abbreviated Personal Globe Inventory using item response theory: The PGI-Short. *Journal of Vocational Behavior*, 76(1), 1–15. <https://doi.org/10.1016/j.jvb.2009.06.007>
- Tracey, T. J. G., Watanabe, N., & Schneider, P. L. (1997). Structural invariance of vocational interests across Japanese and American cultures. *Journal of Counseling Psychology*, 44(4), 346–354. <https://doi.org/10.1037/0022-0167.44.4.346>
- Van Iddekinge, C. H., Roth, P. L., Putka, D. J., & Lanivich, S. E. (2011). Are you interested? A meta-analysis of relations between vocational interests and employee performance and turnover. *Journal of Applied Psychology*, 96(6), 1167–1194. <https://doi.org/10.1037/a0024343>

- Wetzel, E., Hell, B., & Passler, K. (2012). Comparison of different test construction strategies in the development of a Gender Fair Interest Inventory using verbs. *Journal of Career Assessment*, 20(1), 88–104. <https://doi.org/10.1177/1069072711417166>
- Yogatama, B. K., & Napitupulu, E. L. (2017, January 22). Di antara begitu banyak jurusan. *Kompas*, p. 5.
- Zhang, L. (2000). Are thinking styles and personality types related? *Educational Psychology*, 20(3), 271–283. <https://doi.org/10.1080/713663742>
-

Received: 11-09-2018
Accepted: 30-11-2018