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Psychological Evaluation

Adaptation to Brazilian Portuguese of the O*Net Interests Profiler – Short Form

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Abstract

This study aimed to adapt to the Brazilian Portuguese the O*NET Interests Profiler – Short Form. The instrument evaluates vocational interests according to the RIASEC model, which includes six types (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional). Validity evidence was obtained through Principal Components Analysis, Multidimensional Scaling, correlations between secondary concepts from the theoretical model, and contrasts between groups. PCA results, the contrasts between selected occupational groups and correlational results between secondary concepts followed the theoretical expectations. However, the MDS results did not fully confirm the hexagonal structure. Overall results suggest the adapted instrument has acceptable evidence of validity. Further studies are suggested to increase the suitability of the Brazilian version of the instrument.

Keywords: career choice; interests; O*NET; psychological assessment; RIASEC.

ADAPTAÇÃO AO PORTUGUÊS BRASILEIRO DO O*NET INTERESTS PROFILER – SHORT FORM

Resumo

O objetivo deste estudo foi adaptar o O*NET Interests Profiler – Short Form para o português brasileiro. O instrumento avalia interesses vocacionais de acordo com o modelo RIASEC, que inclui seis dimensões (Realista, Investigativo, Artístico, Social, Empreendedor e Convencional). As evidências de validade foram obtidas por meio da Análise de Componentes Principais, Escalonamento Multidimensional, correlações entre os conceitos secundários do modelo teórico e contrastes entre grupos ocupacionais. Os resultados da ACP, dos contrastes entre os grupos selecionados e dos resultados das correlações entre os conceitos secundários confirmaram as expectativas teóricas. No entanto, os resultados do EMD não confirmaram totalmente a estrutura hexagonal. Em geral, os resultados sugerem que o instrumento adaptado apresenta evidências aceitáveis de validade. Estudos adicionais são sugeridos para aumentar a adequação da versão brasileira do instrumento.

Palavras chave: avaliação psicológica; escolha de carreira; interesses; O*NET; RIASEC.

ADAPTACIÓN AL PORTUGUÉS BRASILERO DEL O*NET INTERESTS PROFILER – SHORT FORM

Resumen

Este estudio tuvo como objetivo adaptar al portugués brasileño el O*NET Interests Profiler – Short Form. El instrumento evalúa los intereses vocacionales de acuerdo

con el modelo RIASEC, que incluye seis dimensiones (Realista, Investigativo, Artístico, Social, Emprendedor y Convencional). Las evidencias de validez se obtuvieron mediante Análisis de Componentes Principales, Escalamiento Multidimensional, correlaciones entre los conceptos secundarios del modelo teórico y contrastes entre grupos ocupacionales. Los resultados del PCA, los contrastes entre los grupos seleccionados y los resultados de las correlaciones entre los conceptos secundarios confirmaron las expectativas teóricas. Sin embargo, los resultados del MDS solo confirmaron parcialmente la estructura hexagonal. Los resultados sugieren que el instrumento adaptado tiene evidencias aceptables de validez y confiabilidad. Se sugieren estudios adicionales para aumentar la idoneidad de la versión brasileña del instrumento.

Palabras-clave: Elección de carrera; intereses; O * NET; evaluación psicológica; RIASEC.

1. Introduction

It is difficult to think that anyone would choose something to work with that somehow does not attract him or her at all. The term "interest," in a vocational context, refers to relatively homogeneous specific interest groups related to each other, which constitutes a disposition (usually more stable than a particular interest). In this way, interests constitute a reasonably stable, consistent, and persistent response trend that increases the willingness of an individual to attend to specific environmental stimuli and act towards them.

The theoretical development by Holland (1997) proposed that vocational behavior is a function of interest, personality, and social environments. For Holland, the choice of a specific occupation is an expression of each individual's personality, and by consequence, interest inventories would also reflect personality characteristics. In this way, every career decision should involve an assessment of interests. This assessment process always involves the evaluation of how many personal characteristics "match" with the characteristics of the occupations. He theoretically postulated and empirically identified six main vocational interests and work environments: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. The initials of each of these dimensions form the acronym by which the model is also known: RIASEC (Holland, 1997). Although all people present nuances of the six types, the RIASEC model postulates the dominance of one over the other, characterizing "personality types" or "vocational personalities." The descrip-

tions of the types are only prototypes that characterize extreme cases; most people present a mixture of the six types of the model.

Holland (1997) proposed a hexagonal arrangement for these six vocational interests, presenting a pattern of interrelationships in a two-dimensional graphic plane that presents the shape of a hexagon, with the types appearing in the sequence R, I, A, S, E and C. In this way, the distances between adjacent types (IR, IA, SE, CE, CR) should be smaller than the distance observed between alternating types (RA, IS, AE, SC, ER, CI), which in turn would be smaller than the distance between opposite types (RS, IE, AC). This means that the closest types among themselves also exhibit greater similarity (for example, type I is closer to the types R and A than S, and farther to E and C).

The RIASEC theory also proposes a way to classify vocational environments (occupations), assigning RIASEC categories to occupations using individuals' RIASEC interest scores to code occupations, based to Holland's idea that the people in the environment are the environment itself (Fonteyne, Wille, Duyck, & De Fruyt, 2017). This method involves the application of a RIASEC measure to a sample of people in an occupation, calculating mean RIASEC scores, and assigning high-point codes, usually three-letter codes, to the occupation based on these average RIASEC scores. The first letter goes to the RIASEC category with the highest mean score among the sample; the second-highest mean score determines the second letter; and the third-highest mean score determines the third letter. Holland (1997) called this the incumbent method and stated that those RIASEC codes are the criterion against which to judge other methods for assigning RIASEC codes to occupations.

Besides the main types for persons and environments, the RIASEC model also has the usually called secondary assumptions, used to evaluate the prediction of the outcomes resulting from the RIASEC person-environment fit (Jaensch, Hirschi, & Spurk, 2016). Three of these secondary concepts important in Holland's theory are congruence, identity, and differentiation.

Congruence refers to the correspondence between an individual's personality profile and the profile of the environment. The term is generally used to suggest a degree of similarity between the individual and the requirements of the individual's chosen professional environment. In general, the most common indices used to assess the match between the individual and the context are the Compatibility Index (Bowles, 2008), and Iachan's M Index (Iachan, 1990).

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The second concept is identity, which refers to the clarity and stability of a person's goals and self-perceptions, and indirectly includes clarity and explicitness of the type of environment in which the person works and interacts better (Teixeira, 2010). The quantitative expression of this construct is expressed in an individual's score in instruments made to that end, such as the Career Identity subscale of Career Development Scales for University Students (Escalas de Desenvolvimento de Carreira para Universitários, Teixeira, 2010). Individuals with well-differentiated profiles should have more crystallized vocational identities and, as a result, make career choices with less difficulty.

Finally, differentiation is a measure of the level of definition or distinctness of a person's test profile. Profiles are undifferentiated when there is little difference in the strength of a person's highest and lowest interests (Jaensch et al., 2016). Holland (1997) hypothesized that differentiated profiles are associated with greater clarity of career goals, more stability of careers, and career satisfaction, and those with undifferentiated interest profiles may have difficulty choosing careers because they feel conflicted between multiple dissimilar interests or have difficulty prioritizing their interests.

The RIASEC approach has demonstrated to be fruitful in instruments drawn upon it, such as the O*NET Interest Profiler (O*NET IP). The O*NET IP was built as part of the public edition of the Occupational Information Network (O*NET) system. The O*NET IP measures the six types of Holland occupational interests (Rounds et al., 1999). It is a self-scored interest assessment and has been adapted for computer-based assessments. During all stages of the development of the Interest Profiler, extensive efforts were made to include client and counselor input. The O*NET IP has shown evidence of its validity and usefulness in a variety of research. For example, Tay, Drasgow, Rounds, and Williams (2009) analyzed the O*NET IP Long Form under an IRT ideal point model and found that there was a fairly good model-data fit for the items. Also, Wille, Tracey, Feys, and De Fruyt (2014) found moderate levels of stability in interests and occupations and that the person-environment fit measured by de O*NET IP maintained its congruence all over a 15-year interval.

Only one adaptation of the O*NET IP for other cultures was found (Mudarra Sanchez, 2007), in the context of a validation study of the Self-Assessment System Career Areas of the Spain Educational System and Occupational National Classification. The RIASEC scales of the O*NET IP in the Spanish adaptation showed

consistency coefficients in the range from .86 to .93. In the same study, the author used the SDS for convergent validity evidence and found acceptable indicators of convergence between the instruments (Mudarra Sanchez, 2007).

Research on the Holland model in Brazil suffers from a lack of instruments with robust evidence of validity. Only recently, the most used international instrument related to the model, the Self-Directed Search (SDS), was published in the country (Primi, Moggi, & Casellato, 2004), but the available version is primarily aimed at high school students. Moreover, the size and cost of the SDS do not stimulate its use in research. Another published instrument done by Meireles and Primi (2015) did not reproduce the model of the hexagonal structure faithfully. So, the career counseling area could benefit if there was a public domain tool that could be used in research.

The purpose of this study was to adapt to Brazilian Portuguese the O*NET Interest Profiler – Short Form and obtain validity evidence for the instrument. Validity evidence based on the internal structure was explored using two procedures: Principal Component Analysis was employed to check if the proposed items could be organized according to the six RIASEC types, and Multidimensional Scaling was used to verify if the six types could be organized according to the hexagonal structure proposed by the theory.

2. Method

2.1 Participants

In this study, 603 university students took part, with a mean age of 26.6 years (SD = 5.87), ranging from 18 to 67 (all demographic categories with missing cases were calculated according to the number of cases that were reported). The whole sample was fairly divided between genders (55.3 % females). Participants were enrolled in 28 different programs (Civil Engineering (10.9%), Nutrition (10.9%), Biomedicine (8.5%), Medicine (8.0%), Dentistry (7.8%), Psychology (6.6%), Literature (6.5%), Theater (5.5%), Economic Sciences (5.3%), Accounting (4.8%), Philosophy (4.6%), and the 20.6% left are from 17 other programs). Roughly half the participants (48.6%) were in the first three semesters. The data indicated that 86.8% were studying their most preferred graduate program, and 68.6% were on their first attempt on any graduate program.

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2.2 Instruments

Demographic Questionnaire: A questionnaire was used to retrieve demographic information and characterize the sample.

The Career Identity subscale of Career Development Scales for University Students (Escalas de Desenvolvimento de Carreira para Universitários, Teixeira, 2010) was used. The participant is asked to assess each item and respond as to the correspondence of his/her way to act or think, recording answers on a five-point Likert scale ranging from 1 = totally false to 5 = totally true. This scale indicates the degree to which the student is identified and satisfied with their career choice. Teixeira (2010) reported an internal consistency index of .87, and also satisfactory evidence of validity, obtained through semantic analysis by judges and factor analysis. The internal consistency of the Vocational Identity Scale observed in this sample was .87.

The O*NET Interests Profiler – Short Form (Rounds et al., 1999) consists of 63 items that assess six dimensions of the RIASEC model. The participant is asked to assess each item and respond as to their likelihood to perform each task, recording answers on a five-point Likert scale ranging from 1 = strongly dislike to 5 = strongly like. A technical report of the instrument informs the existence of several studies of validity and reliability indices for the scales between 0.78 and 0.87 (Rounds, Su, Lewis, & Rivkin, 2010).

2.3 Procedure

The translation procedure followed the literature recommendations on psychometric instruments adaptation of the International Test Commission (2017). At first, permission for adaptation was granted from the original O*NET Interest Profiler authors.

Then two different translations for each item were done by independent translators; these translations were then evaluated by the research group, and the most appropriate translation was selected for each item. After that, three expert judges received the pool of items with no indication of the construct each item was intended to represent. Judges, then, independently assigned each item to a RIASEC construct. The items in which at least two judges did not meet agreement on the assignment, or in which the assignment made by the majority of judges conflicts with the construct the items were intended to represent, were reviewed by the

researchers to reach the best translation or adaptation for the item. Then, a back-translation with one new different translator was made to make sure that the translated version reflected the same item content as the original version. After the back translation, an English native speaker evaluated the semantic equivalence of the original and the back-translated versions.

After that, the 63 items were analyzed in a pilot study conducted with a sample of 45 university students to test the clarity of the items, their understanding of the instructions, and the use of the response system. In the end, all 63 back-translated items were considered equivalent in meaning to the original items and adequate to be used in Brazil (10 for the Realistic, Investigative and Conventional types, and 11 for the Artistic, Social and Entrepreneur types).

For the instrument application, different programs (courses) were contacted according to the researcher's convenience, and the research proposal was presented. If the program manifested interest and consent to participate (through Terms of Agreement), specific classes were contacted, and questionnaires applied in the classroom. The questionnaires' application procedure consisted of an explanation of the research objectives to students and an invitation to participate in it (highlighting the anonymous and voluntary nature of the survey), followed by reading and gathering a Consent Form signed by the students that agreed to participate, before the application of the questionnaires.

2.4 Data Analysis

Three analyses were performed to provide validity evidence of the internal structure of the instrument: Principal Components Analysis (PCA) and Multidimensional Scaling (MDS) analysis, to test the dimensionality of the instrument, and Cronbach's Alpha to test the reliability of the scales.

To represent the social environment of each program, the mean scores of those students in the same program were used, using Holland's (1997) assumption that people make up the environment. So first, each participant had calculated his or her personal summary code (three-letter), corresponding to the three highest raw scores obtained with the instrument. Then, each major was coded using the incumbent method (Jaensch et al., 2016), with a focus placed on the three-digit codes, which were general enough to provide enough data to estimate each program interest profile. In this way, for each major (program), a three-letter code

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was established. Only those programs with more than 25 students were considered to the environment analysis.

The Compatibility Index (Bowles, 2008) and Iachan's M Index (Iachan, 1990) were used to evaluate the level of congruence. The compatibility index (0–8) uses the three-letter person and job codes and utilizes a specified set of scoring rules to assign individuals congruence scores, with higher scores indicating greater congruence. The Iachan's M index is a 29-point scale (0-28), computed by summing numerical weights that correspond to positions in which interest-job matches occur (in the present case, individual interest-program matches). The weights are assigned, such that first-letter interest-job matches receive the highest weight, matches between the first letter in one code and the second letter in the other code receive the next highest weight, and so on. As in the C index, higher scores reflect greater congruence. Differentiation was calculated using the index proposed by Holland (1997), subtracting the lowest interest-score from the dominant interest-score.

To provide converging evidence based on relationships with other variables, two types of analysis were performed: the first analysis was correlation (Pearson), testing the association of the differentiation score with two different variables: the first variable is congruence, measured with the Iachan M Index and the Compatibility Index; and the second variable is the total career identity score.

The second analysis was the mean comparisons, between the highest mean score type from representative pairs of programs, using Student's t-tests.

All analyses were performed in SPSS and FACTOR.

3. Results

In order to check validity based on internal structure, the first analyses performed were those that provided evidence about the dimensionality of the instrument. For this, the total sample of 603 participants was randomly split into two parts, to perform a Principal Components Analysis (PCA) with the first half (n = 305), and a Multidimensional Scaling (MDS) procedure with the second one (n = 298). Although both PCA and MDS are exploratory procedures, this sample partition was performed, seeking to ensure that the MDS results were not influenced by the item selection performed by the PCA.

3.1 Principal Components Analysis

As the O*NET IP items were answered in a five-point ordinal scale, a polychoric correlation matrix was used to perform the intended PCA (Muthén & Kaplan, 1992). The parallel analysis (PA) suggested seven components. However, considering the theory behind the O*NET IP, the PCA was performed forcing the extraction of six components with Direct Oblimin Rotation. The Kaiser-Meyer-Olkin (KMO = .86) and Bartlett's statistic (10278.7; *df* = 1953; $p < .01$) showed no identity problems in the data, and correlations between items were sufficient and appropriate. The final scale items were selected based on the saturated component, loading equals to or greater than .3 and difference value between component loadings equal or greater than .10 (i.e., items with a difference between the highest and the second-highest loading lower than.1 were eliminated).

Repeated PCAs using these criteria led to the elimination of 23 items, resulting in the reduced version of the scale with 30 items. The first component obtained, with items related to the Conventional type, explained 27.26 % of the variance. The second component, Realistic, had an explained variance of 14.18%. The third component corresponded to the Investigative type and had an explained variance of 12.46%. The fourth component obtained with items related to the Artistic type explained 8.44 % of the variance. The fifth component had an explained variance of 5.35% and corresponded to the Social type. The sixth component corresponded to the Entrepreneur type and had an explained variance of 3.43%. All items that measured the six dimensions had high levels of saturation (> .50) in the corresponding components. The percentage of variance explained by the six components obtained was 71.78 % (Table 3.1). The reliability of the internal structure of each subscale (considering the five items with higher loadings in each component) mean score, skewness, and kurtosis for each type are also displayed in Table 3.1 (Cronbach's alpha).

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Table 3.1. Factor loadings from the pattern matrix and Alphas for each type.

Item content (in portuguese)	C	R	I	A	S	E
Corrigir registros ou formulários (Proofread records or forms)	**.82**					
Registrar pagamentos de aluguéis (Record rent payments)	**.75**					
Controlar um estoque usando um computador de mão (Inventory supplies using a hand-held computer)	**.71**					
Manter o envio e o recebimento de registros (Keep shipping and receiving records)	**.63**	.34				
Carimbar, classificar e distribuir a correspondência para uma organização (Stamp, sort, and distribute mail for an organization)	**.54**	.35				
Reparar e instalar fechaduras (Repair and install locks)		**.97**				
Reparar eletrodomésticos (Repair household appliances)		**.90**				
Construir armários de cozinha (Build kitchen cabinets)		**.71**				
Configurar e operar máquinas para fabricar produtos (Set up and operate machines to make products)		**.71**				
Testar a qualidade de peças antes de despachar (Test the quality of parts before shipment)	.35	**.56**				
Realizar testes laboratoriais para identificar doenças (Do laboratory tests to identify diseases)			**.92**			
Examinar amostras de sangue usando um microscópio (Examine blood samples using a microscope)			**.90**			

Table 3.1. Factor loadings from the pattern matrix and Alphas for each type.

Item content (in portuguese)	C	R	I	A	S	E
Trabalhar em um laboratório de biologia (Work in a biology lab)			**.88**			
Desenvolver um novo medicamento (Develop a new medicine)			**.86**			
Conduzir experimentos químicos (Conduct chemical experiments)			**.80**			
Escrever livros ou peças de teatro (Write books or plays)				**.78**		
Desenhar ou pintar quadros (Draw pictures)				**.73**		
Fazer uma performance de dança (Perform jazz or tap dance)				**.64**		
Cantar em uma banda (Sing in a band)	.34			**.78**		
Criar efeitos especiais para filmes (Create special effects for movies)		.30		**.69**		
Ajudar pessoas com problemas familiares (Help people with family-related problems)					**.89**	
Realizar terapias de reabilitação (Perform rehabilitation therapy)					**.86**	
Ajudar a conduzir uma sessão de terapia de grupo (Help conduct a group therapy session)					**.85**	
Ajudar pessoas com problemas pessoais ou emocionais (Help people with personal or emotional problems)					**.81**	
Realizar orientação profissional com as pessoas (Give career guidance to people)					**.65**	
Começar seu próprio negócio (Start your own business)						**.90**

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Table 3.1. Factor loadings from the pattern matrix and Alphas for each type.

Item content (in portuguese)	C	R	I	A	S	E
Promover um produto que você está vendendo (Give a presentation about a product you are selling)						**.61**
Gerenciar um departamento dentro de uma grande empresa (Manage a department within a large company)	.46					**.56**
Negociar contratos de empresas (Negotiate business contracts)	.42					**.59**
Comprar e vender ações e títulos (Buy and sell stocks and bonds)	.32					**.59**
Cronbach's Alpha	.79	.84	.90	.75	.85	.77
Mean (SD)	1.44(.67)	1.51(.78)	2.40(1.29)	2.40(1.05)	2.51(1.07)	2.26(.97)
Sewkness	1.89	2.11	.59	.44	.48	.73
Kurtosis	3.6	4.46	-.92	-.65	-.66	.02

Note: (R) Realistic, (I) Investigative, (A)Artistic, (S)Social, (E)Enterprising, (C)Conventional.

3.1.1 Multidimensional Scaling

To add validity evidence of the internal structure, specific for the hexagonal arrangement, a two-dimensional scaling analysis was employed, based on Euclidean distance transformations of the six mean personality scores. The distance matrix was analyzed using the second half of the sample (n = 298), separately for males and females. The results, concerning their stimuli relative coordinates, are plotted in Figure 3.2. For the overall multidimensional solution, Young's Stress = .224 and R^2 = .84. For the female sample only (n = 126), Young's Stress = .201 and R^2 = .86, and for the male sample only (n = 171), Young's Stress = .232 and R^2 = .78.

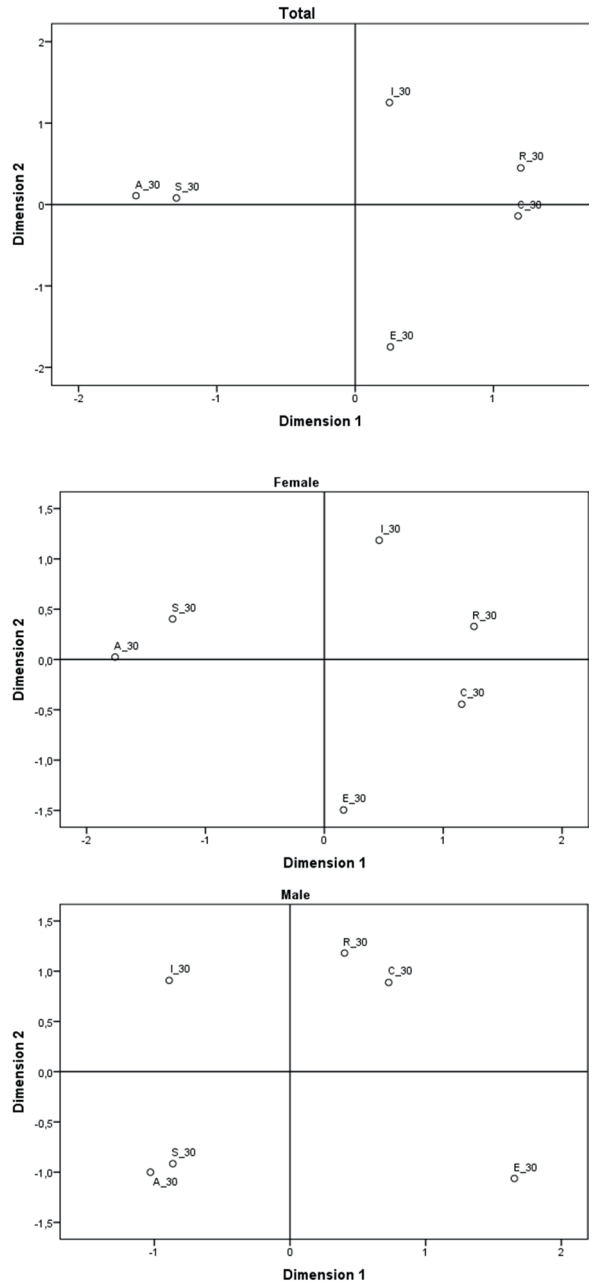

Figure 3.2. Two-dimensional scaling solutions for the six types, overall and by gender.

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3.1.2 Convergent Analyses

The next step was to look after validity evidence based on relationships with other variables. For this, the relationship between vocational identity and the measures derived from the Brazilian O*NET IP, differentiation, and congruence (measured by the Iachan's M index and the Compatibility Index) were explored using bivariate correlations. The results are displayed in Table 3.1.2.1.

Table 3.1.2.1. Correlations between secondary concepts.

	1	2	3
1. Vocational Identity			
2. Differentiation	.086		
3. Congruence – M	.161**	.323**	
4. Congruence – CI	.136**	.328**	.917**

* $p < .05$. ** $p < .01$.

Gender differences were investigated using t-tests. These analyses indicated significant differences for the Realistic type, ($t = 4.12$, $p < .01$; higher scores for men), the Social type, ($t = -2.84$, $p < .05$; higher scores for women), the Entrepreneur type, ($t = 4.91$, $p < .01$; higher scores for men), the Conventional type, ($t = 3.42$, $p < .01$; higher scores for men), and the differentiation level ($t = -3.31$, $p < .01$; higher scores for women).

Finally, to get some additional evidence based on relationships to other variables, the power of the scales to differentiate vocational environments (in this case, majors) were tested, with Student' t-tests performed for each scale comparing two majors that were expected to differ in their mean scores for each RIASEC dimension. Majors were selected based on their sample size (only groups with more than 25 cases were included to have enough power to detect at least medium effect sizes, i.e., d > = .5) and on researchers' judgment of possible contrasting pairs on each dimension. The pertinence of the selected pairs of majors was supported by the occupational classification proposed by the O*NET system. Table 3.1.2.2 shows the results for these analyses. As expected, all results were statistically significant, with large effect sizes (d). To rule out the possible confounding effect of gender,

the analyses were re-run using ANCOVAs with gender as a covariate. All differences between majors were also significant in these analyses.

Table 3.1.2.2. Differences on RIASEC types by compared majors.

Type	Compared Majors	Mean difference	*T*	*p*	*d*
Realistic	Civil Engineering – Literature	.78	6.12	< .001	1.153
Investigative	Biomedicine – Accounting	2.56	14.20	< .001	3.365
Artistic	Theatre – Dentistry	2.00	54.48	< .001	2.514
Social	Psychology – Civil Engineering	2.11	14.48	< .001	2.912
Entrepreneur	Economic Sciences – Literature	2.06	12.83	< .001	3.096
Conventional	Accounting – Theatre	.21	5.27	< .001	1.329

Note: In each comparison, the expectation was that the first group would have a higher score than the second group.

4. Discussion

The aim of this study was to adapt to Brazilian Portuguese and to obtain some initial evidence of validity for the O*NET IP, and examine the structure of interests in a sample of university students, in order to determine the relative fit of the RIASEC hexagon, and therefore validity, of Holland's (1997) structural model as operationalized by the O*NET IP. The analysis of the instrument and the items led to the final result of a version with 30 items (five per type).

The results of this study support the validity of Holland's model in Brazil, as the exploratory factor analysis and the reliability analysis provided validity evidence for the internal structure concretely, about the existence of the six types of the Holland model of occupational interests. Also, some results followed the expectations from theory and empirical research, such as the gender differences, with men presenting higher scores in Realistic, Entrepreneur and Conventional types, and women higher scores in the Social type. These results are somehow similar to those found by Okino (2009) in a Brazilian sample, who found that the Realistic,

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Entrepreneur and Conventional types were predominant in the male sample, and for the female sample, the predominant type was Social.

Another theoretical expectancy confirmed in the study that added validity evidence based on the convergence of the RIASEC types with other variables was the association between some secondary concepts measured by the instrument (congruence and differentiation), and another secondary concept, vocational identity, as an external criterion. Both measures of congruence and differentiation correlated low or moderately with vocational identity, except in the case of the differentiation level. These results are similar to others already published in the literature, for example in Jaensch et al. (2016). This suggests that people who perceive themselves more similar to their environments and have a more differentiated idea of their interests also have more certainty of their career objectives and a sense of belonging to the profession.

Also, the contrasts between the programs, although limited, provide some initial evidence about the power of the instrument to differentiate diverse occupational groups. In the final version of the instrument, significant differences were found for all scales of the RIASEC model, providing evidence of validity for the instrument. It is also interesting to notice that, although there were found gender differences for three out of six RIASEC types, gender effects were not confounded with major effects when pairs of majors were compared.

However, the findings of the MDS analyses somehow drawback the validity of the O*NET IP in its Brazilian version. One objective of the study was to provide additional validity evidence based on the dimensionality structure of the test, checking if the RIASEC structure, as operationalized by the O*NET IP, could be represented by the data. The expectation was to obtain the hexagonal structure proposed by theory and reported in other studies (Gupta, Tracey, & Gore, 2008). According to the result of the MDS in this study, this expectation was not fully met. It seems that a circular model is somehow organized, but the circular arrangement is only partially organized as in the theoretical configuration (R-I-A-S-E-C).

The first difference between the research results and the theory expectative may be the RIASEC hexagonal arrangement in the studied sample, specifically the order of the Artistic and Social types. Similar results are found in the work of (Morgan & de Bruin, 2018), who worked with several African samples. In this work, one of the solutions, correspondent to the Eastern region sample, did not approximate

the hexagonal shape in the expected order. The reported findings may confirm Holland's assumptions that the hexagonal model, with real-world data, would look more like a distorted polygon than a regular hexagon (Holland, 1997). But why do the types are switching places? One possible explanation could be placed on the uncanny mean and standard deviation values for the Realistic and Conventional types. It seems that the items were way underscored, compared to the other types, and the variance of this answer pattern was quite low. This could be a sign of social undesirability of both types, or of the activities related to the items in them. Morgan and de Bruin (2018) hypothesized that cultural and contextual variables, such as the structure of the economy and the labor market, and freedom of individual expression in choices, could be the source that explains differences in the structure of interests across different contexts. It could be possible that the meaning of the six vocational personality types in the Brazilian culture or context may be different from the meaning of the types in the U.S. or European countries.

But besides the order, the other piece of evidence to be taken into account in the MDS analysis is the Young Stress values in all the arrangements evaluated, all of them above the cut-values considered minimally acceptable, which means that the arrangement in the MDS analysis does not explain well enough the variance in the data (Sturrock & Rocha, 2000). This evidence could be joined to the suggestion made by the Parallel Analysis in the PCA. The Parallel Analysis is a simulation technique that compares the observed eigenvalues extracted from the correlation matrix to be analyzed with those obtained from uncorrelated random generated normal variables, in order to suggest the number of factors to retain. In the Parallel Analysis performed in this work, it was recommended seven factors, indicating that maybe there is still valuable information not gathered by the six-factor model. Okino (2009) also found a low percentage (33.5%) of explained variance in her factorial analysis of the Self-Directed Search (another RIASEC instrument), which suggests that six factors are not sufficient to explain the large amount of variance present in interest inventories. But in her study, it is also interesting the fact that, while the variance explained is low, the grouping results were coherent with the theory content of each type.

The main goal, when building a model such as the RIASEC, is to explain and predict phenomena in a parsimonious way. However, in this process, some information is lost in the name of efficiency. An alternative to expanding the RIASEC

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model without changing its essence could be to use the concept of facets as used in the Big Five personality model (Darr & Kelloway, 2016). A facet is a term designated to a unique lower level trait grouping into a broader personality trait. The facets and the factor are organized hierarchically, with the narrowest, and more specific traits combining to define a broader, more global factor. This kind of strategy could be useful to keep the broad overview of interest dimensions that is valuable in the six-factor RIASEC model in research terms, but if one's theoretical or pragmatic requirement asks for more details or a more differentiated perspective, maybe the facet strategy should become an alternative to be considered.Another alternative hypothesis is that context, maybe even over culture, might be moderating the structure's outcome. Holland's interest model has been performed into different populations to determine if it is identifiable in the observed ordering and shape of the RIASEC configuration. Nevertheless, there are some investigations in which the structure of vocational types could not be described with the circular model, for example in the research of Morgan and de Bruin (2018).

The investigations of Rounds and Tracey (1996) and Gupta et al. (2008) may help to shed some light on this issue. Rounds and Tracey (1996) conducted a structural meta-analysis to evaluate the fit of Holland's circular order model for 20 U.S. ethnic matrices, 76 international matrices, representing 18 countries, and a U.S. benchmark sample of 73 matrices. Fifteen of the eighteen countries failed to follow the model and potential moderators, such as: cultural values did not explain model differences between countries. The authors raised questions about how well the circumplex-hexagonal model describes the interest structure for non-US samples. There is a contrasting result to the research of Gupta et al. (2008), who examined the structural validity of Holland's interests model, as assessed by the UNIACT-R, across five racial/ethnic groups (Caucasian/Euro-Americans, African Americans, Asian Americans, Latinos, and Native Americans), but this time, in the population of high school juniors in two states of the United States. The results indicated that no differences in fit were found across ethnicity, supporting the usage with U.S. ethnic groups.

As a conclusion, the version of the Brazilian O*NET IP presented in this paper was designed for research and practice purposes, but in its current form, evidence shows that if it is meant for use in career counseling and other basic or ap-

plied settings, they should be used with caution. Although evidence of validity has been found based on relations to other measures (vocational identity) and the discriminative power of the scales (major differentiation), the validity evidence based on internal structure seems to be ambiguous (PCA supports the model, but MDS does not support the hexagonal organization).

The purpose of adapting the O*NET IP to Brazilian Portuguese is not to fill in the function of a commercial test, but instead, to enhance the construction of both research and commercial measures with a set of scales that are more suitable for a wide range of purposes. Some issues need to be addressed in future research. Foremost is the question of why the RIASEC structure is only partially replied by the O*NET IP scores. Are there additional basic interests that are important for studying careers? Is it an issue related to the sample? Or is it about the context? These results may speak about the need for emic investigations based on how Brazilians evaluate vocational interest.Another issue that requires further investigation is the replicability of the model in other samples of the Brazilian population. Most research about vocational interests in Brazil is based on high school and university students; there is a need to recruit samples from a variety of settings. In addition to providing validity evidence for the RIASEC model, research with diverse populations also provides answers to important questions about the role of culture and social factors in the development of vocational interests.

Some limitations of this study should be noted to provide a context for the results of the study. First, the range of the sample was restricted to one university, leaving behind other populations that could show interesting results, as working professionals or high school students. Also, investigating people who are in different moments of career development, like exploration or establishment phases of career, may provide different information. The generalizability may be highly restrictive, insofar as regional differences may affect how members of various groups develop vocational interests. Also, the results indicate support for Holland's model as operationalized by the O*NET IP. However, as there are not many alternatives to study vocational interest measures in Brazilian Portuguese, testing and scrutiny may need to be continued in this instrument.

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