

Unfavorable Evidence for Personality Assessment with a 10-item Instrument

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Abstract: This study analyzes the internal structure, precision and differences of averages by gender and age on a 10-item scale, designed to assess the Big Five Personality traits. A total of 404 high school students, with an average age of 15.9 years, from São Paulo, Brazil participated in the study. The Ten-Item Personality Inventory (TIPI) scale is comprised of pairs of adjectives representing personality traits arranged on a Likert scale varying from 1 to 7, measuring levels of agreement. It was not possible to identify the five-factor solution through analysis of the main components, but a three-factor structure was found that encompassed the content of social desirability, adjustment problems, and emotional stability, with the alpha varying from 0.41 to 0.63. Additionally, statistically significant differences associated with age were found. Results are discussed in terms of the study and scale limitations.

Keywords: Personality Measures, Psychological Assessment, Adolescents, Personality Traits.

Evidências Desfavoráveis para Avaliação da Personalidade com um Instrumento de 10 Itens

Resumo: Este estudo objetivou analisar a estrutura interna, a precisão e as diferenças de média por sexo e idade em uma escala de 10 itens para avaliação dos Cinco Grandes Fatores de Personalidade. Participaram 404 estudantes do Ensino Médio, com média de idade de 15,9 anos, do Estado de São Paulo. A escala *Ten-Item Personality Inventory* (TIPI) é composta por 10 itens, que são duplas de adjetivos e que representam os traços de personalidade respondidos em escala Likert de 1 a 7. Não foi possível recuperar a estrutura de cinco fatores por meio da análise dos componentes principais, mas sim uma estrutura de três fatores que englobaram conteúdos de desejabilidade social, problemas de ajustamento e estabilidade emocional, com precisões entre 0,41 e 0,63. Além disso, houve diferenças significativas de média associadas à idade. Os resultados são discutidos em termos das limitações do estudo bem como da escala utilizada.

Palavras-chave: Medidas da Personalidade, Avaliação Psicológica, Adolescentes, Traços de Personalidade.

Pruebas Desfavorables para la Evaluación de la Personalidad con un Teste con 10 Elementos

Resumen: Este estudio tuvo objetivo analizar la estructura interna, precisión y las diferencias de acuerdo con género y edad en una escala de 10 ítems para evaluación de los cinco grandes factores de la personalidad. Participaron 404 estudiantes de la escuela secundaria, con una edad media de 15,9 años, del estado de São Paulo. La escala *Ten-Item Personality Inventory* (TIPI), conformada por 10 ítems, que son pares de adjetivos que representan los rasgos de la personalidad bajo en una escala tipo Likert de 1 a 7. No fue posible recuperar la estructura de cinco factores a través del análisis de componentes principales, pero sí una estructura de tres factores que abarca el contenido de la deseabilidad social, problemas de ajuste y la estabilidad emocional, con la precisión entre 0,41 y 0,63. Además, fueron encontradas diferencias de medias significativas asociadas con la edad. Los resultados se discuten en relación a las limitaciones del estudio y escala.

Palabras clave: Medidas de la Personalidad, Evaluación Psicológica, Adolescente, Rasgos de Personalidad.

Personality is one of the frequently studied fields in Psychology (Clapier-Valladon, 1988; Groth-Marnat, 2003) and can be understood as a pattern of functioning for each individual (Cloninger, 1999; Hall, Lindzey, & Campbell, 2000). This functioning corresponds to an individual's personality pattern, which is an amalgam of separate and

identifiable styles (Oldham & Morris, 1995). In other words, personality is frequently understood as a combination of different systems related to psychological attributes (Allport, 1937; Mayer, 2005).

Among diverse approaches to understanding personality, the Big Five Factors (BFF) model is one of the most studied and most frequently cited in current literature (Digman, 2002; McCrae & Costa, 1996). The BFF is a modern version of the theories of personality traits, which was allied with the method provided by the factor model. It is a simpler way

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to describe personality characteristics, considered robust and replicable in distinct cultures (Lucas, Diener, Grob, Suh, & Shao, 2000), in different age groups (Digman & Takemoto-Chock, 1981), and which allows one to unify a description with the field of personality attributes (Goldberg, 1992). We also note that it has been used in various fields such as Evolutionary Psychology (Buss, 1991), Clinical Psychology (Widiger & Frances, 2002; Widiger, Trull, Clarkin, Sanderson, & Costa, 2002) and personnel selection (Barrick & Mount, 1991; McCrae & Costa, 1997; McCrae & John, 1992).

McCrae and Costa (1997) attribute a relative universality of the BFF model to the existence of a common set of biological characteristics inherent to our species, represented by traits, or simply due to a psychological consequence of human experiences shared in group life. They indicate that causal differentiations would be associated with the way certain personality traits are manifested in variations in historical and cultural aspects of social groups. Hence, they defend the BFF as a characteristic of the human species, the expression of which varies according to culture, age and gender (McCrae, 2001).

Even though there is no consensus regarding the nomenclature of the five factors, the same personality traits are described and the way they are grouped is equivalent in the different approaches to the BFF model. In the first Brazilian paper addressing the BFF (Hutz et al., 1998), the factors were called extroversion, agreeableness, conscientiousness, neuroticism, and openness to new experiences. The factors composing the BFF will be briefly described based on considerations of researchers in the field (Costa & McCrae, 1992; McCrae & Costa, 1996, 1997; Trull & McCrae, 2002; Widiger et al., 2002; Zillig, Hemenover & Dienstbier, 2002).

The factor extroversion refers to the quantity and intensity of favorite interpersonal interactions, level of activity, need for stimulation, and the ability to rejoice. Extroversion is an interpersonal dimension that refers to the types of interactions a person has over a continuum that ranges from compassion to antagonism. Conscientiousness, in turn, represents a degree of organization, persistence, control, and the motivation to achieve objectives. Neuroticism refers to a chronic activity of emotional adjustment and effective instability, including unrealistic ideas, low tolerance of frustration and non-adaptive coping strategies. Finally, the factor openness to new experiences is also referred to as intellect, though openness is not directly linked to intelligence. This factor refers to exploratory behavior and acknowledgement of the importance of new experiences.

Personality traits can vary depending on the gender and age of individuals. Nonetheless, the specific configuration in which these differences occur has varied in different studies (McCrae & Costa, 1996, 1997). Costa and McCrae (2006) attribute the differences concerning age to environmental influences common in different cultures and also biological differences, related to the maturation of certain psychological

structures. The study reported in Barrio Gándara, Carrasco Ortiz and Holgado Tello (2006) for instance, conducted with 852 Spanish children and adolescents aged between 8 and 15 years old, revealed significant differences concerning gender only on the agreeableness and conscientiousness factors, while significant differences were observed concerning age in all five factors. The scores in the factors openness and conscientiousness tend to diminish over time. Neuroticism, from 12 to 13 years old, tends to increase while agreeableness and extroversion tend to remain the same after an increase up to 12 and 13 years of age. Older adolescents could be characterized by an increase in neuroticism and extroversion with lower levels of agreeableness, conscientiousness and openness. In regard to differences by gender, women, regardless of age, presented higher levels of agreeableness and conscientiousness. However, differences were significant only among children and not among adolescents. Hence, the authors highlight the point that evolutionary differences seem to be associated with age more so than gender.

In Brazil, Nunes and Noronha (2009b) address adolescents aged 16 and 18 years old and indicate significant differences in the averages related to gender only on the scales of openness and agreeableness. In both cases, women obtained higher averages. Another study (Nunes, Hutz, & Nunes, 2010), conducted with a sample including an age range from adolescents to elderly individuals from various Brazilian states, reported differences by gender in the factors neuroticism and agreeableness, in which women presented higher averages in both factors. Age was also significantly correlated with the factors neuroticism, agreeableness, and openness in all cases where r was close to 0.15, which suggests a weak relationship of this variable with personality traits. The increase in these factors levels over time. Similarly, differences in terms of gender were found in a group of college students in which women presented higher levels of agreeableness (Bartholomeu, Nunes, & Machado, 2008).

The studies previously mentioned, and a large part of the studies investigating personality traits, use evaluation instruments composed of a varied number of items, though short versions of these instruments are seldom listed. Practical difficulties are found in evaluating methods with many items, such as a lack of willingness or fatigue on the part of participants in answering the instruments (Gosling, Rentfrow, & Swann, 2003); reliability rates, such as Cronbach's alpha, which is directly influenced by the number of items, increases in longer scales (Urbina, 2007). A higher number of items increases the probability of a greater amount of co-variances among variables with a greater level of reliability as a consequence.

Despite the psychometric difficulties inherent to small sets of evaluative items of psychological functions, some authors propose the development and application of shorter instruments. Robins, Tracy, Trzesniewski, Potter and Gosling (2001) state that shorter instruments eliminate redundant items and significantly reduce the fatigue of respondents.

Brief forms of instruments can be found in the international literature. These are intended to measure different constructs such as personality, self-esteem, and gains in psychotherapy (Gosling et al., 2003; Lambert et al., 1996; Robins et al., 2001). In regard to the evaluation of personality through shorter instruments, one of the most frequently mentioned in the literature is the Ten-item Personality Inventory (TIPI), developed by Gosling et al.

The TIPI is an instrument intended to evaluate personality based on the BFF model composed of 10 items that represent the factors of extroversion, conscientiousness, neuroticism, agreeableness, and openness to experience. Each item is composed of two adjectives (with similar content) to be evaluated on a Likert scale of seven points (ranging from “strongly disagree” up to “strongly agree”).

In the study conducted by Gosling et al. (2003), the TIPI was applied to 1,813 (65% women) undergraduate students of an American college. Reliability coefficients (Cronbach's alpha) equal to 0.68 (extroversion), 0.40 (agreeableness), 0.50 (conscientiousness), 0.73 (neuroticism), and 0.45 (openness) were found, while the instrument's factors were based on the content of the items. In addition, correlations between the TIPI's factors with the Big-Five Inventory (BFI) and the NEO Personality Inventory Revised (NEO-PI-R) were tested. The factors corresponding to the TIPI with both instruments were those that presented the highest number of correlations, which was expected, and indicated the instrument's validity based on variables external to the instrument.

Specifically in regard to the reliability coefficients of this instrument, these did not meet criteria recommended by the psychometric literature, that is, precision levels did not reach at least 0.70 (Urbina, 2007). Such a fact may be seen as a limitation of instruments with a reduced number of items. As noted by Gosling et al. (2003), it is almost impossible to achieve high levels of alpha coefficients in instruments such as the TIPI, which are designed to evaluate broad domains (such as the five factors) with only two items by dimension (with the negative and positive poles). In fact, the development of the Spearman-Brown formula was motivated especially to anticipate the precision of a test if it had a different number of items. Computations of precision are typically sensitive to the number of items involved, which has an effect in extreme cases, from shorter to longer tests. In fact, the authors who developed the TIPI did not expect high levels of reliability because they sought to optimize the validity of the instrument. In this context, it is recommended that the test-retest procedure be utilized to verify the reliability of scales for instruments with a small number of items (Wood & Hampson, 2005).

Muck, Hell and Gosling (2007) developed a German version of the TIPI called the Ten-Item Personality Inventory-German (TIPI-G). The instrument was applied to 180 undergraduate students in a self-evaluation version and also to 359 undergraduate students for peer evaluation. The alpha coefficients found for the TIPI-G factors ranged from 0.42 to

0.67 for self-evaluation and from 0.42 to 0.80 for the hetero-evaluation. Correlations between the TIPI-G and NEO-PI-R were found similar to data obtained by Gosling et al. (2003), while the TIPI-G factors presented the greatest magnitudes of correlations; all were significant, ranging from -0.76 to 0.69 with factors corresponding to the NEO-PI-R.

Denissen, Geenen, Selfhout and Van Aken (2008) also conducted a study with a German version of the TIPI. First, the TIPI's original version was translated and adapted to Germany and then a new item for the dimension openness was developed. This version was called TIPI-r. The instrument was applied together with the Big Five Inventory (BFI) to 205 undergraduates who answered both a self-evaluation version and a peer evaluation version of the German TIPI. The reliability of the scales were evaluated through a test-retest process and ranged from 0.58 to 0.75 for self-evaluation, and from 0.83 to 0.96 for hetero-evaluation. Similar to data found in two studies previously presented, the correlations found between the TIPI-r's factors and the BFI's factors corroborate what was expected, that is, the highest magnitudes of correlations were between the scales of instruments that evaluated equivalent dimensions. Additionally, we expected to find significant differences in relation to the instrument's factors in relation to age and gender.

According to the data presented, the reliability of the scales tends to be low or moderate in the different studies using versions of the TIPI, which seems to be a limitation of the instrument. However, the use of this instrument in studies has been justified by evidence that indicates the instrument's scales are valid. In this context, considering the peculiarities of the instruments composed of a small number of items, the TIPI is an instrument with satisfactory psychometric properties. Given this consideration and also a scarcity in Brazil of instruments with a reduced number of items such as this one, this study aimed to investigate the evidence for validity based on the internal structure of the Brazilian version of the TIPI and in the relationship between the variables of participants' gender and age. In regard to the instrument's internal structure, it is worth noting that there was an expectation of finding five factors that represent the dimensions of the BFF model based on the original instrument and the theoretical model used in its construction. Significant differences were expected for gender and age in relation to the instrument's factors.

Method

Participants

A total of 404 students of all the classes attending a public secondary school in the state of São Paulo, Brazil were selected in a convenience sample and voluntarily participated in the study. Most were women ($n = 240$ or 59.4%), aged between 14 and 20 years old (average = 15.9,

$SD = 1.1$). It is worth noting that most participants ($n = 349$) were aged between 15 and 17 years; 182 students were in the 10th grade (45%), 141 the 11th grade (34.9%), and 81 (20%) were in the 12th grade.

Instrument

The TIPI version translated and adapted for the Brazilian context by Carvalho and Primi (2008), called here the TIPI-Br, was used. Permission was asked of the author of the instrument's original version. The scale has ten items that consist of pairs of adjectives, each measuring the same pole of one of the dimensions of the Big Five Factors model. Half of the items represent low levels of scores in the construct, that is, one pole of the dimensions of the big five factors and the other half, the high levels (the other pole). According to instructions of Gosling et al. (2003), the odd items (which represent low levels of the construct) should be inverted to generate scores in the factors.

Procedure

Data collection

The TIPI-Br was applied collectively in classrooms at a time and date previously scheduled with the institution under the coordination of a psychologist and a psychology student. The application took approximately five minutes. The participants older than 18 years old signed free and informed consent forms and those younger than 18 years old had the forms signed by their legal guardians.

Data analysis

The data analysis procedure included analysis of the principal components and precision. The potential existence of differences of averages between men and women and

also those related to age was verified through ANOVA. Only individuals aged from 15 to 17 years old were included in the analysis because the other age groups had a small number of people ($n < 25$). These groups were also very unbalanced in terms of distribution in different age groups. The Statistical Package for the Social Sciences (SPSS, 2003) version 12th was used for data analysis and the level of significance was fixed at $p > 0.05$.

Ethical considerations

The study's project was submitted to and approved by the Ethics Research Committee at the University of São Francisco (Protocol CAAE: 0171.0.142.0000-07). Data collection was initiated only after the committee's approval.

Results and Discussion

To verify whether the sample was appropriate to the factor analysis, the Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity test were used. The KMO was 0.66, which indicates the data was sufficiently adequate for the factor analysis and Bartlett's sphericity test was significant at the level of 0.001 ($\chi^2 = 471.882$; $gl = 45$), showing there were sufficient correlations among the variables for factor analysis use. Even though there are other criteria to verify the appropriateness of the factor analysis, the KMO and the sphericity test are minimum indexes for such purpose (Howell, 2002).

The extraction of factors was conducted through analyzing the principal components and varimax rotation. It is worth noting that we verified whether the correlations among factors justified the use of an oblique rotation, though, most of the magnitudes of correlations were below 0.20 and, and for this reason, we proceeded to the orthogonal rotation. Items with factor loads equal to or above 0.30 were presented; Figure 1 presents the scree plot.

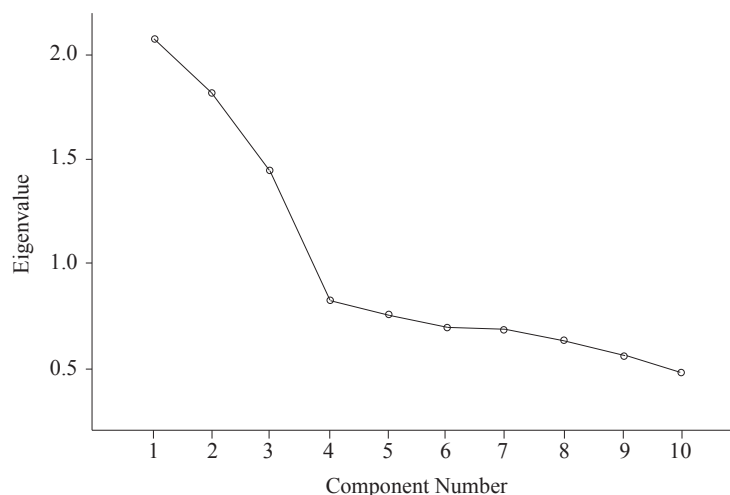


Figure 1. Scree plot of the TIPI-Br's items.

Three values were obtained with eigenvalues above 1.0, which was corroborated by the scree plot, capable of explaining 53.6% of total variance. The rotation matrix's factor loads are presented in Table 1.

Table 1
Factor solution of the TIPI-Br's items

Items	F1	F2	F3
(7) Sympathetic; warm. (Agreeableness)	0.732		
(1) Extroverted; enthusiastic. (Extroversion)	0.689		-0.333
(5) Open to new experiences; complex. (Openness)	0.679		
(3) Dependable; self-disciplined. (Conscientiousness)	0.666		
(4) Anxious; easily upset. (Neuroticism)		0.737	
(8) Disorganized; careless. (Conscientiousness)		0.723	
(10) Conventional; uncreative. (Openness)		0.567	0.302
(2) Critical; quarrelsome. (Agreeableness)		0.560	-0.372
(6) Reserved; quiet. (Extroversion)			0.758
(9) Calm; emotionally stable. (Neuroticism)			0.683
Cronbach's alpha coefficient	0.63	0.55	0.41
Number of items	4	4	2

The obtained structure did not permit recovering the five-factor structure; hence, some hypotheses were raised. The first is that the characteristics of the studied sample differed from the original study of Gosling et al. (2003); most of the sample was composed of adolescents. The second hypothesis is that the format of the scale, with the use of pairs of adjectives, was not able to generate an interpretable factor structure to evaluate personality according to the BFF, or possibly that the terms used did not work appropriately as descriptors for the original traits. We note that low but significant correlations were found among the results of measures of the five factors of personality in Brazil (Nunes et al., 2010). Such a fact converges with the non-occurrence of a simple factor solution in which items of a factor present high factor loads in the dimension for which they were constructed and virtually null factor loads for the remaining. Hence, when the TIPI-Br items were adapted, the chosen adjectives could be descriptors of traits that do not maximally separate the factors as defined theoretically.

In any event, the potential to recover the solution of five factors is very important since it is characterized as an essential structure for the model grounding the instrument. Not being able to recover this structure is significantly

unfavorable evidence regarding the instrument, especially if we consider the number of cross-cultural studies able to find such a solution (McCrae, 2002; Poortinga, Van de Vijver, & Van Hemert, 2002; Rolland, 2002).

In regard to the structure found, Factor 1 was represented by items related to high levels of agreeableness, extroversion, openness and conscientiousness, which can be seen as a factor of social desirability, that is, items representing content that are typically described as aspects socially favorable and for this reason, desired by people (Ribas Jr., Moura, & Hutz, 2004). Factor 2 was composed of items that represented low scores in the dimensions of neuroticism, conscientiousness, openness and agreeableness. It is possible that these items represent characteristics of people who experience difficulties interacting socially, since they have in common a low control over their emotions and behavior. Lastly, Factor 3 included two items that represent functioning of personality with more introverted characteristics and characteristics of emotional stability, respectively. In fact, personality characteristics highlighted by these items present similarities since low scores in the dimensions extroversion and neuroticism may be related to a tendency of the individual to be more calm and peaceful (Nunes & Noronha, 2009a). Despite the possibility of raising hypotheses concerning coherence of content among the items that grouped together in the three observed factors, this interpretation becomes limited since it does corroborate the expectation of the five factors, which have strong empirical bases (McCrae, 2002; Poortinga et al., 2002; Rolland, 2002). The reliability indexes obtained in the three factors were 0.41, 0.55 and 0.63, respectively; similar to those found in studies conducted in other countries with the original scale (Gosling et al., 2003; Muck et al., 2007).

Afterwards, the reliability coefficients (Cronbach's alpha) were computed for the theoretical factors of the TIPI-Br—for the five expected factors according to the BFF model—just to compare with the original scale (Gosling et al., 2003). Precision was below 0.32 in all the cases, which reaffirmed the impossibility of recovering the five factors, even considering low precision standards as suggested by Gosling et al. (2003). Therefore, with an exploratory purpose, we opted to keep the three-factor structure previously described for subsequent analysis. The descriptive statistics of the factors is displayed in Table 2.

Table 2
Descriptive Statistics TIPI-Br's Empirical Factors

Factors	<i>n</i>	Minimum	Maximum	Average	<i>SD</i>
Factor 1	388	1.50	7.00	5.64	0.94
Factor 2	387	1.00	7.00	3.42	1.27
Factor 3	393	1.00	7.00	4.26	1.50

Almost the entire range of responses (from 1 to 7) was reached in the three factors, which was expected given the number of individuals, with a higher average in factor 1 and a lower average in factor 2. It was expected that people scored higher in items that present socially desirable characteristics and endorse a smaller number of items whose characteristics are not sociably accepted (Edwards, 1957, 1990).

Another focus of analysis is the potential existence of different averages between women and men and also related to age in the TIPI-BR. Analysis of variance with repetitive measures was used for verification: a matrix 3x2x3 (factors of personality, gender, age) was analyzed. Results are presented in detail in Table 3.

Table 3
Analysis of Variance with Repetitive Measures of Personality Traits Considering the Participants' Gender and Age

Source of variance	SQ	gl	MQ	F	p	ETA ²
Among groups						
Personality factors	2.405	1.842	91.250	54.106	0.001	0.129
Personality factors*gender	2.405	1.842	1.306	0.774	0.452	0.002
Personality factors*age	18.984	11.049	1.718	1.019	0.428	0.017
Personality factors*gender*age	16.815	9.208	1.826	1.083	0.373	0.015
Error	1130.509	670.329	1.686			

The participants presented significant differences when personality factors were compared, with the size of effect marginally expressive, though no significant differences were found in relation to gender and/or age. The significant difference in personality traits suggests differences in the expression of three traits of personality among people (inter-individual differences), which was expected. However, there was also an expectation that differences would be found in the intensity of the expression of traits if groups were considered separately by gender and age, which they were not. Therefore, this result was the opposite of that observed in other studies reporting differences of averages according to the participants' gender and age, probably indicating the scale is not a good resource to evaluate personality, since it was not able to detect differences that were observed in other studies (Barrio Gándara et al., 2006; Bartholomeu et al., 2008; Nunes & Noronha, 2009a, 2009b; Nunes et al., 2010).

Therefore, both the analysis of internal structure and the precision of the scale, such as the analysis of variance, suggest that the scale does not meet minimum requirements. In other words, it was not possible to recover the five factors theoretically aligned with the BFF model. The scales' precision did not reach the minimum standard required and differences in the averages of the scores due to age and gender were not found.

Conclusions

The study of personality is a relevant theme with applications in many fields within the discipline of psychology in addition to the field of research. This study presents an analysis of the internal structure, precision and differences due to gender and age of a short scale to evaluate personality,

originally developed to access the Big Five Factor (BFF). Short scales to analyze personality are especially useful in research in which there is not much time available to collect data.

The original objective of this study was to offer a ten-item scale to evaluate whether the BFF is appropriate to the Brazilian context. Such a structure did not hold in the TIPI-Br when the principal components analysis was performed. Additionally, when this five-factor structure was forced into the data analysis, precision indexes were not satisfactory, invalidating its interpretation according to this reference. We then opted for a three-factor structure to study the TIPI-Br characteristics, which can be described as social desirability, adjustment problems, and emotional stability.

With this in mind, the interpretation of the three factors found using the TIBI-Br was not very relevant, both because it departs from the model that was the focus of this study (Big Five Factors) and from a potential alternative theoretical model (Eysenck's Three-Factor Model (Eysenck, 1981; Eysenck & Eysenck, 1985). It is relevant to recover the concepts of validity proposed in the last version of Standards (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999) in which the process of validation has the essential role of supporting the interpretation of psychological tests. When there is no empirical evidence that supports the results of a test based on the theoretical model adopted for its development, interpretability of results is impaired.

The characteristics of the TIPI-Br related to internal structure (principal components analysis) and internal consistency (Cronbach's alpha) were also examined initially. Observed results were not favorable, as expected, since as pointed out by Gosling et al. (2003), studies based on external

criteria should be a priority, that is, evidence of validity should be based on relationships established with external variables. The results of the investigation focused on the differences of averages among groups were not favorable either; significant results were obtained in the comparisons among the factors, but not in comparisons by age and gender.

Consequently, considering this study's limitations, the ten-item test with the adopted format has no minimum standards for professional use demanding any type of decision-making due to the psychometric characteristics, which hinders its interpretability. One important question to consider in future studies is why the instrument was not appropriate to be used in a sample of adolescents in the Southeast of Brazil, since it already presented favorable characteristics in other countries. It will be necessary to verify the comprehension of the participants concerning the adjectives used, to determine whether the two-adjective structure by item confused the respondent, or, a more extreme hypothesis, verify whether this format has limited use regardless of where it is applied.

Additionally, Brazilian studies (Nunes et al., 2010) using specific tests developed to evaluate personality in the BFF model indicate a low, but significant, correlation among some of the general factors. Similarly, items developed to evaluate these factors effectively present low factor loads in the remaining factors. Such results indicate that in order for the instrument to recover the five factors that guided its theoretical construction, it would be important in the adaptation of the TIPI-Br to give priority to descriptors of traits that produced a "simple solution". That is, that they present a high factor load in only one of the five factors and a very low load in the remaining factors.

Before discarding the use of TIPI-Br in professional practice in Brazil, it would be advisable to conduct further studies regarding evidence for the instrument's validity based on external variables, such as simultaneous application with another instrument to evaluate the BFF. Also, we suggest that other studies verify the possibility of replicating the BFF factor structure with a sample representative of the Brazilian population using the TIPI-Br.

Pre-testing other items to verify whether their inclusion would provide better psychometric and validity indicators than the original version can be utilized so that the best (ten) items could be selected in the pre-test. Or perhaps, a larger number of items, 20 for instance, would substantially improve the instrument's reliability and validity indicators. Finally, we suggest a study including a re-test to verify the stability of the constructs over time, as performed in other international studies, which was not possible in this study given its design.

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