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# Convergent and criterion-related validity for a brief scale of the Five-Factor model

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## ABSTRACT

This study sought evidence for the validity for the Reduced Markers Scale (EMR) in a population of university students ( $n=175$ , mean age=28.5,  $SD=7.4$ ). The EMR is composed of 25 items that measure and evaluate personality according to the Five-Factor Model. For convergent validity, we analyzed the correlations between the EMR and the *Bateria Fatorial de Personalidade* (BFP). For the criteria-related validity, regression analyses were conducted for EMR and the Positive Mental Health Scale. The results indicated high significant correlations between the EMR and BFP, except for the factor of Sociability and Openness to Experiences. Both EMR and BFP showed similar abilities to explain the external criterion, and the BFP accounted for 10% of the residual variance. The EMR proved to be suitable for evaluating personality in this sample. However, we consider there are some limitations due to the amount of information provided by the instrument.

**Keywords:** psychological assessment; personality; typical traits.

## RESUMO – Validade convergente e baseada em critério externo para marcadores reduzidos de personalidade

O presente estudo buscou evidências de validade para a Escala de Marcadores Reduzidos (EMR) em uma população de estudantes universitários ( $n=175$ , média de idade=28,5,  $DP=7,4$ ). A EMR possui 25 itens que avaliam a personalidade baseados no Modelo dos Cinco Grandes Fatores. Para a validade convergente, analisaram-se as correlações entre a EMR e a *Bateria Fatorial de Personalidade* (BFP). Para a validade baseada em critério externo, realizaram-se regressões para a EMR junto à Escala de Saúde Mental Positiva. Os resultados indicaram correlações significativas altas entre a EMR e BFP, exceto para os fatores sociabilidade e abertura à experiência. Tanto EMR quanto BFP demonstraram semelhante capacidade para explicar o critério externo, e a BFP foi responsável por 10% da variância residual. A EMR mostrou-se indicada para avaliar a personalidade na amostra estudada. Entretanto, consideram-se algumas limitações na quantidade de informação fornecida pelo instrumento.

**Palavras-chave:** avaliação psicológica; personalidade; traços típicos.

## RESUMEN – Validez convergente y de criterio para los marcadores reducidos de la personalidad

Este estudio buscó pruebas de validez de Escala Reducida Marcadores (EMR) en una población de estudiantes universitarios ( $n=175$ , edad media=28,5,  $DE=7,4$ ). El EMR tiene 25 ítems que evalúan la personalidad basado en el modelo de los cinco grandes factores. Para la validez convergente, se analizaron las correlaciones entre el EMR y la *Bateria Fatorial de Personalidade* (BFP). Para la validez basada en criterio externo se llevó a cabo regresiones de EMR junto a escala de la salud mental positiva. Los resultados indican correlaciones significativas entre la EMR y BFP, con excepción de los factores sociabilidad y apertura a la experiencia. Tanto EMR como BFP mostró capacidad similar para explicar el criterio externo, y el BFP representó el 10% de la varianza residual. La EMR resultó ser adecuado para evaluar la personalidad en la muestra. Sin embargo, consideramos algunas limitaciones en la cantidad de información proporcionada por el instrumento.

**Palabras clave:** evaluación psicológica; personalidad; trazos típicos.

## Introduction

The Five-Factor Model (FFM) is globally recognized as one of greatest contributions to personality psychology (Gomes & Golino, 2012; Jenkins-Guarnieri, Wright, & Johnson, 2013; Joshanloo &

Nosratabadi, 2009). To develop this model, personality theorists identified the existence of five factors that best explained the human personality. They proved through factorial analysis that these five factors were a sufficient representation of all human personality framework traits. This evidence was developed into the Five-Factor

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Model (Fiske, 1994; McCrae & Costa, 1996). More recently, a variety of studies involving personality trait descriptors reached similar and more significant results that reinforced the five constant factors used to describe the human personality traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience (Gomes & Golino, 2012; Hauck, Teixeira, Machado, & Bandeira, 2012b)

Conceptually, Extraversion is characterized by assertiveness, communication, and an individual's ability to be socially active. Agreeableness refers to pro-social tendencies, altruism, and flexibility of the subject. Conscientiousness indicates the individual's level of discipline, organization, and persistence. Neuroticism refers to the characteristics of anxiety, depression, and links to negative emotions in general. The Openness to Experience factor expresses curiosity, intellectual flexibility, and the desire for new, complex and varied experiences (Hauck, Machado, Teixeira, & Bandeira, 2012a; Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006; Nunes, Hutz, & Giacomoni, 2009). Thus, the FFM assembles a structure that summarizes a complex set of different features of human behavior and arranges them into five basic, universal personality traits called factors (Fiske, 1994).

However, in this structure, each factor covers dozens of specific facets. These facets are behavioral predisposed responses to life situations. Therefore, the FFM are five isomorphic factors that constitute basic and fundamental aspects of personality present in many cultures of the world (McCrae & Costa, 2008).

#### **Personality assessment: measures based on the FFM**

Globally, the instruments to assess personality are mainly scales and inventories that investigate personality by either descriptor-items, which are affirmative sentences, or marker-items, consisting of adjectives (Goldberg, 1992; Mullins-Sweatt et al., 2006). The main instruments that were either adapted or created for Brazil use descriptor-items in the FFM which are: NEO – Personality Inventory-Revised and NEO Five-Factor Inventory – short form (NEO-PI-R and NEO-FFI; Costa & McCrae, 2007), *Bateria Fatorial de Personalidade* (BFP; Nunes, Hutz, & Nunes, 2010a), and The Big Five Inventory (BFI; Andrade, 2008). There are also scales with descriptor-items that measure one specific factor: *Escala Fatorial de Extroversão* (EFEx; Nunes & Hutz, 2007a), *Escala Fatorial de Neuroticismo* (EFN; Hutz & Nunes, 2001), Factorial Scale of Agreeableness (EFS; Nunes & Hutz, 2007b) and the Open to Experiences Scale (EAE; Vasconcellos & Hutz, 2008). In contrast, marker-item devices are less common in Brazilian psychology. Currently, there are only two measures that use marker-items for personality evaluation based on the FFM: *Escala de Marcadores Reduzidos* (EMR; Hauck et al., 2012b)

and *Escala de Marcadores de Personalidade* (Hutz, Nunes, Silveira, Serra, Anton, & Wieczorek, 1998).

Studies indicate that the existing personality measures in Brazil are too lengthy under specific assessing contexts where time needs to be optimized. For example, 60 to 150-item instruments evaluating personality usually require more than twenty minutes for a participant to answer, making data collection more difficult (Gosling, Rentfrow, & Swann Jr., 2003; Hauck et al., 2012a). There are also a variety of settings in the practical psychological context, such as in clinics and hospitals that seek to use faster and simpler instruments. In this context, there may not be much time to spend with a patient, and only a short screening of the personality traits is needed rather than a full evaluation (Gosling et al., 2003). Therefore, short measures are necessary and helpful in several contexts of the psychological praxis.

Most research that seeks validity evidence for brief measures have primarily been conducted by international studies using marker-item instruments (Goldberg, 1992; Gosling et al., 2003; Mullins-Sweatt et al., 2006). International sources state that brief measures of FFM have several benefits, but caution is required as well. The most reported advantages for shorter measures are both the elimination of redundant items and time optimization (Gosling et al., 2003; Hauck et al., 2012a). Hence, the scope of personality evaluation increases especially when there are several other constructs in the psychological assessment battery (Nunes, Muniz, Nunes, Primi, & Miguel, 2010b). Furthermore, short measures are also useful for online data collection given that online research usually require follow-up studies from the same survey. Thus, shorter measures potentially reduce both the rates of frustration and boredom among respondents whereas larger scales can overwhelm participants (Gosling et al., 2003).

Caution is also necessary when using short scales. Two points are frequently highlighted in the scientific literature. Firstly, shorter measures usually demonstrate psychometric weakness when compared with larger scales (Goldberg, 1992). Secondly, that they often fail in evaluating minor facets of the human personality (Carvalho, Nunes, Primi, Nunes, 2012; Mullins-Sweatt et al., 2006).

In the Brazilian context, the EMR was developed in order to attend to both the lack of brief instruments for personality evaluation and the current gap in the landscape of marker-item measures (Carvalho et al., 2012; Hauck et al., 2012a; Passos & Laros, 2015). EMR is a 25-adjective-item instrument composed of five scales, which correspond to the five FFM factors. The items are evaluated by a Likert scale of five points, where 1=Strongly Disagree and 5=Strongly Agree. This is a smaller version of *Escala de Marcadores de Personalidade* (EMP; Hutz et al., 1998), which is a 64-item measure from Goldberg's robust set of 100-item measure (1992). For the Brazilian sample, the EMP reported robust

reliability, with Cronbach's alpha ranging from .78 to .88 across its five subscales (Hutz et al., 1998).

Despite both the development and small size of EMR, one previous study highlighted three different aspects. First, in the process of developing items, the authors have carefully combined theoretical, semantic and statistic criteria, in order to maximize the content validity of the subscales (Hauck et al., 2012a). Second, the EMR revealed the reliability index comparable to EMP, with Cronbach's alpha ranging from .61 to .83 for its subscales (Hauck et al., 2012b). Third, another previous study has demonstrated that the EMR had "covered the latent trait comparable to instruments with a much higher amount of items", despite setting only five adjectives in each of the five scales (Machado, Hauck, Teixeira, & Bandeira, 2014). Yet, all of these studies support the importance of future research using both Item Response Theory and confirmatory techniques in order to investigate the criterion and convergent-related validity evidence for EMR (Hauck et al., 2012a; Machado et al., 2014). Therefore, this study aims to investigate convergent and criterion-related validity for the EMR.

In the context of Brazil, unlike in the international studies, there are few convergent validity studies with psychological instruments for assessing personality (Nakano, 2014). Convergent validity contributes to preserving the underlying theoretical model of the psychological test, which make it secure to use in combination with other validated instruments. Consequently, this research investigated the convergent validity of EMR by comparing it with a longer 126-item instrument developed in Brazil, the *Bateria Fatorial de Personalidade* (BFP).

### Positive Mental Health and the Five-Factor Model

This research analyzes the validity of the EMR in light of an external criterion: Positive Mental Health. The term "Positive Mental Health" arises from the positive elements encompassed in the concept of mental health. One of these elements is operationally referred to as well-being. As proposed by the World Health Organization (WHO), well-being is an important concept of mental health that allows individuals to realize their full potential (World Health Organization, 2008). Keyes (2002; 2007) has subdivided the concept of well-being into emotional (or subjective) well-being, psychological well-being, and social well-being. In order to evaluate these three Positive Mental Health factors in adults, Keyes (2002) also built the Mental Health Continuum-Short Form (MHC-SF) in the United States. The Brazilian version of the MHC-SF is called *Escala de Saúde Mental Positiva* and was adapted and validated by Machado and Bandeira (2015).

The concept of well-being refers to "the capacity of the individual to fully dispose of their skills and abilities to meet their needs, personal and interpersonal goals and values" (Machado & Bandeira, 2015). Therefore, the

evaluation of Positive Mental Health reasonably correlates with the ways of being, thinking, and feeling, which are considered intrinsic components to characterize human personality (Keys, 2007; Machado & Bandeira, 2012). Moreover, the literature reports the strong association between the prediction of the facets of subjective, psychological, and social well-being to the factors of Extroversion, Neuroticism, and Agreeableness (Hauck et al., 2012a; Joshanloo & Nosratabadi, 2009; Machado & Bandeira, 2012; Nunes et al., 2009). These findings increase the correlation between Positive Mental Health and the personality model proposed by the FFM. Aside from the verification of the convergent validity with BFP, we sought to verify the ability of both of these measures to predict Positive Mental Health.

## Method

### Participants

The sample for this study was composed of 175 adults, ranging from 18 to 70 years old ( $M=28.5$ ;  $SD=7.4$ ; 57.8% female). The sample consisted of students and staff at a university located in southern Brazil. The director of the institution signed a release authorizing the research and the participants signed the consent form at the time of data collection.

### Instruments

- Reduced Markers Scale (*Escala de Marcadores Reduzidos* – EMR; Hauck et al., 2012a): an instrument that measures the FFM's five factors using five subscales composed of five adjectives each. This measure is evaluated from the Likert scale of five points, where 1=Strongly Disagree to 5=Strongly Agree. The study of validity evidence for the EMR revealed appropriate psychometric proprieties,  $\alpha$  ranging from .61 to .83.
- Factorial Personality Battery (*Bateria Fatorial de Personalidade* – BFP; Nunes et al., 2010a): an instrument with 126 descriptor-items measuring the five factors and its facets according to the FFM. Each of the five dimensions of FFM possesses 17 facets. The responses are provided through a 7-point Likert scale based on agreement (1=totally disagree; 7=totally agree). The  $\alpha$  reported for the five dimensions of the BFP and its facets ranged from .57 to .89.
- Positive Mental Health Scale (*Escala de Saúde Mental Positiva* – ESMP, adapted for Brazilian culture by Machado & Bandeira, 2015). A 14-item scale divided into three subscales, which measures subjective well-being (three items), psychological well-being (six items), and social well-being (five items). The responses are provided by a 6-point Likert scale based on frequency. The original American version of this scale (Mental Health Continuous – Short

form) reports Cronbach's Alpha above .80 for all subscales and the global scale (Keys, 2005). The Brazilian version, in turn, also demonstrates strong psychometric properties, with the general factor of Positive Mental Health explaining 50% of variance and a reliability index above .70 (Machado & Bandeira, 2015).

## Procedures

In this study ethicality was ensured according to the National Health Council's resolution No. 466/2012 of the Ministry of Health. Additionally, the approval and all procedures recommended by the Ethics and Research Committee were followed closely.

There were two steps in the data collection procedures. First, the researchers provided a self-applied protocol to the university participants, each one containing the instruments mentioned in this research and a cover page presenting the study along with a statement of consent. Second, the university delivered these questionnaires to the professors that were, in turn, responsible for collecting the protocols in their respective classrooms. Once completed, the researchers used statistical software to release the results from the instruments to proceed with the analysis.

## Data analysis

Three statistical analyses were performed. First, in order to estimate the association among the personality evaluations through EMR and BFP, Simple Bivariate Correlations were used. This provided the effect description of each of the two equal factors achieved when comparing two instruments. Second, Multiple Linear Regression determined the association between the facets of each factor of PFB and the EMR factors, as well as the correlation of these two measurements with the external criteria (Mental Health Positive Scale). Finally, a Canonical

Correlation investigated the correlation between the total set of facets of BFP and of the five factors of the EMR. In order to measure latent variables (which were not directly observed), the Canonical Correlation combined the total number of variables in the two instruments and then provided the amount of information in common. This analysis also provides a score of shared variance. Reliability indexes were also estimated by Cronbach's alpha.

## Results

### Convergent validity analysis

Considering the total sample, the association between the factors of EMR with facets of BFP indicated that all the factors of the EMR were significantly correlated with each of the facets of the BFP ( $p < .01$ , Table 1). In addition, the correlations were shown to be mostly weak. Weaker correlations were found to be both Agreeableness and Openness to Experience factors of EMR in association to both Agreeableness and Openness to Experience facets of BFP. These results support the hypothesis that the two instruments cover the evaluation of personality traits as proposed by the FFM.

In order to further the association between the two instruments that assess personality in the FFM, a second analysis aimed to investigate how each of the facets of BFP and the EMR factors helped to explain personality. Thus, as shown in Table 1, the results for this Multiple Correlation Analysis indicated both significant ( $p < .001$ ) and moderate to strong correlations for all facets and factors of the two tests.

Finally, a Canonical Correlation related all facets of the EMR to all the factors of BFP, seeking a linear combination to summarize the set of facets and factors. The results showed high correlation of .82 (Wilk's Lambda = .11,  $F(25, 614.4) = 20.1$ ,  $p < .001$ ) reporting

Table 1  
Multiple Bivariate Correlations between EMR and BFP

EMR	BFP					Multiple Correlation
						EMR/BFP
N	N	N1	N2	N3	N4	.67 $F=34.6$ (4.17)
	.64	.56	.60	.41	.52	
E	E	E1	E2	E3	E4	.69 $F=4.6$ (4.17)
	.62	.67	.34	.48	.37	
A	A	A1	A2	A3		.56 $F=26.0$ (3.17)
	.42	.52	.09*	.26		
C	C	C1	C2	C3		.57 $F=28.7$ (3.17)
	.54	.43	.28	.55		
O	O	O1	O2	O3		.57 $F=28.8$ (3.17)
	.47	.56	.18*	.24		

Note: N=neuroticism, E=extroversion, A=Agreeableness, C=Conscientiousness, O=Open to experience; \*\*Statistically not significant;

\*Statistically significant at  $p < .005$ , all other correlations were statistically significant at  $p < .001$ .



67% of shared variance. Therefore, the two instruments demonstrated high explanatory power of personality traits, according to the FFM. The reliability indexes (Cronbach's alpha) calculated for the factors of BFP and for the EMR respectively were:  $\alpha=.89$  and  $.76$  for neuroticism,  $\alpha=.75$  and  $.71$  for extroversion,  $\alpha=.72$  and  $.75$  for agreeableness,  $\alpha=.84$  and  $.77$  for conscientiousness and  $\alpha=.50$  and  $.52$  for open to experience.

### External Criterion-related validity analysis

The external criterion-related validity was investigated by a Multiple Linear Regression for the five personality factors of both EMR and BFP, with the *Escala de Saúde Mental Positiva* (ESMP). Separate regression models of both personality scales indicate that the coefficient of determination for the BFP's items were  $R^2=.65$  ( $F(5, 169)=24.9$ ;  $p<.001$ ), while for the EMR's items were  $R^2=.62$  ( $F(5, 169)=21.0$ ;  $p<.001$ ). Those findings support that both measurements have a similar magnitude of explanation compared in relation to the criterion variable. Finally, a hierarchical regression has indicated that the BFP accounts for about 10% of the residual variance criterion measured after regression EMR [ $F(5, 164)=9.12$ ;  $p<.001$ ], demonstrating the amount of information lost by the investigator by using the shorter instrument. As previously described in the scientific literature (Hauck et al., 2012a; Joshanloo & Nosratabadi, 2009; Machado & Bandeira, 2012; Nunes et al., 2009), the association between the Positive Mental Health Scale and all the factors of BFR and EMR was found in this study. More specifically, there was strong association between the external criterion and the Extroversion, Neuroticism, and Agreeableness factors in EMR.

### Discussion

According to previous studies, it is expected that brief measures show psychometric weakness when compared to larger scales (Carvalho et al., 2012; Goldberg, 1992; Mullins-Sweatt et al., 2006). In contrast, the convergent validity evidence between EMR and the BFP presented in this paper showed strong psychometric properties in the mini markers for personality assessment. In addition, the EMR also showed to be helpful in assessing personality traits, as indicated by the high rate of shared variance (67%), demonstrating the ability of the two instruments (EMR and BFP) to explain the personality framework according to the FFM. Furthermore, EMR also showed moderate to high correlations with various facets in each of the BFP factors.

According to the criterion-related validity, the residual variance accounted by BFP indicated that the EMR loses only 10% of the capacity to explain the external criteria, in comparison to the longer measure. However, it is important to consider that future studies can

investigate the psychometric proprieties of EMR with other measures that evaluate personality according to FFM. Thus, both the high level of shared variance in the convergent validity analysis and the low level of residual variance in the criterion-related analysis, suggest EMR as a good fit rather than a limitation of both convergent and criterion measures. These results expand the personality evaluation in contexts where assessing personality were lengthy, but a necessary task. EMR has shown to cover the latent personality traits comparable to large instruments, even with only five adjectives in each of the five scales (Machado et al., 2014).

In contrast, there were weak significant correlations between the factors of the EMR and the following BFP facets: A2 (.09), A3 (.26), C2 (.28), O2 (.18), and O3 (.24) (Table 1), indicating that EMR must not be used to deeply evaluate these facets. This result supports that brief instruments are an inappropriate choice to evaluate specific facets of each of the five factors in the FFM (Goldberg, 1992; Mullins-Sweatt et al., 2006). Thus, we consider this as an intrinsic limitation for the EMR as well, indicating that caution is required when using this brief instrument to evaluate personality. In this respect, the purpose of the evaluation needs to be carefully considered before choosing the measures in the psychological battery (Passos & Laros, 2015). By choosing EMR, the facets of the individual's personality will not be integrally known, which could compromise some assessments.

### Final Considerations

The EMR has proven to be a good instrument for characterizing personality in the FFM. However, the findings also support that EMR cannot completely replace longer instruments as it provides a smaller amount of information in its results.

In Brazil, much of the difficulty in psychological assessment praxis lies in the quantity of instruments. Therefore, the EMR could be an exceptional option specifically among the limited number of small measures for personality evaluation in the Brazilian context. However, we consider that the lack of knowledge regarding the methodological aspects of the development of these psychological tests' worrying. It may compromise both the correct choice and use of a test in different contexts of the psychological assessment. Developing this type of knowledge and increasing the number of quality psychological instruments is one possible solution. Professionals could then make better choices about the measure that best fits in each assessment situation and objective. Future studies should further the discussion regarding the validity of brief markers to evaluate personality facets in each of the Five Factors. In addition, further research in this field may also attempt to expand the EMR correlations with external criteria and conduct studies of predictive validity and compare it with other measures.

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