Trends in Psychology (2023) 31:690–715
https://doi.org/10.1007/s43076-022-00145-y

ORIGINAL ARTICLE

Evidence of Validity and Accuracy of an Implicit Measure to Assess the Depressive Trait

Nathalia Melo de Carvalho[1] · **Rafael Valdece Sousa Bastos**[1] · **Jean Carlos Natividade**[1]

Accepted: 17 January 2022 / Published online: 28 January 2022

Abstract

In the Big5 model, the depressive trait is an underlying neuroticism factor that indicates a tendency to experience negative emotions, low expectations for the future, and loneliness. The present study sought to build an implicit measure to assess the depressive trait and search for evidence of its validity. In study 1, we elaborated and selected items through an implicit task that was based on accuracy and response times. In study 2, the items were applied to an implicit association test. The results indicated that the measure had satisfactory evidence of validity, including a one-factor structure, and relationships with other theoretically expected variables. Furthermore, the reliability indices of the measure were adequate. The test–retest correlation coefficient was higher than the values that were found in the literature. This research presented an implicit measure built with an innovative item selection process and which proved to be suitable to access the depressive trait of personality.

Keywords Implicit assessment · Depressive trait · Personality traits · Big five factors · Test validity · Test accuracy · Implicit social cognition

Since the first studies of personality, some traits have been shown to be especially relevant because of their predictive power on behaviors and other outcomes in the lives of individuals (Gregory, 2014). The depressive trait, for example, is considered predictive of well-being, professional performance, and mental disorders (Klein et al., 2011; Quevedo & Abella, 2011; Slaughter & Kausel, 2009). People with higher levels of the depressive trait and other traits that are associated with negative emotions are more likely to develop clinical conditions of depression, a public health problem that affects 4.4% of the world's population (World Health Organization, 2017).

✉ Jean Carlos Natividade
jeannatividade@gmail.com

[1] Department of Psychology, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil

The most common way to detect levels of the depressive trait is through self-report instruments (e.g., Costa & McCrae, 2007; Nunes et al., 2010; Soto & John, 2017). One limitation of these measures, however, is the influence of bias that results from social desirability and the handling of self-image (Payne & Gawronski, 2010). People who are highly motivated to build a favorable image of themselves find the opportunity to falsify answers in self-report instruments because they have sufficient time to reflect and deliberate on the presented items (Fazio & Olson, 2003). In recent decades, implicit measures have emerged in an attempt to overcome this limitation. They have been shown to be useful in capturing more spontaneous responses (Payne & Gawronski, 2010). A recent meta-analysis showed that the implicit association test (IAT) is the most used measure to assess the implicit self-concept of personality (De Cuyper et al., 2017). The meta-analysis also revealed, however, that few studies developed empirical procedures to guarantee evidence of validity based on the content of implicit measures of the self-concept. Most studies failed to assess personality more narrowly by measuring facets that underlie the Big5 factors. Thus, the present study sought to construct an IAT to assess the depression facet of the Big5 model and search for evidence of its validity. Additionally, we developed an empirical procedure based on accuracy and response times to select items for implicit measures.

Depressive Trait in the Big5 Model

The Big5 model has been shown to be replicable and well accepted in studies of personality (Barenbaum & Winter, 2010). This model has a basic assumption that the idea that individual human differences can be identified in the natural language of people (John et al., 1988). This can be assumed because, throughout evolution, people would have invented words to describe individual characteristics that were important for social interaction (John et al., 1988). Based on this assumption, researchers who searched for terms to describe individual differences in dictionaries and books within the scope of different cultures found that personality characteristics could be grouped into five explanatory dimensions (e.g., Goldberg, 1992; Hutz et al., 1998).

In theory, the Big5 factors are independent of each other and refer to a continuum. Every person is at some level (low, medium, or high) in the latent trait spectrum of each of the five factors (Costa & McCrae, 2007; John et al., 2010). In short, they can be defined as follows: extraversion (a tendency to seek stimulation in interactions with others), agreeableness (a tendency to behave in a prosocial manner), conscientiousness (a tendency to be obstinate and organized to achieve established goals), neuroticism (a tendency to experience negative emotions and emotional instability), and openness to experience (a tendency to seek new and enriching experiences; Costa & McCrae, 2007; John et al., 2010; Natividade & Hutz, 2015).

With some exceptions (e.g., Ashton et al., 2004; Benet & Waller, 1995), researchers from different cultures agree that the five-factor structure is the best arrangement of personality descriptors (McCrae et al., 2004). No consensus has been reached, however, on the nomenclature of these factors or the facets (or subfactors) that

underlie each of them. The number of facets may vary according to the instrument that is chosen to approach personality. The NEO-PI-R, for example, presents a structure of 30 facets (Costa & McCrae, 2007), and the BFI-2 has 15 facets (Soto & John, 2017). An instrument that was built specifically for the Brazilian context revealed a structure of 17 facets (Nunes et al., 2010).

Although the number of facets varies, the depressive trait in all these instruments underlies the neuroticism factor and is grouped in a subfactor called depression (Costa & McCrae, 2007; Nunes et al., 2010; Soto & John, 2017). The depressive trait is understood as a tendency to present negative emotions, low expectations for the future, feelings of loneliness, boredom, the absence of clear goals, and a monotonous and emotionless life (Nunes et al., 2010; Soto & John, 2017). People with high scores on the depression facet consider themselves unable to deal with difficulties that arise in their lives, whereas low levels of this facet indicate happier and more hopeful people with regard to the future because they believe in their own ability to deal with any problems that may arise throughout their lives (Nunes et al., 2010). Also, some authors emphasize happiness as a facet of neuroticism that would be opposite to depressive characteristics, as happier people rarely feel sad, constantly look to the brighter side of life, and feel comfortable about themselves (Goldberg, 1999; Hofstee et al., 1992).

High scores on the depression facet are associated with several negative life outcomes, such as lower levels of happiness, a worse quality of life, and shorter longevity (Terracciano et al., 2008). Among all the subfactors of neuroticism, the depression facet is most strongly related to subjective well-being. Individuals with high levels of the depressive trait tend to experience more negative than positive affect while evaluating their own lives as less satisfactory (Quevedo & Abella, 2011). Additionally, the traits that comprise the neuroticism factor are generally associated with different psychiatric conditions, such as depression and anxiety disorders (Lahey, 2009). Thus, neuroticism and its facets can be considered personality traits that significantly impact both physical and mental health conditions (Lahey, 2009).

Implicit Measurement of Personality

Measuring the depression facet may help identify people who would benefit from preemptive interventions that minimize the risk of the onset of mental disorders (Klein et al., 2011). The evaluation of the depressive trait, however, faces the same difficulty as measuring other constructs that are considered socially undesirable, in which people are not always willing to reveal negative aspects of themselves (Payne & Gawronski, 2010). Some people may also be unaware of their own characteristics or tend to protect self-esteem and be reluctant to acknowledge that they are depressive people (Hepper et al., 2010). Aware of these difficulties, researchers have developed in recent decades implicit (or indirect) methods to assess disorder-relevant contents, such as self-esteem and depression, which proved to predict some specific psychopathological behaviors (Meites et al., 2008; Roefs et al., 2011).

In contrast to self-report measures, implicit measures aim to assess psychological constructs without directly asking people what one wants to know (De Houwer &

Moors, 2010). The implicit association test (IAT) and Go/No-Go task are examples of such measures (Greenwald et al., 1998; Nosek & Banaji, 2001). Although they have some particularities, these tests are similar regarding the way they use response time as a unit of measure for the strength of an association between categories, avoiding the deliberative processing of information by respondents. This characteristic makes it less strongly influenced by self-presentation goals, although scores on the implicit measures are also susceptible to faking (Greenwald et al., 2002; Steffens, 2004).

Among the available implicit measures, the IAT is notable because it is the most used measure of personality traits (De Cuyper et al., 2017). This test assesses constructs whose definitions involve associations between concepts, such as attitudes (associations between objects and affects), stereotypes (associations between groups and non-valence attribute concepts), and self-concept (associations between the self and non-valence attribute concepts; Greenwald et al., 2002). Personality measures have traditionally been based on the self-concept to measure traits (Kim et al., 2019). In the impossibility of accessing the traits themselves, one tries to identify how strongly people believe that certain characteristics adequately describe them (Kim et al., 2019). These beliefs constitute a small part of complex networks of associations that form the self-concept and thus are subject to measurement through the IAT (Greenwald et al., 2002). There is no consensus, however, about which specific constructs underlie the IAT's responses (Corneille & Hütter, 2020).

The implicit measurement of personality is still at an early stage compared with the long history of explicit measures, but some satisfactory results have already been reported. For example, the factorial structure of the IAT that was built to assess the five major factors was shown to be adequate and have internal consistency (Grumm & von Collani, 2007; Schmukle et al., 2008). However, more considerable problems are found with regard to the temporal stability of the measures and evidence of validity based on relationships with other variables (De Cuyper et al., 2017; Hofmann et al., 2005; Schimmack, 2019). Few studies have produced results about the temporal stability of implicit measures of personality. These measures have also shown weak correlations with self-report instruments and little predictive power regarding behaviors (Costantini et al., 2015; Hofmann et al., 2005; Schmukle et al., 2008; Meissner et al., 2019).

With regard to specifically implicit measures of depression, studies have built measures to assess depression as a mood state (Glashouwer & De Jong, 2010; Meites et al., 2008) or negative self-schema (Dentale et al., 2016), with no intent to assess it as a stable characteristic (i.e., trait) in the scope of personality. However, depression as a trait also is a relevant disorder variable (Klein et al., 2011). This gap in measures of depression trait meets the argument of De Cuyper et al. (2017) that implicit measures of personality would benefit from a narrower approach to personality by considering not only the Big5 factors but also the facets that underlie them, such as organization and depression (Costantini et al., 2015). Cuyper et al. argued that a more specific (or facet) approach can result in the greater predictive power of implicit measures on behavior, especially if the type of behavior is considered (i.e., automatic or deliberate). They also emphasize the importance of further studies to

develop empirical procedures to select items that comprise implicit tests to ensure that the selected words or images accurately represent the target construct.

Present Study and Hypothesis

This study was designed to construct an IAT to assess the depression facet of neuroticism and search for evidence of its validity. We also sought to develop an empirical procedure to select items for implicit measures. Therefore, two studies were performed. The first study consisted of the elaboration of items and execution of an item selection procedure that considered the accuracy and speed (i.e., response time) of associations between words and the target category. No specific hypotheses were tested because this was an exploratory and methodological study.

In the second study, evidence of the validity of the constructed measure was sought based on the internal structure and relationships with other variables. The instrument's reliability was tested by internal consistency and test–retest coefficients. In this study, we expected the items to be grouped in a one-factor solution in the EFA, which would be coherent with the definition of the depression facet (Costa & McCrae, 2007; Nunes et al., 2010; Soto & John, 2017). We also tested the best arrangement for implicit and explicit depression items together through confirmatory factor analysis (CFA) to contribute to the discussion about whether implicit and explicit measures assess the same construct (Fazio & Olson, 2003; Payne et al., 2008), distinct but related constructs (Nosek & Smyth, 2007), or constructs that would be best explained by a common second-order factor. For criterion validity, we mainly hypothesized that implicit depression would positively correlate with explicit neuroticism, depression, and negative affect and negatively correlate with self-esteem, satisfaction with life, positive affect, and positive expectations toward the future (Dentale et al., 2016; Lahey, 2009; Quevedo & Abella, 2011). We also expected that the participants who behaved in a depressed or neurotic manner, such as thinking that life was not worth living or having trouble not crying, would present higher levels of implicit depression (Lahey, 2009; Nunes et al., 2010).

Study 1

Method

Participants

The participants were 176 university students. An equivalent proportion of men and women was sought, with students from different courses. The participants were divided into two groups according to the task they completed: 105 participants completed the task that elaborated categories that are related to the individual, and 71 participants completed the task for categories that belonged to the depression facet. No detailed information about the participants was obtained in this study.

Procedures

Data Collection

The participants were personally approached on the university campus and invited to participate in a survey on personality. When the participants arrived in the laboratory, they were informed about their rights and how the research would be performed. They received noise mufflers and were directed to computers that were separated by partitions so that a quiet data collection environment with few visual stimuli could be ensured. The survey was answered entirely via computer. Informed consent was obtained from all individual participants included in the study.

Elaboration of Items

We first elaborated a list of words that represented the individual and depression facet, in their high and low extremes, according to previous recommendations (e.g., Greenwald & Farnham, 2000). We named categories that were related to the individual as Me (target category) and Other (opposing category) and the representative categories of the depressive trait as Depression (target category) and Cheerfulness (opposing category). Two researchers then independently used the list that was developed in the previous step to select words that best represented the four categories based on word content. A third researcher compiled the two previous selections and judged the adequacy of the words for the definitions of the constructs. Finally, a list of 26 words was generated to represent the individual, and 33 words represented the depression facet.

Empirical Test of Items

Based on the sets of items that were elaborated in the previous step, a Go/No-Go task (Nosek & Banaji, 2001) was configured to empirically test associations between the words and categories. The task was performed on a computer. In the upper right corner of the screen, a category appeared. In the center of the screen, a word appeared that would or would not be representative of the category. In the task that was developed for the categories that were related to the individual (Me and Other), the participants provided their names and surnames before starting the task so that this information could be used as representative stimuli of the Me category. For these categories, each word remained on the screen for 0.7 s. For the categories of the depression facet, each word remained on the screen for 0.9 s. The time lapse during which the words remained on the screen was selected according to the time that is commonly used in Go/No-Go tasks (Nosek & Banaji, 2001). Three judges also evaluated whether the time lapse that was used was sufficient to read and understand the content of the words. If the word was representative of the category, then the participant should press the space bar on the computer keyboard as quickly as possible before the maximum time was reached. If the word was not representative, then

the participant should not press any key. The task was configured to randomly display 90 trials and repeat each word at least once. All of the participants' responses were considered in the data analysis.

Analyses

The average response time of making associations between the words and their respective categories and accuracy rates was calculated. The criteria for selecting the items, based on responses in the task, were as follows: eight words in each category with the highest accuracy rates and the shortest association time (in cases of identical values) between the word and category. The data that were generated to produce the results are open and available for download on the Open Science Framework (https://osf.io/7nre6/).

Results

A total of 32 words were selected (16 for each pair of categories, eight for each target category and eight for each opposing category). Table 1 shows the words that were selected for the Me, Other, Depression, and Cheerfulness categories, together with their respective accuracy rates and average response times.

Study 2

Method

Participants

A total of 98 participants were included in study 2, 62.2% were women ($n=61$), and 37.8% were men ($n=37$), with an average age of 21.9 years ($SD=6.14$ years, $Min=18$ years, $Max=61$ years), who lived in the city of Rio de Janeiro, Brazil. For education, 13.3% had completed high school ($n=13$), 79.6% had incomplete higher education ($n=78$), and 7.1% ranged from completed higher education to completed graduate education ($n=7$). The sample size was aligned with the recommendation of a minimum of 10 participants per item to run a factorial analysis (Osborne et al., 2008).

Instruments

The participants completed the IAT that was constructed for this study to assess the depressive trait and an online questionnaire that asked sociodemographic questions (gender, age, and education), presented scales of self-reported personality, self-esteem, and subjective well-being and asked behavioral criterion questions about typical behaviors of depressed and high neurotic people. The behavioral criterion questions asked

Table 1 Words selected for the categories Me, Other, Depression, and Cheerfulness

Me and Other				Depression and Cheerfulness			
Words	Corrects (%)	*M* (ms)	*SD*	Words	Corrects (%)	*M* (ms)	*SD*
Name[a]	93.9	486.23	71.99	Negativist[a]	98.3	524.21	86.25
So-and-so[b,c]	91.9	503.57	74.79	Crestfallen[a]	97.7	551.42	90.18
I[a]	91.8	465.33	87.58	Pessimistic[a]	97.3	524.31	82.68
Surname[a]	91.7	503.78	70.23	Hopeless[a]	97.2	556.19	92.88
So-and-so[b,c]	91.0	505.24	76.56	Depressed[a]	97.1	519.28	90.47
My[a,c]	90.4	473.73	80.69	Depressive[a]	96.8	521.91	95.66
Me[a,d]	89.4	472.69	78.16	Sad[a]	96.7	527.02	86.94
Me[a,d]	89.3	469.73	89.59	Disillusioned[a]	96.3	525.92	88.40
Their[b]	89.2	497.44	80.53	Smiling[b]	96.0	512.68	81.11
Other[b]	87.5	508.21	78.68	Joyful[b]	95.8	492.91	92.51
So-and-so[b,c]	86.7	513.52	75.40	Happy[b]	95.6	477.67	81.50
They[b]	86.4	496.34	91.03	Positive[b]	95.1	505.25	82.02
Theirs[b]	86.3	508.16	86.85	Radiant[b]	94.6	556.20	105.40
Another[b]	85.7	518.36	93.81	Jovial[b]	94.2	537.92	93.57
With Me[a]	85.6	509.55	82.18	High Spirit[b]	94.1	570.88	99.01
Mine[a]	81.7	501.24	84.86	Glad[b]	94.0	530.34	95.04

[a]Word selected for the target category

[b]Word selected for the opposing category

[c]Words were different in the Portuguese language, but there is no translation for them in English and they are equivalent in meaning to "so-and-so"

[d]Words were different in the Portuguese language, but there is no translation for them in English and they are equivalent in meaning to "me"

how strongly the participants believed that good things would happen in their future (0 = I do not believe that good things will happen in my life, 100 = good things will definitely happen in my life). They were also asked if they had trouble holding back tears at some point in the previous week (yes and no), came to think that life was not worth living at some point in the previous week (yes and no), and if they felt so helpless they could not leave the house the day before (yes and no). More general criterion questions were also asked, including how many friends they have (0 to 100 or more), how many people (friends, family, etc.) they believed they could count on (0 to 100 or more), and how many times (approximately) they had unprotected sex in the last month (0 to 100 or more). Additionally, control questions were asked to guarantee that the participants were not answering the scales randomly. These questions asked the participants to mark a specific response option (e.g., "This is a control question. Please mark number four").

Implicit Measure of the Depressive Trait

The words that were selected in study 1 were introduced in a computerized version of the IAT that was built and applied using Inquisit software (Draine, 2001). We

chose a seven-block structure for the measurement, with three blocks having the training function (single categorization sessions) and the other four blocks having the test function (double categorization sessions). The participants first provided their names and surnames so that these words appeared as stimuli that were representative of the Me category. They were then informed about which words belonged to each target category (Me and Other) and each attribute category (Depression and Cheerfulness) and how they should proceed to answer the test. The participants' task was to associate the words that appeared in the center of the screen with the correct categories as quickly as possible and make as few mistakes as possible. When the word referred to a category that was shown in the upper left corner of the screen (e.g., Me or Depression), the participant should press the "E" key. If the word belonged to a category that was shown in the upper right corner, then the participant should press the "I" key (e.g., Other or Cheerfulness). The words appeared in random order in both the training blocks and test blocks. In blocks 3 and 6, each word appeared only once for the participant (one trial). In blocks 4 and 7, each word appeared twice (two trials). Adjectives with different forms for women and men (i.e., a common feature of the Portuguese language) were inflected according to the participant's gender to avoid bias (Natividade et al., 2012). All of the participants completed the seven blocks in the same order. The order, categories, and number of trials of the blocks are presented in Table 2.

Factorial Battery of Personality (FBP; Nunes et al., 2010*)*

This instrument measures the five personality factors and their 17 facets: extraversion (communication, self-confidence, dynamism, social interactions), agreeableness (kindness, pro-sociability, trust in people), conscientiousness (competence, cautiousness/prudence, endeavor/commitment), neuroticism (vulnerability, emotional instability, passivity, depression), and openness to experience (openness to ideas, liberalism, search for novelties). This is a personality test that was built specifically for Brazil. It has 126 items in the form of statements, and the participants should estimate the extent to which they agree with each of them on a 7-point scale. Examples of the items are as follows: "I'm tired of living" and "I'm an irritable person." The alpha coefficients that were reported in the original study ranged from 0.74 to 0.89. In the present study, the

Table 2 Sequences of blocks and trials of the implicit measure of depressive trait

Block	Number of trials	Function	Categories on the left	Categories on the right
1	20	Training	Me	Other
2	20	Training	Depression	Cheerfulness
3	32	Test	Me and Depression	Other and Cheerfulness
4	64	Test	Me and Depression	Other and Cheerfulness
5	20	Training	Other	Me
6	32	Test	Other and Depression	Me and Cheerfulness
7	64	Test	Other and Depression	Me and Cheerfulness

alpha coefficients were 0.92 for extroversion, 0.81 for agreeableness, 0.82 for conscientiousness, 0.91 for neuroticism, and 0.79 for openness.

Reduced Scale of Personality Descriptors (RED5;* Natividade & Hutz, 2015*)

This measure assesses the five personality factors through 20 items in the form of adjectives or short expressions, such as "anxious," "calm," and "open to new experiences." Each personality factor consists of four items. Participants must judge how adequately each adjective or expression describes them on a 7-point scale. The alpha coefficients that were reported in the original study ranged from 0.59 to 0.84. In the present study, the alpha coefficients were 0.88 for extroversion, 0.79 for agreeableness, 0.78 for conscientiousness, 0.75 for neuroticism, and 0.58 for openness.

Rosenberg's Self-Esteem Scale (*Hutz & Zanon, 2011*; Brazilian version of Rosenberg's Original Scale, 1965)

This single-factor scale measures self-esteem through 10 items in the form of statements. Participants are asked to state how much they agree with each of the items on a 4-point scale. The alpha coefficient that was reported in Hutz & Zanon (2011) was 0.90. In the present study, the alpha coefficient was 0.88.

Life Satisfaction Scale (LSS;* Hutz et al., 2014*; Brazilian version of the Original Scale by* Diener et al., 1985*)

This instrument assesses the cognitive component of subjective well-being through five items, explained by a single factor. The items are answered on a 7-point scale. Participants must indicate how strongly they agree with each item. The alpha coefficient was not reported in Hutz et al. (2014). In the present study, the alpha coefficient was 0.82.

Positive and Negative Affect Schedule (PANAS;* Zanon & Hutz, 2014*; Brazilian Version of the Scale by* Watson et al., 1988*)

This scale assesses the affective dimensions (positive affect and negative affect) of subjective well-being. Each factor is composed of 10 items that are presented in the form of adjectives and represent emotions that are commonly experienced by people. The items are answered on a 5-point scale. Participants must indicate how strongly the adjectives describe the way they have been feeling lately. The alpha coefficients were not reported in Zanon & Hutz (2014). In the present study, the alpha coefficient was 0.87 for positive affect and 0.89 for negative affect.

Procedures

Data Collection

The data collection procedures were identical to study 1, with the exception that we invited the participants to return to the laboratory after 30 days for a second wave of data collection. Of the initial participants, 34 returned to the laboratory and responded again to the implicit measure of the depressive trait. Informed consent was obtained from all individual participants included in the study.

Analyses

Participants who answered the control questions incorrectly, had an accuracy rate of less than 70% on the IAT, and emitted more than 10% of responses with a time lapse of less than 300 ms were excluded from the analyses (Greenwald et al., 2003; Grumm & von Collani, 2007). Overall, we excluded six participants and ran the analyses with $N = 98$. The logarithmic transformation of response times was then performed according to standard procedures in the literature (Schmukle et al., 2008). For the calculation of IAT items, words from the Depression and Cheerfulness categories were transformed into pairs (e.g., negative and positive) by considering the best matches with regard to opposite content in the Portuguese language and according to the procedure that was suggested in previous studies (Grumm & von Collani, 2007; Schmukle et al., 2008). The value of the item consisted of subtracting the average response time of each pair in the congruent blocks (6 and 7) from the average response time of that same pair in the incongruous blocks (3 and 4). Thus, for each word pair, the participants had an association score, which was used as the item's value.

To test the structure of the measure, an exploratory factor analysis (EFA) was performed using the principal axis method. We also tested three models using CFA with a robust maximum likelihood estimator. In model 1, we specified only one factor to explain all items from the explicit facet of depression (from the FBP) and implicit depression. In model 2, we specified two correlated factors to explain explicit and implicit corresponding items. Model 3 was specified with one second-order factor to explain both explicit and implicit factors of the depressive personality trait. We used R software (R Development Core Team, 2012) and the Lavaan statistical package (Rosseel, 2012) for these analyses. The reliability indices of the measurements were obtained by calculating the alpha, omega, and Pearson correlation coefficients between the two moments of the test application. To obtain an average association for each participant, the IAT effect (D score) was calculated according to the procedure that was suggested by Greenwald et al. (2003). Finally, Pearson's correlation coefficients were calculated, and Student's *t*-tests were performed to obtain evidence of validity based on relationships with other variables. These analyses were conducted using jamovi 1.0 software (The jamovi project, 2019). The data are available for download at the same link that is provided in study 1.

Results

Structure and Accuracy

The procedure for calculating the items that are described above resulted in a set of eight pairs of words, which underwent a factor analysis with principal axis and oblimin rotation methods. Initially, the adequacy of data for factoring was found, $KMO = 0.81$; Bartlett's sphericity test: $\chi^2(28, N = 98) = 127$, $p < 0.001$. A parallel analysis of random eigenvalues, with 500 bootstrap samples, showed that the last observed eigenvalue that was greater than the simulated one was for factor I (factor I: observed eigenvalue = 2.17, simulated eigenvalue = 0.54; factor II: observed eigenvalue = 0.27, simulated eigenvalue = 0.35). This factor explained 27.4% of the data variance. The scree plot also showed the emergence of a single factor. Considering these results, the extraction of a single factor was considered adequate. The data adequacy indices for the single factor model were also satisfactory (Brown, 2006), $\chi^2(20, N = 98) = 15.5$, $p = 0.75$; $\chi^2/df = 0.77$; Tucker–Lewis index (TLI) = 1.07, root mean square error of approximation (RMSEA) = 0.00 [90% confidence interval = 0.00–0.06); standardized root mean square residual (SRMR) = 0.07. The items, their respective factor loadings, and communalities are presented in Table 3.

We also tested three models through confirmatory factor analysis (CFA). The results showed that the model with two correlated factors was the best solution for the data compared with a single factor model and a second-order factor model. The correlation between the latent implicit depression trait and latent explicit depression trait was 0.50. The adjustment indices for all the models are shown in Table 4. With regard to the reliability indicators for the implicit measure, the alpha and omega coefficients were 0.75. Additionally, the Pearson correlation coefficient that was obtained between the two moments of application of the implicit measure (30-day interval) was 0.62 ($p < 0.001$).

Table 3 Factor loadings and communalities of the items from a principal axis factoring analysis

Items	Factor Loadings	h^2
Negativist/Positive	.61	.37
Disillusioned/Radiant	.59	.35
Pessimist/Jovial	.56	.32
Crestfallen/High Spirit	.50	.26
Hopeless/Smiling	.50	.25
Sad/Joyful	.49	.24
Depressive/Glad	.47	.23
Depressed/Happy	.45	.20
Eigenvalue	2.15	
% of explained variance	27.4	
Alpha coefficient	.75	
Omega coefficient	.75	
Test–retest coefficient[a]	.62	

[a]Approximately 30 days between test–retest, $n = 34$. $N = 98$

Table 4 Adjustment coefficients of the models tested from confirmatory factor analyses with robust maximum likelihood estimator

	Single-factor	Two-factor	Second-order factor
χ^2	180.5	113.2	112.1
Df	104	103	102
P	< .001	.23	.23
χ^2/df	1.73	1.10	1.10
CFI	0.80	0.97	0.97
TLI	0.77	0.97	0.97
GFI	0.77	0.87	0.87
RMSEA	0.087	0.032	0.032
CI 90% RMSEA	0.067–0.111	0.000–0.063	0.000–0.063
AIC	1427.3	1355.6	1357.6

Single-factor means model specified with a single factor explaining all of the depression personality facet items. Two-factor means model specified with two correlated factors, one explaining implicit depression items, and the other explicit depression items. Second-order factor means model specified with one second-order factor explaining both explicit and implicit factors of depressive personality facet. $N = 98$

χ^2, chi-square; *df*, degrees of freedom; χ^2/df, chi-square/degrees of freedom ratio; *CFI*, robust comparative fit index; *TLI*, robust Tucker–Lewis index; *GFI*, goodness-of-fit index; *RMSEA*, robust root mean square error of approximation; *CI 90% RMSEA*, 90% confidence interval; *AIC*, robust Akaike information criterion

Relationships with Other Variables

To search for more evidence of validity, Pearson correlations between the constructed measure and other variables were calculated. Table 5 shows correlations between the implicit depressive trait (IAT), the five personality factors that were assessed with an extensive contextualized-statements test (FBP) and a reduced-adjective measure (RED5), the dimensions of subjective well-being and self-esteem, and the behavioral criterion questions. Implicit depression positively correlated with the Neuroticism factor (RED5) and negatively correlated with satisfaction with life, self-esteem, and positive expectations for the future.

Table 6 shows correlations between the constructed measure and facets of the FBP. Negative correlations were found between implicit depression and communication (FBP), self-confidence (FBP), dynamism (FBP), and trust in people (FBP) facets, and a positive correlation was found between implicit depression and depression facet (FBP).

Finally, differences between groups in levels of the implicit and explicit depressive trait were tested. No significant difference was found between men ($n = 37$) and women ($n = 61$) in levels of implicit depression, $t(96) = -0.55$, $p = 0.58$, $d = 0.10$, Hedge's $g = 0.10$). This result was also found for levels of explicit depression, $t(96) = 0.84$, $p = 0.40$, $d = 0.16$, Hedge's $g = 0.16$. Participants who declared that they had not been able to stop crying at some point in the previous week had higher levels of implicit depression ($n = 49$, $M = -0.42$, $SD = 0.37$) compared with

Table 5 Pearson correlation coefficients between implicit depression (IAT), personality (FBP and RED5), subjective well-being, self-esteem, and criterion questions

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Implicit depression (IAT)	−0.50	0.38	(.75)																	
2. Neuroticism (FBP)	3.67	1.04	.19	(.91)																
3. Extroversion (FBP)	4.04	0.98	−.25*	−.22*	(.92)															
4. Agreeableness (FBP)	5.34	0.56	−.05	−.27**	.06	(.81)														
5. Conscientiousness (FBP)	4.76	0.66	.02	−.36**	.11	.13	(.82)													
6. Openness (FBP)	5.12	0.71	−.001	.003	.48**	.01	.01	(.79)												
7. Extroversion (RED5)	4.47	1.46	−.18	−.20*	.82**	.09	.02	.39**	(.88)											
8. Agreeableness (RED5)	5.85	0.86	−.07	−.27**	.48**	.34**	.21*	.31**	.49**	(.79)										
9. Neuroticism (RED5)	3.82	1.15	.26**	.62**	.04	−.22**	−.21*	−.07	.02	−.20*	(.75)									
10. Conscientiousness (RED5)	4.92	1.18	−.03	−.38**	−.09	.26**	.51**	−.13	−.03	.16	−.31**	(.74)								

Table 5 (continued)

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
11. Openness (RED5)	5.11	0.90	−.04	−.06	.46**	.08	−.11	.63**	.44**	.22*	−.05	−.05	(.58)							
12. Life satisfaction	4.48	1.50	−.28**	−.49**	.43**	.23*	.37**	−.004	.24*	.22*	−.24*	.23*	.06	(.82)						
13. Positive affect	3.29	0.82	−.19	−.50**	.56**	.12	.41**	.23*	.39**	.30**	−.27**	.18	.24*	.56**	(.87)					
14. Negative affect	2.30	0.79	.19	.66**	.06	−.19	−.18	.03	.01	−.09	.64**	−.37**	−.02	−.38**	−.20*	(.89)				
15. Self-esteem	2.92	0.64	−.34**	−.77**	.38**	.20*	.40**	.13	.25*	.28**	−.57**	.22*	.13	.63**	.65**	−.57**	(.88)			
16. CQ1	74.6	25.3	−.34**	−.54**	.38**	.27**	.30**	.12	.26**	.17	−.36**	.15	.17	.57**	.68**	−.45**	.71**	-		
17. CQ2	9.05	7.55	−.10	−.16	.12	.02	.03	.17	.10	.31*	−.20	.21*	.01	−.12	−.02	−.12	.06	.04	-	
18. CQ3	9.59	12.2	−.04	−.19	.02	.07	.13	−.08	−.07	.13	−.21*	.15	−.02	.22*	.10	−.17	.17	.28*	.24*	-
19. CQ4	3.23	14.2	.15	−.09	.01	.21*	.01	−.11	−.07	.10	.12	.01	−.02	.07	.11	.03	.002	−.05	.11	−.01

CQ1 = Regarding your future, how much do you believe that good things will happen? CQ2 = How many close friends do you have? CQ3 = Regarding the people who are part of your life (friends, family, etc.), how many of them do you believe you can really count on? CQ4 = In the last month, how many times, approximately, have you had unprotected sex? Alpha coefficients of the scales are in the main diagonal, within parentheses. $N = 98$

* $p < .05$

** $p < .01$

Table 6 Pearson correlation coefficients between implicit depression (IAT) and FBP facets

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Implicit depression (IAT)	− 0.50	0.38	(.75)																	
2. N1 – vulnerability	4.06	1.23	.13	(.82)																
3. N2 – emotional instability	3.72	1.47	.03	.50**	(.84)															
4. N3 – passivity	4.26	1.30	.07	.60**	.50**	(.79)														
5. N4 – depression	2.75	1.23	.33**	.60**	.40**	.49**	(.79)													
6. E1 – communication	3.94	1.31	− .21*	− .45**	− .02	− .24*	− .31**	(.84)												
7. E2 – self-confidence	3.38	1.14	− .23*	− .13	.28**	.24*	− .06	.58**	(.75)											
8. E3 – dynamism	4.42	1.14	− .22*	− .48**	− .15	− .33**	− .57**	.64**	.41**	(.70)										
9. E4 – social interactions	4.52	1.22	− .17	− .12	.20*	.06	− .26**	.56**	.57**	.49**	(.82)									
10. A1 – kindness	5.68	0.67	.09	.10	.19	− .02	− .14	.14	.08	.23*	.41**	(.80)								

Table 6 (continued)

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
11. A2 – pro-sociability	5.46	0.92	.02	.03	−.13	−.22*	−.19	−.22*	−.33**	−.07	−.25*	.16	(.72)							
12. A3 – trust in people	4.71	0.98	−.22*	−.32**	−.36**	−.26*	−.46**	.14	−.04	.15	.14	.15	.24*	(.76)						
13. C1 – competence	4.68	0.84	−.07	−.42**	−.24**	−.46**	−.51**	.28**	.17	.52**	.17	.06	−.001	.11	(.82)					
14. C2 – cautiousness/ prudence	5.10	1.17	.16	.13	−.27**	−.01	.12	−.26*	−.32**	−.14	−.34**	.09	.17	−.01	−.23*	(.62)				
15. C3 – endeavor/ commitment	4.69	1.06	.01	.03	−.01	−.23*	−.16	.04	−.02	.21*	−.03	.12	.18	−.13	.43**	.11	(.71)			
16. O1 – openness to ideas	5.25	0.98	−.08	−.20*	−.05	−.05	−.15	.35**	.30**	.32**	.38**	.18	−.26**	.13	.09	−.09	−.001	(.75)		
17. O2 – liberalism	5.53	0.87	.08	.14	.21*	.11	.09	.14	.17	.06	.29**	.36**	−.27**	−.04	−.01	.001	.06	.36**	(.59)	
18. O3 – search for novelties	4.43	1.17	.03	−.09	.11	.20*	.06	.26	.28**	.21*	.37**	.22*	−.30**	−.05	−.01	.03	−.09	.19	.22*	(.65)

Alpha coefficients of the scales are in main diagonal, within parentheses. $N = 98$

N, neuroticism Factor; *E*, extroversion factor; *A*, agreeableness factor; *C*, conscientiousness factor; *O*, openness factor

*$p < .05$

**$p < .01$

those who claimed not to have had this experience ($n=49$, $M=-0.58$, $SD=0.37$), $t(96)=2.13$, $p=0.03$, $d=0.43$, Hedge's $g=0.43$. However, no difference in levels of explicit depression was found between these two groups, $t(96)=1.05$, $p=0.30$, $d=0.21$, Hedge's $g=0.21$.

Moreover, participants who claimed they felt so helpless they could not leave the house the day before had higher levels of explicit depression ($n=26$, $M=3.53$, $SD=1.27$) compared with those who did not say so ($n=72$, $M=2.46$, $SD=1.09$), $t(96)=4.10$, $p<0.001$, $d=0.90$, Hedge's $g=0.94$. Participants who said they thought life was not worth living ($n=25$, $M=3.95$, $SD=1.12$) at some point in the previous week had higher levels of explicit depression compared with those who did not have this thought ($n=73$, $M=2.33$, $SD=0.97$), $t(96)=6.90$, $p<0.001$, $d=1.54$, Hedge's $g=1.60$. However, there were no differences between these groups in levels of implicit depression, with regard to both feeling helpless to leave the house, $t(96)=0.99$, $p=0.32$, $d=0.23$, Hedge's $g=0.24$, and having thought that life was not worth living, $t(96)=1.99$, $p=0.05$, $d=0.42$, Hedge's $g=0.45$. For this last result, it is worth noting that we found a moderate effect size ($d=0.42$; Hedge's $g=0.45$) with a 0.05 p-value. Thus, although it did not achieve statistical significance, reporting differences between groups might allow further attention to this behavioral question. As expected, people who endorsed having though that life was not worth living had higher level of implicit depression ($n=25$, $M=-0.38$, $SD=0.46$) compared to those who declared not having this thought ($n=73$, $M=-0.55$, $SD=0.34$).

General Discussion

The main goal of the present study was to build an implicit measure to assess the depressive trait and search for evidence of its validity. The starting point was the definition of the construct, and a list of words that represented four categories was generated: Me, Other, Depression, and Cheerfulness. The adequacy of the items for these categories was judged by three researchers who were experts on the construct and using a computerized task. This procedure sought to ensure that the chosen words, in addition to adequately representing the construct, were easily identifiable as belonging to their respective category by the target population of the test. This task was developed based on previous studies that highlighted the need for more robust procedures to select the items that comprise IATs (De Cuyper et al., 2017). We believe that this was an innovative proposal in implicit measurement because previous studies selected items with no empirical procedures (e.g., Glashouwer & De Jong, 2010) or using self-report methods (e.g., Costantini et al., 2015).

The advantage of this procedure for selecting items compared with strategies that were used in previous studies is that it minimizes a possible source of error variance in scores that are obtained through implicit instruments. Like any psychological measure, the score that is generated by the IAT not only is related to the respondents' latent trait level but also carries associated errors (Gawronski, 2019). Some errors are random and cannot be predicted or controlled; others, however, can be identified and corrected. The item selection procedure that was developed in the present study provides an additional guarantee that respondents

strongly associate the chosen words with their respective categories. In practical terms, this can prevent the participant, when answering the test, from getting confused about the appropriate category with which to associate a word. An implicit measure whose items are not strongly associated with categories by the target population of the test may require additional effort by participants to associate the words with the correct categories. This effort, therefore, may cause part of the observed score not to be related to the individual's latent trait level but rather to be related to the time the participant takes to remember that an item belongs to a certain category. In this sense, although eliminating errors that are associated with psychological measures is not possible, selecting items that are strongly associated with categories can help increase the accuracy of implicit measures. Future studies, however, may improve this procedure by controlling possible confounding effects of stimulus selection, such as word length or familiarity.

In a second step, an IAT was created with categories and words that were previously selected. The instrument then underwent empirical testing so that more evidence of validity could be sought, and reliability indicators were obtained. The EFA revealed a single factor structure for the measurement, which was congruent with the definition of the construct, which conceives it as one of the subfactors of neuroticism (Costa & McCrae, 2007; Nunes et al., 2010; Soto & John, 2017). This result indicates that the measure that was built presented evidence of validity based on the internal structure. The CFA also revealed that implicit and explicit depression items were explained by distinct but correlated factors, reinforcing the idea that implicit and explicit measures might assess distinct but correlated constructs (Nosek & Smyth, 2007), although structural misfit between measures can also explain the size of the correlation (0.50) and the emergence of independent latent factors (see Payne et al., 2008).

Additionally, the instrument's accuracy was tested using alpha, omega, and test–retest coefficients. The alpha and omega coefficients were higher than 0.70, indicating satisfactory internal consistency (Nunnally, 1978). The test–retest correlation coefficient, however, was 0.62, which was slightly below the recommended value. Even if this value was found to be higher than those that were obtained in other studies that built implicit personality tests (De Cuyper et al., 2017), a value that is considered adequate, according to psychometric manuals, would be greater than 0.70 (Nunnally, 1978; Pasquali, 2011).

Previous studies found the same pattern of results with regard to the reliability of implicit measures (i.e., levels of internal consistency that were comparable to explicit measures) but lower temporal stability (De Cuyper et al., 2017). Some critics relied on these results to argue that the scores that are obtained by implicit measures would be uninformative because they might indicate random values (e.g., Mitchell, 2018). Arguably, however, this would be a misinterpretation when considering the dual model of information processing (Gawronski, 2019). According to this model, implicit associations tend to be less (and not equally) stable over time compared with explicit associations because they vary depending on how much content is accessible in memory (Gawronski & Bodenhausen, 2011). Thus, low or moderate temporal stability would not pose a threat to the

accuracy of implicit instruments but would reveal that, given the way constructs are designed, lower test–retest correlations are expected (Gawronski, 2019).

In the specific case of personality, however, low temporal stability may represent a limitation of the use of implicit measures. This is because implicit associations are only a means of accessing the target construct and reflect different patterns of the way people tend to think, feel, and behave (traits). Although implicit associations have more variations over time than explicit associations, personality traits are expected to remain stable (Pervin, 1994). Thus, low or moderate temporal stability may indicate that implicit personality measures are highly susceptible to the influence of contextual variables, which is an undesirable characteristic in instruments that evaluate traits. Future studies may explore ways to increase the temporal stability of the measure that is constructed (e.g., by testing the influence of contextual cues on the test–retest correlation coefficient; Gschwendner et al., 2008).

Relationships between the constructed measure and other variables were also tested to search for more evidence of validity. As expected, levels of the implicit depressive trait positively correlated with the depression facet (FBP) and neuroticism factor (RED5). Once again and in the expected direction, negative correlations were found between implicit depression and life satisfaction and between implicit depression and self-esteem. These relationships are important evidence of the validity of the constructed measure because, according to previous studies, depressive people tend to evaluate themselves negatively with regard to both their own self and to the living conditions they believe they have (Klein et al., 2011; Quevedo & Abella, 2011). One caveat must be made, however, about the relationships that were found between the constructed measure and self-esteem. Although the strength of the correlation was only moderate, it proved to be superior compared with correlations that were obtained between the implicit measure and explicit measures of personality. Other studies should further investigate whether an affective load is assigned to items of the measure that is constructed in this research (Grumm & von Collani, 2007).

Additionally, a negative correlation was found between implicit depression and how strongly people believed that good things would happen in their future lives. This result was expected when considering that high hopelessness about the future is one of the main characteristics of people with high levels of the depressive trait according to the definition of the construct (Nunes et al., 2010). In contrast, some expected relationships were not found. For example, no significant correlation was found between the constructed measure and FBP neuroticism factor or affective dimensions of subjective well-being. There are several reasons for weak or nonsignificant correlations between implicit and explicit tests, which do not necessarily concern the validity of the tests (Hofmann et al., 2005). Some of these reasons imply that these measures would evaluate different mental processes, whereas others emphasize methodological issues (Fazio & Olson, 2003; Gawronski, 2019).

In the present study, the lack of conceptual convergence between personality measures may have been the main reason for weak or, in the case of the neuroticism (FBP) factor, nonsignificant correlations. The measure that was constructed in the present study assesses personality through adjectives that represent categories, whereas the FBP uses affirmatives. This may represent a possible source of

conceptual divergence between the two measures. Additionally, the IAT structure itself may have contributed to dissonant results between implicit and explicit measures. Using the IAT that was built in the present study, it is not possible to know how strongly respondents associate the depressive trait with themselves individually; instead, it only allows comparisons with a nonspecific "other" (Karpinski, 2004). Self-report instruments, in contrast, seek to assess how strongly someone associates a certain characteristic with himself, regardless of how firmly he believes that another person has that characteristic. Future studies should explore other types of implicit (e.g., single-category IAT; Karpinski & Steinman, 2006) and explicit (e.g., semantic differential) measures of the depressive trait by expanding conceptual convergence between the two forms of measurement.

Finally, differences between groups in levels of explicit and implicit depression were tested. Compared with the implicit measure, the explicit measure of the depressive trait generally proved to more efficiently discriminate groups in the expected direction. The opposite was observed only for one of the behavioral criterion questions, more specifically with regard to the participant not having been able to stop crying at some point in the previous week. Participants who avowed this weakness had higher levels of implicit but not explicit depression. This behavioral criterion question was elaborated to assess an automatic behavior because it refers to non-verbal and uncontrollable behavior. Consistent with results from previous studies, this result reinforces the idea that implicit measures would more efficiently predict automatic behaviors (e.g., Back et al., 2009; Steffens & Schulze-König, 2006). Future studies should replicate this finding and elaborate more complex research designs to differentiate automatic and deliberate behaviors, preferably using behavioral observation. Also, we recommend further attention to the behavioral question related to having thought that life was not worth living. Despite the difference in implicit depression did not achieve statistical significance (p-value was not inferior to 0.05, but equal to this value), people who endorsed this item had higher implicit depression than people who did not with a moderate effect size ($d = 0.42$). Future studies may clarify the importance of this behavior in the context of implicit depression by testing the difference between groups in a larger sample.

The present results substantiate findings in the literature on implicit measures that less efficiently predict behaviors, even those that are obtained through self-report methods, that are considered typical of the target construct (Costantini et al., 2015; Schmukle et al., 2008). Notably, however, this issue is part of a broader debate, and these results do not necessarily indicate problems of validity of the tests but may indicate methodological flaws (Gawronski, 2019). To organize knowledge that has been accumulated about implicit measurement to date, Gawronski (2019) showed that studies have failed to consider moderators of relationships between implicit associations and behaviors. According to this author, there is no consistent theoretical support for expecting unconditional relationships between implicit tests and behavioral outcomes. Limitations of this research include the absence of moderation analyses and the retrospective measurement of behaviors, which is subject to distortions that result from memory failures.

Another possible explanation for relationships that were not found concerns the sample size. Current guidelines in psychology have emphasized the

importance of adopting good research practices to avoid false-positive and false-negative results, including the selection of sufficiently large samples. A previous sample calculation for all analyses (not only for EFA) and the inclusion of more participants could have increased the statistical power of this study while minimizing possible inferential errors. In addition to the sample size, the characteristics of the participants were not very representative of the Brazilian population. The sample was mostly composed of undergraduate students from only one university. Other studies should endeavor to find evidence of validity in larger and more diverse samples.

Compared with previous studies, the measure that was built in this study has several strengths. We sought to assess depression that is conceived as a trait rather than a mood state (Glashouwer & De Jong, 2010; Meites et al., 2008). The depressive trait is well known to be a relevant predictor of mental disorders (Klein et al., 2011). Thus, this measure can be used not only in test batteries to evaluate clinical conditions of depression but also in a preventive manner by identifying people whose personality amplifies the risks of mental disorders. The measure that is presented herein also has the advantage of assessing personality more narrowly, which can increase its predictive power toward behavior (De Cuyper et al., 2017), compared with single IATs that are designed to assess the major factors of personality (e.g., Grumm & von Collani, 2007; Schmukle et al., 2008). We also tested the measure's structure through factor analysis and obtained a temporal stability coefficient, an analysis that has rarely been performed previously in studies of implicit depression (e.g., Dentale et al., 2016; Glashouwer & De Jong, 2010; Meites et al., 2008).

The measure that was constructed in the present study provided satisfactory evidence of validity and reliability. We found a structure that aligned with the definition of the construct, had some expected relationships with other variables, and had adequate reliability indices. Although the test–retest correlation coefficient was slightly below an ideal value, the obtained value was higher than the values that were reported in previous studies (De Cuyper et al., 2017). This result may have been mainly a consequence of the empirical procedure that was designed to select items, which sought to reduce measurement errors that are caused by weak associations between items and categories that comprise the implicit tests. Future studies should expand the evidence of validity that was found in the present study by testing moderating roles of other variables in relationships between the constructed measure and behaviors (Garownski, 2019). The accumulation of more evidence of validity may indicate that the constructed measure can be a reliable tool in both research and applied contexts. In clinical and organizational contexts, for example, the possibility of measuring the depressive trait allows predictions of the risk of the onset of mental disorders and professional performance (Klein et al., 2011; Slaughter & Kausel, 2009). The use of an implicit measure can capture more spontaneous responses and be less prone to distortions, even when people are highly motivated to build a favorable image of themselves. For this purpose, however, more evidence of validity and reliability is needed, especially regarding the power of the measure to predict life outcomes and produce consistent results over time.

Author Contribution Nathalia Melo de Carvalho: conceptualization, methodology, software configuration, data collection, data analysis, writing – original draft. Rafael Valdece Souza Bastos: software configuration, data analysis, data collection. Jean Carlos Natividade: conceptualization, methodology, software configuration, data collection, data analysis, writing – review and editing, supervision, funding acquisition.

Funding This work was supported by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq); the Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ); and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

Data Availability The study was not preregistered. The data of this research are available at the Open Science Framework (https://osf.io/7nre6/).

Declarations

Ethics Approval and Consent to Participate The data collection for this research was approved by the Human Research Ethics Committee of the Federal University of Rio Grande do Sul (UFRGS) under protocol number 712724. All procedures met the recommendations of Resolution 466/2012 of the National Health Council (Brazil), which deals with the ethical aspects of research with human beings.

Conflict of Interest The authors declare no competing interests.

References

Ashton, M. C., Lee, K., Perugini, M., Szarota, P., De Vries, R. E., Di Blass, L., et al. (2004). A six-factor structure of personality descriptive adjectives: Solutions from psycholexical studies in seven languages. *Journal of Personality and Social Psychology, 86*, 356–366. https://doi.org/10.1037/0022-3514.86.2.356

Back, M. D., Schmukle, S. C., & Egloff, B. (2009). Predicting actual behavior from the explicit and implicit self-concept of personality. *Journal of Personality and Social Psychology, 97*, 533–548. https://doi.org/10.1037/a0016229

Barenbaum, N. B., & Winter, D. G. (2010). History of modern personality theory and research. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 114–158). Guilford Press.

Benet, V., & Waller, N. G. (1995). The Big Seven factor model of personality description: Evidence for its cross-cultural generality in a Spanish sample. *Journal of Personality and Social Psychology, 69*, 701–718. https://doi.org/10.1037/0022-3514.69.4.701

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford.

Costa, P. T., & McCrae, R. R. (2007). *NEO PI-R: Inventário de personalidade NEO revisado e inventário de cinco fatores NEO revisado NEO-FFI-R [Versão curta]* [NEO PI-R: Revised NEO personality inventory and NEO revised five factor inventory NEO-FFI-R (Short version)]. São Paulo: Vetor Editora Psico-Pedagócica.

Costantini, G., Richetin, J., Borsboom, D., Fried, E. I., Rhemtulla, M., & Perugini, M. (2015). Development of indirect measures of conscientiousness: Combining a facets approach and network analysis. *European Journal of Personality, 29*, 548–567. https://doi.org/10.1002/per.2014*

Corneille, O., & Hütter, M. (2020). Implicit? What do you mean? A comprehensive review of the delusive implicitness construct in attitude research. *Personality and Social Psychology Review, 24*, 212–232. https://doi.org/10.1177/1088868320911325

De Cuyper, K., De Houwer, J., Vansteelandt, K., Perugini, M., Pieters, G., Claes, L., & Hermans, D. (2017). Using indirect measurement tasks to assess the self-concept of personality: A systematic review and meta-analyses. *European Journal of Personality, 31*(1), 8–41. https://doi.org/10.1002/per.2092

De Houwer, J., & Moors, A. (2010). Implicit measures: Similarities and differences. In B. Gawronski & B. K. Payne (Eds.), *Handbook of implicit social cognition: Measurement, theory, and applications* (pp. 176–193). Guilford Press.

Dentale, F., Grano, C., Muzi, M., Pompili, M., Erbuto, D., & Violani, C. (2016). Measuring the automatic negative self-schema: New evidence for the construct and criterion validity of the Depression Implicit Association. *Self and Identity, 15*(5), 599–613. https://doi.org/10.1080/15298868.2016.1179218

Diener, E., Emmons, R., Larsen, R., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*, 91–95. https://doi.org/10.1207/s15327752jpa4901_13

Draine, S. C. (2001). *Inquisit: Version 1.32*. Seattle, WA: Millisecond Software.

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and uses. *Annual Review of Psychology, 54*, 297–327. https://doi.org/10.1146/annurev.psych.54.101601.145225

Gawronski, B. (2019). Six lessons for a cogent science of implicit bias and its criticism. *Perspectives on Psychological Science, 14*(4), 574–595. https://doi.org/10.1177/1745691619826015

Gawronski, B., & Bodenhausen, G. V. (2011). The associative-propositional evaluation model: Theory, evidence, and open questions. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 44, pp. 59–127). Academic Press.

Glashouwer, K. A., & De Jong, P. J. (2010). Disorder-specific automatic self-associations in depression and anxiety: Results of The Netherlands study of depression and anxiety. *Psychological Medicine, 40*, 1101–1111. https://doi.org/10.1017/S0033291709991371

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment, 4*(1), 26–42. https://doi.org/10.1037/1040-3590.4.1.26

Goldberg, L. R. (1999). A broad-bandwidth, public-domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality Psychology in Europe* (Vol. 7, pp. 7–28). Tilburg University Press.

Greenwald, A. G., & Farnham, S. D. (2000). Using the Implicit Association Test to measure self-esteem and self-concept. *Journal of Personality and Social Psychology, 79*, 1022–1038. https://doi.org/10.1037/KK122-3514.79.6.10?2

Greenwald, A. G., Banaji, M. R., Rudman, L. A., Farnham, S. D., Nosek, B. A., & Mellot, D. S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review, 109*, 3–25. https://doi.org/10.1037//0033-295X.109.1.3

Greenwald, A. G., McGhee, D. E., & Schwartz, J. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality & Social Psychology., 74*, 1464–1480. 0022-3514/98/$3.00.

Greenwald, A. G., Nosek, B., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality & Social Psychology, 85*, 197–216. https://doi.org/10.1037/0022-3514.85.2.197

Gregory, R. J. (2014). The history of psychological testing. In R. J. Gregory (Ed.), *Psychological testing: History, principles, and applications* (7th ed., pp. 1–28). Upper Saddle River, NJ: Pearson.

Grumm, M., & von Collani, G. (2007). Measuring Big-Five personality dimensions with the implicit association test: Implicit personality traits or self-esteem? *Personality and Individual Differences, 43*, 2205–2217. https://doi.org/10.1016/j.paid.2007.06.032

Gschwendner, T., Hofmann, W., & Schmitt, M. (2008). Differential stability. The effects of acute and chronic construct accessibility on the temporal stability of the Implicit Association Test. *Journal of Individual Differences, 29*, 70–79. https://doi.org/10.1027/1614-0001.29.2.70

Hepper, E. G., Gramzow, R., & Sedikides, C. (2010). Individual differences in selfenhancement and self-protection strategies: An integrative analysis. *Journal of Personality, 78*, 781–814. https://doi.org/10.1111/j.1467-6494.2010.00633.x

Hofmann, W., Gawronski, B., Gschwendner, T., Le, H., & Schmitt, M. (2005). A meta-analysis on the correlation between the Implicit Association Test and explicit self-report measures. *Personality and Social Psychology Bulletin, 31*, 1369–1385. https://doi.org/10.1177/0146167205275613

Horn, J. L. (1965). A rationale and test for estimating the number of factors in factor analysis. *Psychometrika, 30*(1), 179–185. https://doi.org/10.1007/BF02289447

Hofstee, W. K., De Raad, B., & Goldberg, L. R. (1992). Integration of the Big Five and circumplex approaches to trait structure. *Journal of Personality and Social Psychology, 63*, 146–163. https://doi.org/10.1037/0022-3514.63.1.146

Hutz, C. S., & Zanon, C. (2011). Revisão da adaptação, validação e normatização da escala de autoestima de Rosenberg [Revision of adaptation, validity and normatization of Rosenberg self-esteem scale]. *Avaliação Psicológica, 10*(1), 41–49.

Hutz, C. S., Nunes, C. H., Silveira, A. D., Serra, J., Anton, M., & Wieczorek, L. S. (1998). O desenvolvimento de marcadores para a avaliação da personalidade no modelo dos cinco grandes fatores [Development of markers to evaluate personality in the big five factor model]. *Psicologia: Reflexão e Crítica, 11*(2), 395–411. https://doi.org/10.1590/S0102-79721998000200015

Hutz, C. S., Zanon, C., & Bardagi, M. P. (2014). Satisfação de vida [Life satisfaction]. In C. S. Hutz (Org.), *Avaliação em Psicologia Positiva* (pp. 43–47). Porto Alegre, RS: Artmed.

IBM (2015). *IBM SPSS Statistics for Windows*, Version 23.0. Armonk, NY: IBM Corp.

John, O. P., Angleitner, A., & Ostendorf, F. (1988). The lexical approach to personality – A historical review of trait taxonomic research. *European Journal of Personality, 2*(3), 171–203. https://doi.org/10.1002/per.2410020302

John, O. P., Naumann, L. P., & Soto, C. J. (2010). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 114–158). Guilford Press.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*(1), 141–151. https://doi.org/10.1177/001316446002000116

Karpinski, A. (2004). Measuring self-esteem using the Implicit Association Test: The role of the other. *Personality and Social Psychology Bulletin, 30*, 22–34. https://doi.org/10.1177/0146167203258835

Karpinski, A., & Steinman, R. B. (2006). The single category Implicit Association Test as a measure of implicit social cognition. *Journal of Personality and Social Psychology, 91*, 16–32. https://doi.org/10.1037/0022-3514.91.1.16

Kim, H., Di Domenico, S. I., & Connelly, B. S. (2019). Self-other agreement in personality reports: A meta-analytic comparison of self- and informant-report means. *Psychological Science, 30*(1), 129–138. https://doi.org/10.1177/0956797618810000

Klein, D. N., Kotov, R., & Bufferd, S. J. (2011). Personality and depression: Explanatory models and review of the evidence. *Annual Review of Clinical Psychology, 7*, 269–295. https://doi.org/10.1146/annurev-clinpsy-032210-104540

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist, 64*, 241–256. https://doi.org/10.1037/a0015309

McCrae, R. R., Costa, P. T., Jr., Martin, T. A., Oryol, V. E., Rukavishnikov, A. A., Senin, I. G., et al. (2004). Consensual validation of personality traits across cultures. *Journal of Research in Personality, 38*, 179–201. https://doi.org/10.1016/S0092-6566(03)00056-4

Meissner, F., Grigutsch, L. A., Koranyi, N., Müller, F., & Rothermund, K. (2019). Predicting behavior with implicit measures: Disillusioning findings, reasonable explanations, and sophisticated solutions. *Frontiers in Psychology, 10*https://doi.org/10.3389/fpsyg.2019.02483

Meites, T. M., Deveney, C. M., Steele, K. T., Holmes, A. J., & Pizzagalli, D. A. (2008). Implicit depression and hopelessness in remitted depressed individuals. *Behaviour Research and Therapy, 46*, 1078–1084. https://doi.org/10.1016/j.brat.2008.05.008

Mitchell, G. (2018). An implicit bias primer. *Virginia Journal of Social Policy & the Law, 25*, 27–59.

Natividade, J. C., & Hutz, C. S. (2015). Escala reduzida de descritores dos cinco grandes fatores de personalidade: prós e contras [Reduced scale of descriptors of big five personality factors: Pros and cons]. *Psico (PUC-RS), 46*(1), 79–89. https://doi.org/10.15448/1980-8623.2015.1.16901

Natividade, J. C., Barros, M. C., & Hutz, C. S. (2012). Influência da flexão de gênero dos adjetivos em instrumentos psicológicos em português [Influence of gender flexion of adjectives on psychological instruments in portuguese]. *Avaliação Psicológica, 11*(2), 259–264.

Nosek, B. A., & Banaji, M. R. (2001). The Go/No-Go association task. *Social Cognition, 19*(6), 625–666. https://doi.org/10.1521/soco.19.6.625.20886

Nosek, B. A., & Smyth, F. L. (2007). A multitrait–multimethod validation of the Implicit Association Test: Implicit and explicit attitudes are related but distinct constructs. *Experimental Psychology, 54*, 14–29. https://doi.org/10.1027/1618-3169.54.1.14

Nunes, C. H. S. S., Hutz, C. S., & Nunes, M. F. O. (2010). *Bateria Fatorial de Personalidade (BFP): manual técnico* [Factorial battery of personality: Technical manual]. São Paulo: Casa do Psicólogo.

Nunnally, J. C. (1978). *Psychometric Theory* (2nd ed.). McGraw Hill.

Osborne, J. W., Costello, A. B., & Kellow, J. T. (2008). Best practices in exploratory factor analysis In J. Osborne (Ed) *Best practices in quantitative methods*. Los Angeles, Sage Publications.

Pasquali, L. (2011). *Psicometria: teoria dos testes na psicologia e na educação* [Psychometry: Theory of educational and psychological tests]. Petrópolis: Vozes.

Payne, B. K., Burkley, M. A., & Stokes, M. B. (2008). Why do implicit and explicit attitude tests diverge? The role of structural fit. *Journal of Personality and Social Psychology, 94*, 16–31. https://doi.org/10.1037/0022-3514.94.1.16

Payne, B. K., & Gawronski, B. (2010). A history of implicit social cognition: Where is it coming from? Where is it now? Where is it going? In B. Gawronski & B. K. Payne (Eds.), *Handbook of implicit social cognition: Measurement, theory, and applications* (pp. 1–15). Guilford Press.

Pervin, L. A. (1994). A critical analysis of current trait theory. *Psychological Inquiry, 5*, 103–113. https://doi.org/10.1207/s15327965pli0502_1

Quevedo, R. J. M., & Abella, M. C. (2011). Well-being and personality: Facet-level analyses. *Personality and Individual Differences, 50*, 206–211. https://doi.org/10.1016/j.paid.2010.09.030

R Development Core Team. (2012). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.

Roefs, A., Huijding, J., Schmulders, F. T. Y., MacLeod, C. M., de Jong, P. J., Wiers, R. W., & Jansen, A. T. M. (2011). Implicit measures of association in psychopathology research. *Psychological Bulletin, 137*, 149–193. https://doi.org/10.1037/a0021729

Rosenberg, M. (1965). The measurement of self-esteem. In M. Rosenberg (Ed.), *Society and the Adolescent Self-Image* (pp. 16–36). Princeton University Press.

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36.

Schimmack, U. (2019) The implicit association test: A method in search of a construct. *Perspectives on Psychological Science*, 1-19https://doi.org/10.1177/1745691619863798

Schmukle, S. C., Back, M. D., & Egloff, B. (2008). Validity of the five-factor model for the implicit self-concept of personality. *European Journal of Psychological Assessment, 24*, 263–272. https://doi.org/10.1027/1015-5759.24.4.263

Slaughter, J. E., & Kausel, E. E. (2009). The neurotic employee: Theoretical analysis of the influence of narrow facets of neuroticism on cognitive, social, and behavioral processes relevant to job performance. In J. Martocchio & H. Liao (Eds.), *Research in personnel and human resources management* (pp. 265–341). Bingley, UK: Emerald Insight.

Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology, 113*(1), 117–143. https://doi.org/10.1037/pspp0000096

Steffens, M. C. (2004). Is the Implicit Association Test immune to faking? *Experimental Psychology, 51*, 165–179. https://doi.org/10.1027/1618-3169.51.3.165

Steffens, M. C., & Schulze-König, S. (2006). Predicting spontaneous Big Five behavior with Implicit Association Tests. *European Journal of Psychological Assessment, 22*, 13–20. https://doi.org/10.1027/1015-5759.22.1.13

Terracciano, A., Löckenhoff, C. E., Zonderman, A. B., Ferrucci, L., & Costa, P. T., Jr. (2008). Personality predictors of longevity: Activity, emotional stability, and conscientiousness. *Psychosomatic Medicine, 70*, 621–627. https://doi.org/10.1097/PSY.0b013e31817b9371

The jamovi project (2019). *jamovi* (Version 1.0) [Computer Software]. Retrieved from https://www.jamovi.org

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

World Health Organization (WHO). (2017). *Depression and other common mental disorders: Global health estimates*. Retrieved from http://apps.who.int/iris/bitstream/10665/254610/1/WHO-MSD-MER-2017.2-eng.pdf

Zanon, C., & Hutz, C. S. (2014). Escala de afetos positivos e negativos (PANAS) [Positive and negative affects scale (PANAS)]. In C. S. Hutz (Org.), *Avaliação em Psicologia Positiva* (pp. 63–67). Porto Alegre, RS: Artmed.