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# Character Strengths Scale-Brief: initial psychometric studies

## *Escala de Forças de Caráter-Breve: estudos psicométricos iniciais*

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## Abstract

### Objective
Character strengths are positive human characteristics that indicate a happy and successful life. The objective was to select items for the Character Strengths Scale-Brief instrument and to identify its psychometric properties.

### Method
Exploratory factor analysis and qualitative analysis of the items (Study 1) were performed in a database of 4,540 people who responded to the Character Strengths Scale (71 items). In Study 2, 1,014 participants responded to the Character Strengths Scale-Brief (48 items).

### Results
The psychometric indices identified in the confirmatory factor analyses were unsatisfactory for the instrument when considering structures previously reported in the literature.

### Conclusion
After successive analyses, the structure of two factors of first order was considered the most adequate for the Character Strengths Scale-Brief (18 items), with better fit indexes and theoretical relevance. The results were discussed in the light of the literature.

**Keywords**: Emotions; Optimism; Personality; Psychology, positive; Psychological tests.

## *Resumo*

### *Objetivo*
*Forças de caráter são características humanas positivas que indicam uma vida feliz e bem-sucedida. Neste artigo, objetivou-se selecionar itens para elaborar a Escala de Forças de Caráter-Breve e identificar as propriedades psicométricas do instrumento.*

### *Método*
*Foram realizadas análises fatoriais exploratórias e qualitativas dos itens (Estudo 1) a partir informações coletadas em um banco de dados composto por 4.540 registros de respostas à Escala de Forças de Caráter (71 itens). No Estudo 2, 1.014 participantes responderam à Escala de Forças de Caráter-Breve (48 itens).*

***Resultados***

*Os índices psicométricos identificados nas análises fatoriais confirmatórias foram insatisfatórios para o instrumento quando consideradas as estruturas relatadas anteriormente na literatura.*

***Conclusão***

*Após sucessivas análises, a estrutura de dois fatores de primeira ordem foi considerada a mais adequada para a Escala de Forças de Caráter-Breve (18 itens), com melhores índices de ajuste e pertinência teórica. Os resultados foram discutidos à luz da literatura.*

***Palavras-chave***: *Emoções; Otimismo; Personalidade; Psicologia positiva; Testes psicológicos.*

This study aimed to select items from the Character Strengths Scale to compose a brief version of that scale, which has been named the Character Strengths Scale-Brief (CSS-Brief), grounded on empirical evidence. In addition, the intention was to verify, based on a large sample, how the strengths behave considering gender and age. Character strengths are positive characteristics that have moral value; they refer to thoughts, feelings and behaviors, and contribute to a better human life, and any individual can express them (Harzer & Ruch, 2015; Peterson & Seligman, 2004; Seligman, 2019). In order for interventions aimed at promoting character strengths to take place, it is imperative that measuring instruments with scientifically demonstrated psychometric qualities be developed. In this connection, the aim of this study was to carry out studies to search for evidence of validity and precision estimates.

Developing character strengths allows for more frequent experience of positive emotions, better interpersonal relationships, and greater engagement in academic and work activities (Littman-Ovadia et al., 2017; Seligman, 2019). There is evidence that strengths can work as a protective factor against psychopathologies such as phobic anxiety, depression and obsession-compulsive disorder, in addition to being a resource for a healthier human development (Gustems & Calderon, 2014; Littman-Ovadia & Steger, 2010).

In 2002, Peterson and Seligman (2004) introduced a theoretical classification covering 24 character strengths arranged into six virtues, which received the title of Values in Action (VIA) Classification of Strengths. In general, the VIA classification, as theoretically predicted by the authors, has not been replicated in empirical investigations through primarily exploratory factor analysis (Littman-Ovadia & Lavy, 2012; Martínez-Marti & Ruch, 2016; McGrath, 2014; Neto et al., 2014; Ng et al., 2016; Noronha & Batista, 2020a; Noronha et al., 2015; Ruch, Weber et al., 2014; Solano & Cosentino, 2018). Some instruments that assess character strengths and the relevant clustering of strengths into virtues are presented in Table 1.

Although most of the studies presented in Table 1 have identified the structure of five first-order factors as the most appropriate, no groupings identical to the VIA were found (Peterson & Seligman, 2004), which highlights the existence of theoretical divergences between authors regarding the nomenclature and existing associations between the strengths (Allan, 2014; Fowers, 2008; Peterson & Seligman, 2004). In addition, one should reflect on the possibility of a single force corresponding simultaneously to several virtues (Ruch & Proyer, 2015).

Added to the theoretical divergences, the possibility that the differences in the factorial structures of the character strengths instruments can be explained by means of three points: methodologies used (methods of estimation, retention and rotation), respondents' sociodemographic characteristics (gender, age, schooling) and contextual and cultural issues of each country. Regarding methodologies, in most of the studies shown in Table 1, the authors opted for strategies that could bias the interpretation of results, such as principal component analysis, the Kaiser-Guttman criterion

**Table 1**

*Factor structures, countries of origin, instruments and Character Strength clusters*



| Authors | Instrument (Country) | ReM (RoM) | Nomenclatures (Number of strengths grouped) | Factor strengths |
|---|---|---|---|---|
| Azañedo et al. (2014)[a] | VIA-IS (Spain) | PA (Varimax) | Emotional strengths (6) | Humor, emotional intelligence, common sense, creativity, leadership and bravery |
| | | | Interpersonal strengths (5) | Impartiality, modesty, kindness, teamwork, and forgiveness |
| | | | Restriction strengths (5) | Self-regulation, persistence, critical thinking, authenticity and prudence |
| | | | Theological strengths (5) | Spirituality, gratitude, vitality, hope and love |
| | | | Intellectual strengths (3) | Love of learning, appreciation of beauty and curiosity |
| Littman-Ovadia and Lavy (2012)[a] | VIA-IS (Israel) | KG (Varimax) | Restriction strengths (7) | Persistence, authenticity, bravery, common sense, critical thinking, self-regulation and prudence |
| | | | Intellectual strengths (4) | Love of learning, vitality, creativity and curiosity |
| | | | Emotional strengths (5) | Love, emotional intelligence, kindness, leadership and humor |
| | | | Interpersonal strengths (4) | Forgiveness, teamwork, modesty and impartiality |
| | | | Theological strengths (4) | Spirituality, Gratitude, Appreciation of Beauty, and Hope |
| Martínez-Marti and Ruch (2016)[a] | VIA-IS (Germany, Switzerland, Liechtensteiner and Austria) | KG (Varimax) | Restriction strengths (5) | Critical thinking, wisdom, persistence, prudence and self-regulation |
| | | | Intellectual strengths (5) | Creativity, curiosity, love of learning, bravery and appreciation of the beautiful |
| | | | Emotional strengths (5) | Vitality, love, emotional intelligence, humor and hope |
| | | | Interpersonal strengths (7) | Authenticity, kindness, teamwork, leadership, impartiality, forgiveness, and modesty |
| | | | Theological strengths (2) | Spirituality and gratitude |
| McGrath (2014)[a] | VIA-IS (United States) | PA and MAP (Varimax and Promax) | Restriction strengths (5) | Prudence, persistence, self-regulation, critical thinking and authenticity |
| | | | Intellectual strengths (3) | Love of learning, appreciation of beauty and curiosity |
| | | | Emotional strengths (5) | Emotional intelligence, humor, bravery, creativity and common sense |
| | | | Interpersonal strengths (6) | Impartiality, kindness, teamwork, modesty, leadership, and forgiveness |
| | | | Theological strengths (5) | Vitality, hope, gratitude, spirituality and love |
| **Noronha and Batista (2020a)[b] | CSS (Brazil) | PA, MAP and Hull (Promin) | Interpersonal strengths (5) | Humor, love, emotional intelligence, authenticity and appreciation of beauty |
| | | | Courage strengths (7) | Judgment, critical thinking, leadership, teamwork, prudence, bravery and creativity |
| | | | Theological strengths (4) | Spirituality, gratitude, perseverance and hope |
| | | | Humanity strengths (3) | Impartiality, kindness and modesty |
| | | | Autoregulation strengths (3) | Self-regulation, vitality and forgiveness |
| | | | Intellectual strengths (2) | Love of learning and curiosity |
| Neto et al. (2014)[a,b] | SRCS (Portugal) | KG (Varimax) | Interpersonal strengths (8) | Kindness, love, vitality, teamwork, authenticity, gratitude, impartiality and humor |
| | | | Leadership strengths (7) | Leadership, persistence, bravery, common sense, creativity, emotional intelligence and spirituality |
| | | | Temperance strengths (6) | Self-regulation, prudence, appreciation of beauty, modesty, hope and forgiveness |
| | | | Intellectual strengths (3) | Curiosity, love of learning and critical thinking |
| Solano and Cosentino (2018)[b,c] | IvyFabre (Argentina) | PA (Promin) | Interpersonal strengths (10) | Forgiveness, kindness, love, humor, hope, Impartiality, authenticity, teamwork, spirituality, gratitude |
| | | | Intellectual and personal empathy strengths (8) | Curiosity, creativity, common sense, leadership, bravery, vitality, emotional intelligence and persistence |
| | | | Restriction strengths (6) | Appreciation of the beautiful, love of learning, prudence, critical thinking, modesty and self-regulation |
| Duan et al. (2012)[c] | Chinese Virtues Questionnaire-96 (China) | | Vitality (10) | Humor, curiosity, creativity, vitality, common sense, hope, appreciation of the beautiful, bravery, spirituality and emotional intelligence |
| | | | Interpersonal (8) | Kindness, teamwork, love, impartiality, leadership, forgiveness, authenticity and gratitude |
| | | | Caution (6) | Prudence, self-regulation, critical thinking, modesty, perseverance and love of learning |

**Table 1**
*Factor structures, countries of origin, instruments and Character Strength clusters*



| Authors | Instrument (Country) | ReM (RoM) | Nomenclatures (Number of strengths grouped) | Factor strengths |
|---|---|---|---|---|
| *Ng et al. (2016)[c] | VIA-IS (United States) | | General factor | |
| | | | Wisdom and knowledge (5) | Creativity, curiosity, critical thinking, love of learning and common sense |
| | | | Courage (4) | Bravery, persistence, authenticity and vitality |
| | | | Humanity (3) | Love, kindness and emotional intelligence |
| | | | Justice (3) | Teamwork, impartiality and leadership |
| | | | Temperance (4) | Forgiveness, modesty, prudence and self-regulation |
| | | | Transcendence (5) | Appreciation of beauty, gratitude, hope, humor, and spirituality |

Note: [a] Principal component analysis; [b] Exploratory Factor Analysis; c Confirmatory Factor Analysis. *general factor and 6 specific; **Authors tried to approximate the structure proposed by Peterson and Seligman (2004). CSS: Character Strengths Scale; Hull: Hull's method; IvyFabre: IVyF abbreviated; KG: Kaiser-Guttman; MAP: Minimum Average Partial; PA: Parallel Analysis; ReM: Retention Methods; RoM: Rotation Methods; SRCS: Self-Rated Character Strengths.

and orthogonal rotation methods (Costello & Osbourne, 2005; Damásio, 2012; Lorenzo-Seva et al., 2011; Patil et al., 2008; Sass & Schmitt, 2010; Schmitt & Sass, 2011). With regard to sociodemographic characteristics and cultural issues, it is necessary to investigate whether the strengths are expressed differently between gender and age, as such studies are still incipient (Martínez-Marti & Ruch, 2016; Noronha & Campos, 2018).

In this regard, in the meta-analysis by Heintz et al. (2017), the differences in the levels of character strengths, according to the respondents' gender, were investigated. In addition, the authors identified whether the age group, country of origin and type of measure would moderate the strength levels according to the gender of 1,189,924 participants. Regarding gender, only four strengths (appreciation of beauty, kindness, love and gratitude) were significant, with small effect sizes (d between 0.27 and 0.32) and higher scores for women. As for the age group and the kind of measurement as moderators, the authors indicated that several interactions (confounding variables) may have occurred thus preventing to describe accurately the effects of these variables between genders. As for nationalities, the size of differences according to gender did not vary.

In the Brazilian scenario, in the study by Noronha and Barbosa (2016), the Character Strengths Scale (CSS) showed higher averages for women in seven strengths (authenticity, kindness, love, emotional intelligence, modesty, appreciation of beauty and spirituality). As for the age group, youth (under 18 years of age) scored higher on bravery, social intelligence and modesty, while adult participants (over 22 years of age) scored higher on critical thinking, love of learning, love, impartiality, leadership, teamwork, self-regulation, appreciation of beauty, gratitude and spirituality.

The advantage of the CSS in relation to other instruments is that, even though it is not a brief version, it has fewer items than those in some of the abbreviated measures developed in other countries and, even so, it presents similar psychometric indices ($\alpha$ = 0.93) (Littman-Ovadia, 2015; Ruch, Martinez-Martí et al., 2014; Ruch, Weber et al., 2014; Solano & Cosentino, 2018). As an example, the Brief Report VIA-IS was developed in Israel by Littman-Ovadia (2015). The items were distributed in five factors. The instrument has 120 items ($\alpha$ between 0.69 and 0.90) and is answered on a five-point Likert-type scale (1 = very different from me and 5 = very similar to me). Another measure, the 24-item Character Strengths Rating Form (Ruch, Martínez-Martí et al., 2014), is a brief instrument (24 items) that assesses character strengths in the German language, but is not an adaptation of the VIA-IS. A five-factor structure for the Character Strengths Rating Form ($\alpha$ between 0.53 and 0.83) was identified. The instrument's response format is a nine-point Likert-

type scale (the authors did not mention the nomenclature of the scale points). Finally, Solano and Cosentino (2018) developed the 24-item abbreviated IVyF (IVyFabre) to assess strengths in the Argentine framework. The authors identified a three-factor structure for the 24 strengths (α between 0.71 and 0.85). Items are answered on a Likert-type scale (1 = very different from me and 5 = very much like me).

With regard to the present study, it should be noted that the measurement instruments must undergo different studies, with different samples and analyses that allow evaluating the extent to which the items reflect the psychological construct (American Educational Research Association et al., 2014). Brief measures offer a quick measure, even within the scope of screening, with a view to choosing interventions based on evidence. The CSS-Brief can work as an alternative tool, since it can be applied in different audiences and contexts. For research purposes, a brief instrument can also be an advantage, as a protocol sometimes consists of several measures. In summary, it is important to include other statistical analyses and better control variables that could interfere with the endorsement of strengths, such as gender and age (Heintz et al., 2017). In addition, there is a need to obtain other evidence of validity and reliability estimation that would allow a better construct understanding (Noronha & Barbosa, 2016).

Two studies are presented. The first study aimed to choose, among the 71 items, the 48 most suitable in terms of theoretical relevance and bearing higher factor loadings. In Study 2, we sought new evidence of validity based on the internal structure. In this Study, the existing factorial structures were replicated through confirmatory factor analysis, so that they could be compared; the CSS-Brief factor structure was identified through exploratory factor analysis; and items with DIF's (Differential Item Functioning) were identified for education, age and gender.

Two hypotheses were set out for the studies. Regarding study 1, the hypothesis suggested that the structure recommended by the VIA or those found in the empirical studies reported in Table 1, would not be replicated by the CSS-Brief. This would be due to two aspects, namely, the small number of items to represent the 24 strengths, the absence of confirmation in the different surveys carried out with the VIA with samples from different countries (Martínez-Marti & Ruch, 2016; McGrath, 2014; Neto et al., 2014). In addition, it was expected that the DIF's values for gender, education and age would be below 0.30 (Hypothesis 2), indicating little interference in the endorsement of the CSS-Brief items (Heintz et al., 2017).

## Method

### Study 1 – Item Selection

#### *Participants*

Initially, a database with results from 4,580 participants who responded to the CSS (Noronha & Barbosa, 2016) was used. The participants were between 13 and 65 years old ($M$ = 22.14; $SD$ = 7.63), 62.12% of whom were female.

#### *Instruments*

*Character Strengths Scale* (CSS) (Noronha & Barbosa, 2016) – The scale assesses the 24 character strengths through 71 items. Respondents indicate how much the statement describes them on a 5-point Likert scale (0 = "nothing to do with me" and 4 = "just like me"). All strengths

have three items that describe it, except the appreciation of beauty strength, which has only two. The CSS factor analysis indicated a unidimensional structure (α = 0.93). "I think a lot before making a decision" and "I don't hold grudges if someone mistreats me" are examples of items on the scale.

### *Procedures*

To carry out Study 1, a research project database approved by the São Francisco University's Research Ethics Committee (Opinion nº 365.343) was used. Data collection took place face-to-face at educational institutions and universities. Signature on the Free and Informed Consent Form (FICF) or the Free and Informed Assent Form was requested prior to the presentation of the instruments for individuals under 18 years of age, whose authorization to participate in the survey from parents or guardians was given through the FICF execution. The average instrument response time was 20 minutes.

### *Data Analysis*

Mplus 7.11 was used for exploratory factor analysis (Muthén & Muthén, 2017). Mainly, the unifactorial structure previously identified for CSS was taken into account. For factor analyses, with Geomin rotation, the Robust Weighted Least Squares estimator was used. Since the objective of the factor analysis was to reduce the number of CSS items, higher factor loadings (≥ 0.30) items were selected in successive simulations (Pasquali, 2017). Subsequently, two items in each strength were selected taking into account the highest factorial load and theoretical relevance, so that each of the strengths would be better represented. Theoretical pertinence was reviewed by the two authors, using Peterson and Seligman (2004) assumptions as a reference. The first version of CSS-Brief totaled 48 items.

## Results

In order to select the best items for the initial brief version of the CSS, Exploratory Factor Analyses (EFA) were performed in a database of participants who responded to the CSS (Noronha & Barbosa, 2016). In the first EFA, three items (3, 11 and 12) had factor loadings with values below 0.30. The three items were removed and a new EFA was performed. The results (RMSEA = 0.070; $\chi^2/df$ = 51558.770/2210; CFI = 0.717; TLI = 0.708) indicated unsatisfactory indices and factorial loads with values between 0.30 and 0.64.

Subsequently, the 48 items of the first version of the CSS-Brief were selected based on the factor loadings and theoretical relevance, in light of the precepts suggested by Peterson and Seligman (2004), so that each strength had two items that represented it. The selected items should be those with higher factorial loads, with the exception of items from the strengths wisdom (4 and 6), spirituality (28 and 51) and hope (27 and 49), which presented equal or close factorial loads.

## Study 2 – Validity Evidence Based on Internal Structure

### *Participants*

The sample was non-probabilistic for convenience, consisting of 1,014 participants aged between 18 and 73 years ($M$ = 35.85; $SD$ = 12.52), most of whom were female (70.4%). The participants belonged to the five regions of Brazil. Regarding education, they had incomplete higher education

(32.15%), complete postgraduation (22.68%), complete higher education (14.50%), complete high school (11.64%), incomplete high school (11.14%), incomplete post-graduation (5.33%) and up to complete secondary education (2.57%).

### *Instruments*

Sociodemographic questionnaire used to characterize the sample. The questionnaire sought information regarding gender, age, education and region to which the participants belonged.

*Character Strengths Scale - Brief* (CSS-Brief) – As presented in the previous study, the instrument assesses the adults' character strengths. The scale consisted of 48 items, two for each character strength. The items have a Likert-type scale format, with 0 = "nothing to do with me" and 4 = "just like me".

### *Procedures*

To carry out Study 2, the survey was forwarded to the Universidade São Francisco's (Opinion nº 3,636,232). Data were collected through a Google Forms questionnaire. A link with the invitation to participate in the survey was made available on social networks (Facebook, Instagram, WhatsApp, Linkedin and e-mail). Upon acceptance of the FICF and the indication of being 18 years or older, the sociodemographic questionnaire and the CSS-Brief (48 items) were released to the participants. The time to complete the instruments was approximately 25 minutes.

### *Data Analysis*

Mplus 7.11 (Muthén & Muthén, 2017) was used for Confirmatory Factor Analysis (CFA), considering the previously identified structures for character strengths, as shown in Table 1. The FACTOR (Lorenzo-Seva & Ferrando, 2006) was used to identify whether the CSS-Brief data matrix was factorable using Bartllet's sphericity test and the Kaiser-Mayer-Olkin (KMO) index. For the factorial retention, the indications of the parallel analysis (Timmerman & Lorenzo-Seva, 2011) and the Minimum Average Partial (MAP) methods were taken into account, based on the analysis of systematized and non-systematized variances (Velicer, 1976) and the Hull method, based on convex closure (Lorenzo-Seva et al., 2011). Subsequently, successive Exploratory Structural Equation Modeling (ESEM) were conducted in Mplus, so that the CSS-Brief had a reduced number of items. Factorial solutions with first (Geomin rotation) and second order (Bi-Geomin rotation) factors were considered. Items that had factor loadings less than 0.50 were excluded. The results presented by the Model Modification Indices were checked to identify suggestions for replacing items that had high correlations, which could improve the adjustment indices. To identify whether there was DIF in the CSS-Brief items as a function of age, gender and education, the MIMIC (Minimum Indicator and Multiple Cause; Muthén, 1989) was used. Items with values above 0.30 were excluded.

## Results

Initially, CFA were performed with nine factorial structures for the character strengths previously identified in the literature, as shown in Table 1, in order to verify whether they would present adequate fit indices in the CSS-Brief (48 items). The data found are exhibited in Table 2.

**Table 2**
*Fit indices and models tested in Confirmatory Factor Analyses*

| Factor Structures | $\chi^2/df$ | RMSEA | CFI | TLI | Factorial loads |
|---|---|---|---|---|---|
| Reference values | < 2 | < 0.05 | ≥ 0.90 | ≥ 0.90 | |
| 6 factors | | | | | |
| CFA-1 | 6766.796/1065 (6.35) | 0.07 | 0.81 | 0.82 | 0.43–0.86 |
| 5 factors | | | | | |
| CFA-2 | 6592.455/1070 (6.16) | 0.07 | 0.82 | 0.83 | 0.42–0.82 |
| CFA-3 | 7275.765/1070 (6.80) | 0.08 | 0.80 | 0.81 | 0.43–0.81 |
| CFA-4 | 6781.148/1070 (6.34) | 0.07 | 0.81 | 0.82 | 0.44–0.88 |
| CFA-5 | 6674.323/1070 (6.24) | 0.07 | 0.82 | 0.83 | 0.43–0.82 |
| 4 factors | | | | | |
| CFA-6 | 7681.910/1074 (7.15) | 0.08 | 0.79 | 0.80 | 0.41–0.77 |
| 3 factors | | | | | |
| CFA-7 | 8208.544/1070 (7.67) | 0.08 | 0.77 | 0.78 | 0.41–0.76 |
| CFA-8 | 8235.999/1070 (7.70) | 0.08 | 0.77 | 0.78 | 0.42–0.76 |
| 1 general factor and 6 specific factors | | | | | |
| CFA-9 | 6390.279/1032 (6.19) | 0.07 | 0.82 | 0.84 | 0.37–0.76 |

Note: CFA-1: Noronha and Batista (2020a); CFA-2: Azañedo et al. (2014); CFA-3: Littman-Ovadia and Lavy (2012); CFA-4: Martínez-Marti and Ruch (2016); CFA-5: McGrath (2014); CFA-6: Neto et al. (2014); CFA-7: Solano and Cosentino (2018); CFA-8: Duan et al. (2012); CFA-9: Ng et al. (2016). CFI: Comparative Fit Index, RMSEA: Root Mean Square Error of Aproximation, TLI: Tucker Lewis Index.

According to the exposition made in Table 2, the factorial structures tested by the CFA presented satisfactory fit indices. In this connection, it was decided to identify whether the CSS-Brief factorial structure was factorable and which retention methods were suggested. The KMO (0.954) and Bartlett's sphericity test (22023.4; *df* = 1128; *p* = 0.00001) presented indices considered very good, indicating the possibility of factoring the scale. Hull's method suggested retention of one factor, while MAP and parallel analysis suggested retention of up to three factors.

Then, the ESEM were conducted in order to reduce the number of CSS-Brief items and identify the structure that would present the best fit indices. Solutions with first and second order factors were tested. Only two factorial structures, with one and two first-order factors, showed theoretical relevance after excluding items that loaded below 0.50. Although the structure with three factors showed good psychometric indices ($\chi^2/df$ = 70.049/25; *p* = 0.0001; RMSEA = 0.04; CFI = 0.99; TLI = 0.98), one of the factors remained with only two items and one of the correlations between the factors was low (*r* = 0.09). After carrying out the analyses and taking into account the suggestions of the Model Modification Indices, the fit indices found in the structure of two first order factors ($\chi^2/df$ = 669.748/118; *p* = 0.0001; RMSEA = 0.07; CFI = 0.953; TLI = 0.939) were better than those of the unifactorial structure ($\chi^2/df$ = 2149.549/209; *p* = 0.0001; RMSEA = 0.10; CFI = 0.86; TLI = 0.85), with loads greater than 0.50.

In the first factor (α = 0.83), Intrapersonal strengths, six items were grouped (hope, gratitude, spirituality, appreciation of beauty, love of learning and vitality) that relate to experiences that translate a positive orientation towards the future, with energy and appreciation for beauty and learning. The second factor (α = 0.87), intellectual and interpersonal strengths, grouped the strength items emotional intelligence, critical thinking, creativity, authenticity, teamwork, bravery, modesty, leadership, common sense, humor, prudence and impartiality. The 12 items refer to the cognitive strengths that help coping with difficulties, solving problems and establishing interpersonal relationships, in order to create healthy social coexistence settings. The strengths love, forgiveness, self-regulation, kindness, persistence and curiosity had no items that represented them in the

structure of 18 items and two factors. Then, the DIF analyses were performed considering the structure of two first-order factors to identify the need to delete more items. The education variable was coded from 1 to 10, in a scalar fashion, that is, 1 corresponded to the lowest level of education found in the sample (incomplete elementary I grade) and 10 corresponded to the highest (complete postgraduate degree). Similarly, age was also coded in a scalar basis (18 to 73). As for gender, 1 corresponded to the male and 2 to the female. The factorial loads and the DIFs values for this structure are shown in Table 3.

**Table 3**

*CSS-Brief factorial loads and DIFs with a first order two-factor structure*

| Items (Strength) | Factorial loads | | DIF's | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Gender | | Age | | Education | |
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| | | | β = 0.067 | β = 0.114* | β = 0.273* | β = 0.284* | β = 0.248* | β = 0.141* |
| 01. I know what to do to make people feel good. (Emotional intelligence) | 0.02 | **0.63** | 0.008 | | 0.031 | | -0.006 | |
| 06. I am competent to analyze problems from different "perspectives". (Critical thinking) | -0.01 | **0.65** | -0.113 | | -0.026 | | -0.033 | |
| 09. Good things await me in the future. (Hope) | **0.79** | 0.02 | 0.001 | | -0.032 | | -0.04 | |
| 15. I can find reasons to be grateful in my life. (Gratitude) | **0.87** | -0.02 | 0.117 | | 0.072 | | 0.002 | |
| 17. I believe in a sacred force that binds us to each other. (Spirituality) | **0.70** | -0.09 | 0.116 | | 0.110 | | 0.07 | |
| 18. I create useful things. (Creativity) | 0.17 | **0.56** | -0.140 | | 0.114 | | 0.042 | |
| 20. I am a real person. (Authenticity) | 0.05 | **0.57** | -0.031 | | -0.036 | | -0.04 | |
| 21. I manage to create a good atmosphere in the groups I work with. (Team work) | 0.12 | **0.60** | -0.008 | | -0.012 | | -0.059 | |
| 22. I brave dangers to do good. (Bravery) | -0.05 | **0.59** | -0.200 | | -0.063 | | -0.081 | |
| 26. I can appreciate the beauty in the world. (Appreciation of beauty) | **0.62** | 0.10 | 0.149 | | 0.021 | | -0.121 | |
| 31. I don't miss opportunities to learn new things. (Love of learning) | **0.65** | 0.09 | 0.053 | | 0.103 | | 0.048 | |
| 32. I am a humble person. (Modesty) | 0.10 | **0.56** | -0.041 | | -0.086 | | -0.107 | |
| 37. I feel full of life. (Vitality) | **0.55** | 0.23 | -0.004 | | 0.069 | | 0.030 | |
| 43. It is easy for me to organize work in groups. (Leadership) | 0.13 | **0.63** | -0.037 | | -0.027 | | 0.011 | |
| 44. I can help people understand each other when there is an argument. (Common Sense) | -0.09 | **0.76** | -0.015 | | -0.051 | | -0.036 | |
| 45. I find it easy to make a boring situation fun. (Humor) | 0.02 | **0.67** | -0.051 | | -0.156 | | -0.044 | |
| 46. I tend to make decisions when I am aware of the consequences of my actions. (Prudence) | -0.09 | **0.72** | -0.098 | | -0.030 | | -0.153 | |
| 47. I am a fair person. (Impartiality) | -0.05 | **0.69** | -0.098 | | -0.024 | | -0.110 | |

Note: *$p < 0.001$. Bolds indicate the highest load on the factor.

The factor loadings varied between 0.55 and 0.87 and the DIFs had low values for gender, age and education (between 0.001 and 0.200). The gender and education variables showed differences in scores for 12 items; men and participants with higher education level were more favored by the items. In the age variable, 18 items had differences in scores, with the youngest participants being favored by the items.

## Discussion

In the present study, the objective was to select items and identify the psychometric properties of the CSS-Brief; in this case, we searched for evidence of validity based on the internal structure of the CSS-Brief, aiming at reducing the number of items in the original version (EFC; Noronha & Barbosa, 2016), since there are advantages in the application of short versions of psychological instruments. In addition, it would allow us to take into account the limitations related to the methodologies used in factor analysis of character strengths instruments. In the first study, most of the items that had higher factor loadings also had better theoretical representations (Peterson & Seligman, 2004). The exception was the strength items hope (27 and 49), spirituality (28 and 51) and wisdom (4 and 6), which had equal loads and highlighted the importance of the theoretical aspect as a criterion for selecting items to avoid decisions that would culminate in erroneous or unreliable results (Damásio, 2012; Patil et al., 2008). As for hope (hoping for the best and working to achieve it), item 49 was chosen ("I know that things will work out") to the detriment of 27 ("I believe that tomorrow will be better than today"). The latter could cause problems when the respondent would be on a pleasant day, for example, which could lead him to reflect as follows when reading that statement: "Today was a very good day. There's no way that tomorrow can be better than today." In this connection, item 49 seems to better represent the expectation that something in the future will be better (Noronha & Batista, 2020b; Peterson & Seligman, 2004).

On the other hand, with regard to spirituality (having strong and coherent beliefs about the higher purpose and meaning of the universe) and common sense (being able to give wise advice to others), items were selected that had statements that best contemplated the definition suggested by Peterson and Seligman (2004). For spirituality, item 28 was chosen ("I believe in a sacred force that connects us to each other) because it refers to a coherent belief with a greater purpose (Peterson & Seligman, 2004). Item 51 ("Believing in a supreme being gives meaning to my life") was excluded because item 8 ("I feel that my life has a greater meaning") had already been selected, and have similar content. Similarly, item 6 ("I make good judgments, even in difficult situations") of common sense was selected, since it indicated an ability that was not associated only with giving advice, characteristic of people known as being wise (Peterson & Seligman, 2004; Seligman, 2019). Item 4 ("I am competent to give advice") had a content similar to item 63 ("I can help people understand each other when there is a discussion), which is also why it was excluded.

In study 2, it was hypothesized that the previously identified factorial structures would present unsatisfactory fit rates in the CSS-Brief (Hypothesis 1), which was confirmed. One justification refers to the culture of each country being different. Possibly, the VIA classification by Peterson and Seligman (2004), made after a wide review, considering different texts, cultures and religions, encompasses a wide range of content that can make it difficult to identify the same structure in different cultures, causing theoretical divergences (Allan, 2014; Giuliani et al., 2020; Seligman, 2019) and different empirical structures (Ng et al., 2016; Noronha & Batista, 2020a; Solano & Cosentino, 2018). In this connection, some authors have sought to better understand the structure character strengths (Allan, 2014; Ng et al., 2016; Noronha & Batista, 2020a). As there is a need to make more contextualized assessments, in this case, considering the strengths of character in the Brazilian scenario, in the present work other analyses were carried out (EFA, MIMIC, ESEM) to identify the construct structure in Brazil. Thus, potential biases not considered before in the assessment of the construct could be minimized (Heintz et al., 2017).

In hypothesis 2, it was expected that the DIF values for the gender, age and education variables would be less than 0.30, which would indicate little interference of the variables in the

endorsement of the CSS-Brief items. The hypothesis was confirmed, indicating that the CSS-Brief has good items to assess character strengths, with levels of bias considered adequate (Linacre, 2012); this would reduce potential errors arising from the specific characteristics of the participants (Heintz et al., 2017), in this case, age, gender and education. Finally, in previous studies, gender and age did not show statistically significant differences for strengths in Brazil and in other countries (Heintz et al., 2017; Noronha & Batista, 2017; Noronha & Martins, 2016), which seems to indicate that such variables are not intervening for the understanding of the construct.

Even with the exclusion of six items, the structure with two first order factors was the one that presented the best results. However, it is considered that there were no losses with the exclusion of the items of curiosity, persistence, kindness, self-regulation, forgiveness and love, since a single strength could correspond to several virtues, besides having similar content among them (Giuliani et al., 2020; Peterson & Seligman, 2004; Ruch & Proyer, 2015). For example, love of learning (mastering new skills and knowledge) seems to encompass, to some extent, curiosity (being interested in the whole experience). Likewise, bravery (not hiding from threat, challenge or pain) includes persistence (finish what you started) and self-regulation (keep your spirits up even in the face of difficult situations) (Peterson & Seligman, 2004; Noronha & Batista, 2020a; Noronha et al., 2015).

Possibly, the methodologies used in the present study were more adequate than those used in the studies reported in Table 1. Some of these studies used the principal component analysis, which tend to inflate explained variances and present higher factor loadings and commonalities when compared to exploratory factor analysis (Costello & Osbourne, 2005; Damásio, 2012). The use of principal component analysis is not recommended when the objective is to observe the existing interrelationship in a latent construct's set of items (Costello & Osbourne, 2005), in the case of the present study, character strengths. As for the Kaiser-Guttman criterion, its results tend to lack precision, with factors overestimation; hence it is not recommended (Costello & Osbourne, 2005; Patil et al., 2008). Finally, orthogonal rotations were also used, which assumes the lack of correlation ($r = 0$) among the factors. This assumption tends to leave the data obtained in psychology research incoherent (Costello & Osbourne, 2005), since behaviors, feelings, symptoms and other human realities work interdependently, having relationships among them (Damásio, 2012; Goretzko et al., 2021).

Thus, in addition to there being theoretical approximations in the clusters found for the factors intrapersonal strengths and intellectual and interpersonal strengths (Azañedo et al., 2014; Littman-Ovadia & Lavy, 2012; McGrath, 2014; Noronha & Batista, 2020a; Peterson & Seligman, 2004; Solano & Cosentino, 2018), some limitations related to methodologies, to sociodemographic characteristics and to culture were minimized in the present study. In this connection, it is considered that there were advances in the study of character strengths in the Brazilian scenario. As limitations of this study, we consider the fact that items to control acquiescence and social desirability were not developed. However, it is noteworthy that in the present work the initial psychometric studies of the CSS-Brief were carried out, and the objectives were attained. The structure identified for the CSS-Brief was also different from the VIA classification (Peterson & Seligman, 2004), although it showed some similarities. The factors found have theoretical cohesion, with the structure of two first order factors being the most adequate to evaluate the strengths in the Brazilian scenario. Furthermore, we consider a limitation the fact that most of the sample is composed of participants who had higher education, which does not include an important portion of the general Brazilian sample. In future studies, it is suggested that bias controls, in addition to more in-depth methods on the Item Response Theory, be also performed so that the CSS-Brief presents less impact of scores from different sources and that participants with lower educational levels be also included in the sample.

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## Contributors

H. H. V. BATISTA and A. P. P. NORONHA were responsible for the conception and design of the research, analysis and interpretation of data, and reviewing and approving the final version of the article.