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Veröffentlichungsversion / Published Version

Zeitschriftenartikel / journal article

### Empfohlene Zitierung / Suggested Citation:

Neto, F. (2021). Psychometric properties of the Porto Saudade Scale. *Measurement Instruments for the Social Sciences*, 3, 1-10. <https://doi.org/10.1186/s42409-021-00022-x>

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NEW MEASUREMENT INSTRUMENT

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# Psychometric properties of the Porto Saudade Scale



Félix Neto

## Abstract

Saudade involves psychosocial reactions to several circumstances involving deprivation from loved people and/or familiar locations. This work concerns the development and preliminary validation of an instrument to assess general disposition to saudade, the Porto Saudade Scale (PSS). Three studies were conducted which indicated that the PSS has favorable psychometric properties. Exploratory factor analysis of the PSS demonstrated a single latent saudade factor. The confirmatory factor analysis showed that the single latent model of the PSS is adequate and possesses good internal consistency. As expected, the data also supported the convergent, discriminant, and external validity of the PSS. Saudade was more frequently reported among females than among males. These results suggest the validity of the PSS and emphasize that it is a brief measure with strong psychometric evidence for assessing saudade.

**Keywords:** Adolescents, International students, Measurement, Saudade

## Introduction

The word *saudade* is a Lusophone term, which encompasses a range of psychosocial reactions to circumstances involving deprivation, from loved ones and/or familiar locations for example, that is, from something an individual is attached to that is absent. In Brazil, saudade is officially celebrated each year, on 30 January. Even though saudade has long contributed to inspiring thought and literature (Botelho, 1990; Fanha & Letria, 2002; Lourenço, 1978; Noronha, 2007; Rodrigues, 1967; Teixeira, 2006; Vasconcelos, 1996), empirical investigation on this topic in psychological sciences is scant (Neto, 2019; Neto & Mullet, 2014, 2020a, 2020b, 2020c). The aim of this current research is to preliminarily develop and validate a new scale in an effort to understand people's relationship with saudade.

## Saudade

Empirical research on saudade is scant even though it represents one of the most familiar emotions for

Portuguese people (Farrell, 2006). Saudade has also inspired authors from medieval ages to contemporary times. *Today Translations* has indicated that the Portuguese term saudade was the 7th most difficult word to translate. In English, the term is generally translated by words such as longing, yearning, missing, homesickness, and nostalgia (Silva, 2012). Nevertheless, none of those words embrace the complete meaning of *saudade* as the Portuguese generally comprehend it.

King Duarte of Portugal in the fifteenth century considered saudade “precisely the feeling that the heart fails because it is apart from the presence of someone(s) whom it loves very much” (Botelho, 1990, p. 36). King Duarte reported saudade as being different from sadness, disgust, sorrow, displeasure, or boredom. For the Portuguese language's greatest poet Luis Vaz de Camões saudade is “pure, sweet and painful torment” (Castro, 1980, p. 18). For philosopher Francisco Manuel de Melo, saudade is the “bad thing you like and [the] good thing you suffer from” (Vasconcelos, 1996, p. 101).

The concept was scrutinized using the prototype analysis (Neto & Mullet, 2014; Rosch, 1978). First, college students were asked to indicate features they spontaneously associated with saudade. Eleven attributes were

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frequently evoked: (a) memories (“recordações”, in Portuguese), (b) sadness (“tristeza”), (c) missing someone (“sentir falta de alguém”), (d) missing something (“sentir falta de algo”), (e) thinking (“pensar”), (f) sensation of loss (“sensação de perda”), (g) nostalgia (“nostalgia”), (h) distance (“distância”), (i) crying (“chorar”), (j) feeling (“sentimento”), and (k) pain (“dor”). Even if the great majority of evoked feelings tied to the concept are likely to be regarded as negative in tone, some positive feelings were also tied to it (e.g., joy, love).

Second, these scholars explored the centrality of each attribute and their affective valence in another sample of college students. Everyone in the sample could evaluate each attribute as more or less prototypical of saudade. Also, the affective valence evaluations oscillated between very negative and very positive; that is, the sample was without doubt mindful of the complexity of saudade. Third, in two more studies, it was shown that the centrality of the attributes was connected to their recognition, and to story writing of previous experiences of saudade.

Saudade can be defined as a bittersweet emotional experience, usually intense, that occurs when you remember a loved one from whom you are separated, a significant place from which you are far away, or a time that was once happy and is now over. Saudade is a complex phenomenon that manifests itself at the cognitive (e.g., memories, thinking), emotional (e.g., sadness, joy, loneliness), behavioral (e.g., crying, calling others), and motivational (e.g., wanting to go back in time, wanting to be close) levels (Neto & Mullet, 2014). Saudade is a complex emotion, furthermore, because it is a mixed emotion. Mixed emotions possess ambivalent features, representing positive and negative experiences simultaneously (Braniecka, Trzebinska, Dowgiert, & Wytykowska, 2014). Saudade is deeply rooted in the daily lives of the Portuguese. Neto and Mullet (2020b) found that about 40% of participants in their samples (Portuguese adolescents, students or migrant adults living abroad) experienced saudade often or very often.

Past research has also examined differences in saudade between Portuguese migrants living in Switzerland and Portuguese adults without migratory experience (Neto, 2019). Results showed that migrants felt greater saudade than did non-migrant people. For a majority of migrants saudade was a frequent feeling: around two-thirds experienced it at least once a week, and around half experienced it three or four times a week. “As migration involves separation from close persons and places, it makes sense that migration might exacerbate this feeling” (Neto, 2019, p. 675). The duration of stay impacted the level of saudade. Those migrants with longer lengths of residence outside the home country felt less saudade. As expected, acculturation factors such as Portuguese

language proficiency, separation, and assimilation predicted saudade; that is, greater Portuguese language proficiency, feelings of separation, and lower assimilation orientation emerged as significant predictors of saudade. Adaptation factors such as sociocultural adaptation and migration satisfaction also predicted saudade; greater sociocultural adaptation difficulties and lower satisfaction with migration emerged as significant predictors of saudade. Overall, both personal and situational factors seem to be determinants of saudade.

Neto and Mullet (2020c) analyzed the relations between saudade and demographic factors, subjective well-being, loneliness, and personality traits. Saudade was found to be mainly related to negative emotionality/affectivity. Concerning subjective well-being, negative emotional states emerged as significant predictors of saudade. Regarding personality factors, neuroticism also emerged as a significant saudade predictor. Furthermore, loneliness predicted saudade above and beyond personality factors. Therefore, a general portrayal outlined by this investigation was that experiencing saudade is predicted by a negative emotional context.

A set of studies was conducted to assess the positive and negative functions of saudade (Neto & Mullet, 2020a). Respondents were led to experience saudade through recall and writing about a past saudade event. Participants then completed evaluations of positive and negative affect, loneliness, and social connectedness (Study 1), self-esteem (Study 2), and inspiration (Study 3). Respondents in the recalled saudade condition gave greater scores on positive affect, close connectedness, and inspiration than respondents in the neutral (control) condition. Nonetheless, no significant differences were found between conditions concerning negative affect, loneliness, societal connectedness, and self-esteem. The results are widely consonant with past investigations about the closely related concept of nostalgia (Stephan et al., 2015)

In previous research, the concept has been assessed indirectly and directly. Neto and Mullet (2020b) conducted four studies to develop an indirect assessment of saudade grounded on prototype theory (Neto & Mullet, 2014; Rosch, 1978). Two studies were conducted with college students, one with adults and another with adolescents. Through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) a scale for three factors with 14 items was developed. The first factor was labeled *Missing close others* given that it loaded statements such as “I suffer from being so far away from people I love” and “I would like to come back and see my family.” The second factor was labeled *Lack of intimacy* given that it loaded on statements such as “I suffer from lack of affection.” The third factor was labeled *Longing for the past* given that it loaded on statements such as “I

keep remembering the past.” In this scale, called Experience Saudade Scale (ESS), the concept was measured in an indirect way since the word saudade is not included in any of the 14 items.

In previous research saudade has been assessed directly using one or two questions. Neto and Mullet (2020b) used one direct question on how often the participant experienced saudade: “To what extent have you experienced saudade during the past four weeks?” In other studies saudade was measured using two direct questions: (1) “how often have you experienced saudade in the past 4 weeks”, and (2) “how often have you experienced saudade in comparison with other people” (Neto, 2019; Neto & Mullet, 2020c). Single item scales have a number of problems associated with them (e.g., see Diener, 1984) Thus, there is a need for a direct multi-item scale to measure saudade.

There is interest to have a direct multi-item scale to measure saudade, in addition to an indirect measure. For example, Hatrup, Mueller, and Aguirre (2007) compared the influence of using direct and indirect measures of work values. The findings showed that “the method used for operationalizing work values may have a substantial influence on conclusions about the magnitudes or patterns of differences in values among respondents” (Hatrup et al. p. 508). In the research about an emotion, such as loneliness, the gender findings are inconsistent (Maes, Qualter, Vanhalst, Noortgate, & Goossens, 2019), and Borys and Perlman (1985) contended that these inconsistencies could be explained as a function of the type of measure used to assess loneliness. The Revised UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980) does not explicitly ask people whether they perceive themselves as “lonely”, but rather assess this indirectly. Borys and Perlman (1985) argued that when loneliness is assessed indirectly through the Revised UCLA Loneliness Scale, gender differences were not generally found, and when it was assessed directly more frequently gender differences were found. Therefore, it seems important to measure psychological constructs directly and indirectly and to compare the findings resulting from both methods of measurement.

### The present research

The goal of the current research was to develop and initially validate a direct multi-item saudade instrument, the Porto Saudade Scale (PSS). There are a number of implicit (indirect) measures (De Houwer & Moors, 2010), such as the implicit association test, based on reaction time (Nosek et al., 2009). De Houwer, Teige-Mocigemba, Spruyt, and Moors (2009) defined an implicit measure as “a measurement outcome that is causally produced by the to-be-measured attribute in the absence of certain goals, awareness, substantial cognitive

resources, or substantial time” (p. 350). According to De Houwer and Moors (2010) direct measures are characterized by two properties: (1) the measurement outcome derives from a self-assessment by the respondent, and (2) the target of the self-assessment is the attribute that the measurement outcome is assumed to capture. These authors suggested that if a measure does not have both properties, it can be considered an indirect. As in the current paper, we plan to assess saudade characterized with both properties; the measure can be considered as a direct measure.

Saudade can be assessed at trait and state levels. Saudade can be an overall disposition to feel it, and a disposition that manifests itself in most circumstances of life. Saudade as a state, by contrast, only applies to particular circumstances (e.g., a particular person, location, or period of time). The PSS intends to assess saudade as a trait in a variety of contexts.

The development of this novel measure was grounded on classic measurement theory. It assumes that “although a single global question is simple to use and acceptable in assessment of subjective reactions rather than in evaluations of objective phenomena, multi-item measures—even if uni-dimensional—are more stable, reliable, and precise” (Carmel, 2017, p. 291).

The objectives of this research are four-fold:

- (1) The first objective is to scrutinize the internal structure of the PSS among Portuguese adolescents. To achieve this several analyses will be conducted, including item, exploratory, and confirmatory factor analyses. Factor analyses are linked to the assessment of the construct validity of scales (Thompson & Borrello, 1992). Our expectation is that the scores on the PSS items will result in a single underlying dimension.
- (2) The second objective is to analyze the reliability of the PSS. To accomplish this, we will assess Cronbach’s  $\alpha$ , composite reliability, and corrected item-factor correlations. Values of CR and  $\alpha$  higher than 0.70 are indicated as adequate (Hair, Black, Babin, & Anderson, 2010).
- (3) The third objective is to assess the validity of the PSS. In order to achieve this, we will assess the convergent validity (by means of the average variance extracted and by examining the associations with other measure of saudade), and the discriminant validity (by exploring correlations with variables that are conceptually distinct) of the PSS.
- (4) The fourth objective is to test the external validity of the PSS. In order to achieve this, we will assess the psychometric characteristics of the PSS in a Brazilian sample.

Furthermore, since previous research has shown that women report more experience of saudade than men (Neto & Mullet, 2020c), we also examine the relation between gender and PSS among adolescents. Since women feel more connected to close relationships than men (e.g., de Ridder, 2000), they might be more comfortable reporting saudade.

In order to accomplish these objectives three studies were conducted. In the first one, EFA was applied to a set of five items devised from previous research (Neto, 2019; Neto & Mullet, 2014). The sample group was Portuguese adolescents. In the second one, the unidimensional factor evidenced in Study 1 was analyzed with CFA, using another Portuguese sample of adolescents. The scores from this new measure were then correlated with measures to assess convergent and discriminant validities. Finally, in the third study, a sample of international students from Brazil will be examined whether the adequate psychometric characteristics of the PSS found in the two previous studies can be generalized to this population.

### Study 1

In the first study, we examined the internal structure of the PSS and its internal consistency among adolescents. Adolescence is characterized by profound changes in the social domain (Steinberg & Morris, 2001). According to Erikson's theory of individual development, people at younger ages tend to highly prize friendships, close intimate relations, and personal identity (Conway & Holmes, 2004). Hence, it is not surprising that feelings of saudade are particularly present during adolescence. In fact, it has been shown that the experience of saudade was more frequent among adolescents than among adults (Neto & Mullet, 2020b). Our expectations were that PSS scores would display a single-factor structure and good internal consistency. Furthermore, it was expected that girls would report higher saudade than boys.

### Method

#### Sample

The participants were 180 adolescents (92 girls and 88 boys). Their ages ranged from 14 to 18 ( $M = 16.26$ ;  $SD = .98$ ), and they were students in the 10th to 12th grades. All respondents self-reported their nationality as Portuguese.

#### Measures

**Porto Saudade Scale (PSS)** In a previous study, we used two items to assess saudade (Neto, 2019). In the present study, we have added three other items based on previous research (Neto & Mullet, 2014). Therefore, the PSS is composed of five statements that measure the frequency at which an individual feels saudade, and thus

constitutes a direct measurement of saudade proneness (see Table 1). Short scales, often discussed as containing three to eight items, are recommended by researchers (Burisch, 1997), and the PSS falls within these boundaries. Responses ranged from 1 ("very rarely") to 7 ("very often"). Higher scores reflect higher saudade proneness.

#### Demographic questions

Participants provided information regarding their gender, age, grade in school, and nationality.

#### Procedure

Contacts were made with public schools in the district of Porto for the purpose of obtaining authorization for the application of the survey. Once our study was approved by the schools, a consent form requesting parental permission for participation in the survey was obtained from all the participating students. All respondents in this study participated voluntarily. A trained researcher, a class teacher, or both were present to answer questions. Respondents filled out the questionnaire in a classroom environment. The anonymity of the respondents was assured. This process is in accord with the Helsinki Declaration.

#### Data analysis

The factor validity of the PSS was analyzed using EFA. Then, Cronbach's  $\alpha$  was used to evaluate internal consistency of the measure. ANOVA was used to show a potential gender effect. IBM SPSS statistical software (version 26) was used for data analyses. The criterion for statistical significance was set at .05.

## Results and discussion

### Dimensionality

For the purpose of testing the sample's suitability for EFA, Kaiser-Meyer-Olkin's (KMO) measure of sample adequacy was evaluated and Bartlett's sphericity test was conducted (Tabachnick & Fidell, 2007). They showed that the statements had enough common variance for EFA. Bartlett's test was significant, with  $\chi^2(10) = 358.88$ ,  $p < .001$  confirming homogeneity of variances (Watson, 2017). The value of the KMO was .81, higher than the recommended .60 (Field, 2017). These findings indicate factorability and support for conducting an EFA using all five items.

The inter-item correlation matrix was subjected to a principal-component analysis. A single factor appeared (eigenvalue  $> 1$ ), explaining 61.3% of the variance. Table 2 presents the loadings of the PSS items.

### Reliability and descriptive statistics

For the purpose of assessing internal consistency of the PSS scores, Cronbach's  $\alpha$  and item-total correlations for

**Table 1** Original version in Portuguese and English translation for the Porto Saudade Scale

Items of the original version of the PSS in Portuguese	Translation of the items of the PSS in English
Item 1: Quantas vezes sente saudade? Muito raramente—Muito frequentemente	Item 1: How often do you feel saudade? Very rarely—very frequently
Item 2: Quantas vezes se recorda de ter sentido saudade? Muito raramente—Muito frequentemente	Item 2: How often do you remember of feeling saudade? Very rarely – Very frequently
Item 3: Até que ponto fala sobre o que o(a) faz sentir saudade? Muito raramente—Muito frequentemente	Item 3: To what extent do you talk about what makes you to feel saudade? Very rarely—very frequently
Item 4: Até que ponto sente saudade? Uma ou duas vezes por ano/Uma vez em cada dois meses/Uma ou duas vezes por mês/Cerca de uma vez por semana/Cerca de duas vezes por semana/Três a quatro vezes por semana/Pelo menos uma vez por dia	Item 4: To what extent do you feel saudade? Once or twice a year/once every couple of months/once or twice a month/approximately once a week/approximately twice a week/ Three to four times a week/at least once a day
Item 5: Com que frequência sente saudade em comparação com outras pessoas? Muito menos frequentemente—Muito mais frequentemente	Item 5: How often do you feel saudade in comparison with other people? Much less frequently—much more frequently

each item were calculated. The  $\alpha$  score for the PSS was good (.84). The  $\alpha$  of the remaining scale (when the item was removed) was higher than .75. The corrected total item correlations revealed scores from .48 to .73 (see Table 2). The average inter-item  $r$  (homogeneity) for the PSS item set was adequate at .51. Thus, these results lend support to good internal consistency.

The mean score of the PSS was 4.44 (SD = 1.44). This finding indicates that the level of saudade was slightly high, and higher than the neutral midpoint of 4.00 ( $t = 4.11$ ,  $df = 179$ ,  $p < .001$ ). In line with our expectation, boys ( $M = 4.16$ ,  $SD = 1.48$ ) and girls ( $M = 4.71$ ,  $SD = 1.36$ ), [ $F(1, 179) = 6.92$ ,  $p < .01$ ,  $\eta^2 = .037$ ] reported significant differences on the PSS scores. More particularly, boys’ scores on the PSS were significantly lower than girls’ scores. Age was unrelated to saudade ( $r = -.12$ ,  $p > .05$ ).

**Study 2**

In the second study, we analyze whether the single-factor structure identified in Study 1 through EFA is replicated by conducting a confirmatory factor analysis. In addition, the psychometric properties of the PSS will be assessed through reliability and validity tests. The convergent validity will be tested by means of the average variance extracted and by correlating PSS score with

a self-labeling item of saudade. In order to evaluate the discriminant validity, we will examine the relationships of the PSS scores with subjective well-being (SWB; satisfaction with life, positive affect, negative affect), mental health syndromes (depression, anxiety, and stress), and emotional intelligence.

**Method**

**Sample**

Two hundred and forty-seven adolescents (42% male and 58% female) took part in this study. Their average age was 16.40 years (SD = 1.1; range of 14–20) and were students in the 10th to 12th grades. All participants self-reported their nationality as Portuguese.

**Measures**

The instruments included the PSS already described above in Study 1, and the following scales previously adapted to Portuguese populations.

**Satisfaction with Life Scale (SWLS)** The SWLS (Diener, Emmons, Larsen, & Griffin, 1985) comprises five statements (e.g., “The conditions of my life are excellent”). Response options ranged from 1 (strongly disagree) to 7 (strongly agree). Reliability and validity of the

**Table 2** PSS items, intercorrelations among the items, structure coefficients, and item-reminder correlations

Items	1	2	3	4	5	Factor Loadings	Corrected item-total correlations
1 How often do you feel saudade?	-					.84	.70
2 How often do you remember of feeling saudade?	.67*	-				.84	.72
3 To what extent do you talk about what makes you to feel saudade?	.38*	.46*	-			.65	.48
4 To what extent do you feel saudade?	.50*	.53*	.29*	-		.73	.56
5 How often do you feel saudade in comparison with other people?	.66*	.58*	.50*	.53*	-	.84	.73

$n = 180$ . PSS Porto Saudade Scale

\* $p < .001$

Portuguese adaptation of the SWLS was adequate (Neto, 1993, 1995). In this sample, Cronbach alpha was .84.

**The Positive and Negative Affect Schedule (PANAS)**  
The PANAS includes 20 items, 10 evaluating positive affect (PA), and ten evaluating negative affect (NA) (Watson, Clark, & Tellegen, 1988; Simões (1993). Cronbach’s alpha was .83 and .80, respectively.

**The Depression Anxiety and Stress Scale-21 (DASS-21)**  
The DASS-21 (Lovibond & Lovibond, 1995; Pais-Ribeiro, Honrado, & Leal, 2004; Szabó, 2010) includes 21 items. Each subscale targets common forms of psychological pathology with seven items (depression, anxiety, and stress). Cronbach’s  $\alpha$  was .85, .81, and .86, respectively.

**The Wong and Law Emotional Intelligence Scale (WLEIS)**  
The WLEIS includes sixteen items and four subscales with four items each: Self Emotional Appraisal (SEA), Others’ Emotion Appraisal (OEA); Regulation of Emotion (ROE); and Use of Emotion (UOE) (Carvalho, Guerrero, Chambel, & González-Rio, 2016; Rodrigues, Rebelo, & Coelho, 2011; Wong & Law, 2002). In this sample, Cronbach’s alphas for the four subscales were SEA .81; OEA .81; ROE .85; UOE .83.

**Self-labeling item of saudade**  
Additionally, one direct general question on the inclination to feel saudade was asked: “How prone are you to feel saudade?” Answer options ranged from 1 (“not at all”) to 7 (“very much”).

Socio-demographic data were also gathered, including age, gender, grade in school, and nationality.

**Procedure**

The procedure was the same as used in Study 1.

**Data analysis**

Descriptive statistics (mean [M], standard deviation [SD], skewness [SK], and kurtosis [KU]) were calculated for all items. Confirmatory factor analyses (CFA) has been estimated and tested to analyze the factor structure of the PSS. First, a one-factor CFA model was estimated for the whole sample. Model plausibility was assessed using several fit indices. The goodness-of-fit indices used included: the chi-square statistic; the comparative fit index (CFI); the root mean squared error of approximation (RMSEA); and the standardized root mean square residual (SRMR). The cut-off criteria that were utilized are those in Hu and Bentler (1999): a CFI of at least 0.90, and a RMSEA and SRMR of less than 0.08 together would denote a good fit.

Internal consistency of the PSS was evaluated by CR (composite reliability) and  $\alpha$ . The AVE (average variance

extracted) was calculated to assess convergent validity (Fornell and Larker (1981). Values of AVE equal to or higher than .50 were judged to evidence convergent validity (Marôco, 2014). The analyses were performed through IBM SPSS and AMOS (version 26.0).

**Results and discussion**

**Item-level analyses**

The items’ distributional properties, summary measures, skewness (Sk), and kurtosis (Ku) for the five items of PSS are shown in Table 3. No strong deviation from normal distribution was found, as the items displayed absolute values of skewness lower than 1 and kurtosis lower than 2 (Schumacker & Lomax, 2004). On the other hand, Mardia’s multivariate kurtosis for the five items of PSS was 2.68 ( $p < .001$ ). According to previous research (Kline, 2005), these values show no strong deviation from normal distribution, thus assuring that they do not compromise CFA results.

**Dimensionality**

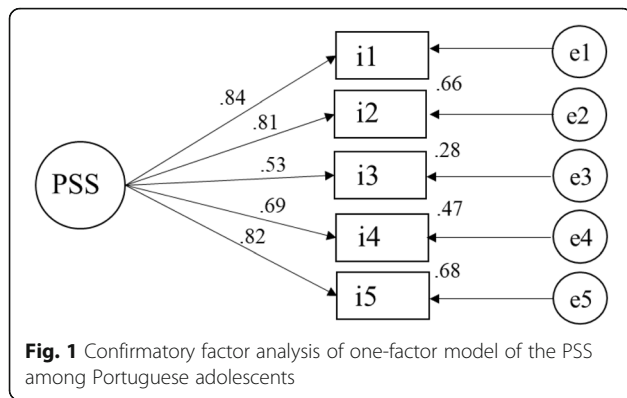
To examine construct validity of the PSS measure we performed a CFA, with maximum likelihood estimation and mean structure analysis based on the data from the Study 1 model. Figure 1 presents the graphic representation of the unifactorial latent structure. This one-factor structure fit the data well:  $\chi^2 = 12.52$ ,  $df = 5$ ,  $p = .01$ , CFI = 0.99; GFI = 0.98; RMSEA = 0.07 [IC90% 0.023–0.13], SRMR = 0.03. Standardized factor loadings ( $\lambda$ ) of the items ranged from 0.53 to 0.84, and all were statistically significant ( $p < 0.01$ ) with a mean value of .74, which exceeds the recommended cut-off of .70 (Hair et al., 2014, b). This provides support that all items were reasonable indicators of their respective latent factor.

**Reliability**

From the found factorial solution, the composite reliability was calculated, indicating high reliability (.86). In addition,  $\alpha$  and item-total correlation for each item was calculated. The  $\alpha$  (.85) for the PSS score was satisfactory, also supporting the reliability of the PSS scale. The values of corrected item-total correlations ranged from .46 to .75. The mean inter-item correlation coefficient was .52. Therefore, these results show adequate

**Table 3** PSS’s items: descriptive statistics

PSS’s items	M	SD	SEM	Min	Max	Mode	Sk	Ku
Item 1	5.15	1.71	.06	1	7	3	-.25	-.61
Item 2	5.15	1.59	.06	1	7	3	-.11	-1.51
Item 3	3.86	2.08	.05	1	7	4	-.08	-1.25
Item 4	4.37	2.20	.06	1	7	4	-.52	-.71
Item 5	4.48	1.77	.06	1	7	4	-.56	-.76



reliability for the current sample. Hence, it is possible to proceed and test convergent validity of the PSS.

**Convergent validity and discriminant validity**

The AVE was used to test convergent validity. The AVE for the PSS was .56. This result suggests an acceptable convergent validity evidence for PSS. We conducted a bivariate correlational analysis between the PSS and all study variables. A single self-report of constructs has been utilized in past research to validate scales (e.g., Hughes, Waite, Hawley, & Cacioppo, 2004). A self-labelling item of saudade was also used in this study and found a significant large correlation with the PSS score ( $r = .52, p < .001$ ) according to Cohen’s (1988) guidelines. This association also supports the convergent validity of the PSS.

Several indicators of subjective well-being, mental health, and emotional intelligence were used to evaluate the discriminant validity of the PSS. The PSS scores presented small positive associations with negative affect ( $r = .15, p < .05$ ), stress ( $r = .18, p < .01$ ), anxiety ( $r = .20, p < .01$ ), depression ( $r = .18, p < .01$ ), self-emotion appraisals ( $r = .15, p < .05$ ), others’ emotion appraisals ( $r = .22, p < .01$ ), and no significant correlations with satisfaction with life ( $r = .02, p > .05$ ), positive affect ( $r = .08, p > .05$ ), regulation of emotion ( $r = -.10, p > .05$ ), use of emotion ( $r = .06, p > .05$ ). These results are favorable to the discriminant validity of the PSS.

The mean score of the PSS was 4.58 (SD = 1.46). This finding indicates that the level of saudade was slightly high, and higher than the neutral midpoint of 4.00 ( $t = 6.25, df = 246, p < .001$ ). As expected, boys ( $M = 4.15, SD = 1.44$ ) and girls ( $M = 4.89, SD = 1.39$ ), [ $F(1, 246) = 16.73, p < .001, \eta^2 = .064$ ] reported significant differences on the PSS scores. More particularly, boys’ scores on the PSS were significantly lower than girls’ scores. Age was unrelated to saudade ( $r = -.02, p > .05$ ).

In summary, the uni-dimensional factor structure of the PSS suggested in Study 1 was also found in Study 2, which indicates that the 5-item saudade scale has good construct validity. The composite reliability and Cronbach’s alpha were adequate. This structure was modestly

associated with subjective well-being, mental health, and emotional intelligence constructs, which suggests its discriminant validity.

**Study 3**

The main goal of this study is to test the external validity of the PSS, by examining its reliability and validity in a sample of Brazilian international students (IS). International student sojourners are individuals who leave their home countries to pursue academic careers in another country for a temporary period (Safdar & Berno, 2016). Saudade is one of the challenges that IS may encounter when they leave home (Wilks & Neto, 2016).

Recently, Portugal has attracted an increasing number of IS. In the 2000/2001 academic year the proportion of IS attending Portuguese institutions of higher education was 3%. In 2016/2017, there were 41,997 IS enrolled in higher education in Portugal, representing 11.6% of the higher education student enrollment (Direcção Geral de Estatística de Educação e Ciência, 2016). In that academic year, Portuguese higher education received 179 different nationalities. Half of the IS were from Lusophone countries (50.3%) and close to a third (34.5%) from the European Union. In the 2016/2017 academic year, the most IS were from Brazil (28.9%), followed by Angola (8.6%), Spain (8.2%), Cape Verde (6.4%), Italy (6.1%), and Germany (3.9%).

It is expected that the PSS will demonstrate additional evidence regarding its psychometric characteristics in Brazilian IS. Besides the reliability and dimensionality of the PSS, the convergent validity will be tested by means of the average variance extracted and by correlating PSS score with a self-labeling item of saudade. In order to evaluate the discriminant validity, we will examine the relationships of the PSS scores with subjective well-being (satisfaction with life, positive affect, negative affect).

**Method**

**Sample**

The sample comprised 183 international students from Brazil. Sixty-four percent were women and 36% were men. Their average age was 24.70 years (SD = 5.59; range of 18–40). The average length of residence in Portugal was 14.39 months (SD = 13.55). All participants self-reported their nationality as Brazilian.

**Measures**

The instruments included the PSS, the SWLS, the PANAS, and the self-labeling item of saudade already describe above.

Socio-demographic data were also gathered, including age, gender, nationality, and length of stay. We used the total number of months as a measure for lengths of stay.



**Procedure**

A convenience sample of Brazilian college students was recruited by a Brazilian trained research assistant in the city of Porto. The research conformed to current legal and ethical norms in the country. Informed consent was obtained, and full anonymity was guaranteed. After completion of the survey, all participants' questions were addressed.

**Data analysis**

The data analysis was identical to that used in Study 2.

**Results and discussion**

The items' distributional properties showed no strong deviation from normal distribution, thus assuring that they do not compromise CFA results.

**Dimensionality**

Figure 2 presents the graphic representation of the unifactorial latent structure. This one-factor structure fit the data well:  $\chi^2 = 9.93$ ,  $df = 5$ ,  $p = .08$ ,  $CFI = 0.99$ ;  $GFI = 0.98$ ;  $RMSEA = 0.07$  [IC90% 0.00–0.138],  $SRMR = 0.03$ . Standardized factor loadings ( $\lambda$ ) of the items ranged from 0.67 to 0.91, and all were statistically significant ( $p < 0.01$ ) with a mean value of .78. This provides support that all items were reasonable indicators of their respective latent factor.

**Reliability**

The composite reliability was calculated, indicating high reliability (.89). In addition,  $\alpha$  and item-total correlation for each item was calculated. The  $\alpha$  (.90) for the PSS score was satisfactory, also supporting the reliability of the PSS scale. The values of corrected item-total correlations ranged from .63 to .84. The mean inter-item correlation coefficient was .64. Therefore, these results show satisfactory reliability for the current sample.

**Convergent validity and discriminant validity**

The AVE was used to test convergent validity. The AVE for the PSS was .62. This result suggests an acceptable

convergent validity evidence for PSS. A self-labelling item of saudade was also used in this study and found a significant very large correlation with the PSS score ( $r = .75$ ,  $p < .001$ ) according to Cohen's (1988) guidelines. This association supports the convergent validity of the PSS. Indicators of subjective well-being were also used to evaluate the discriminant validity of the PSS. The PSS scores presented no significant associations with satisfaction with life ( $r = .11$ ,  $p > .05$ ), negative affect ( $r = .03$ ,  $p > .05$ ), and positive affect ( $r = .02$ ,  $p > .05$ ). These results are favorable to the discriminant validity of the PSS in this sample.

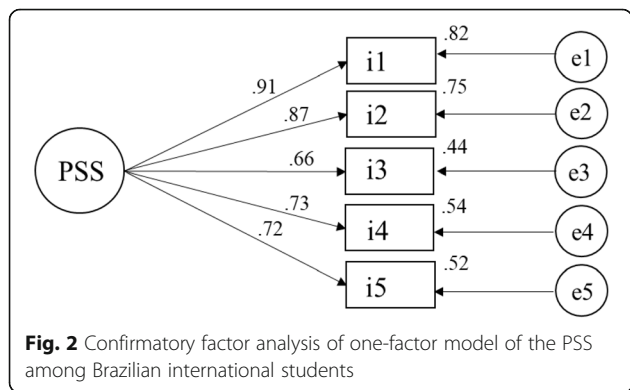
The mean score of the PSS was 4.65 (SD = 1.48). This finding indicates that the level of saudade was slightly high, and higher than the neutral midpoint of 4.00 ( $t = 5.93$ ,  $df = 182$ ,  $p < .001$ ). As expected, male college students ( $M = 4.30$ ,  $SD = 1.47$ ) and female college students ( $M = 4.85$ ,  $SD = 1.46$ ), [ $F(1, 182) = 6.01$ ,  $p < .05$ ,  $\eta^2 = .032$ ] reported significant differences on the PSS scores. More particularly, men's scores on the PSS were significantly lower than women's scores. Results also showed that sojourners' length of residence in the host country was negatively correlated with the level of saudade ( $r = -.22$ ,  $p < .01$ ). More specifically, Brazilian college students with lower length of residence reported higher levels of saudade. Similar results were found among Portuguese migrants living in Switzerland: the longer time they spent abroad, the less saudade they felt (Neto, 2019). Age was unrelated to saudade ( $r = -.07$ ,  $p > .05$ ).

**General discussion**

This paper intended to describe the development and the preliminary validation of a novel instrument to evaluate saudade, the Porto Saudade Scale. The current study supported adequate psychometric characteristics of the PSS as a direct and trait measure of saudade. The reported findings provided support to the construct validity, reliability, and the convergent, discriminant, and external validities of the PSS. Indicators of reliability and validity met satisfactory standards of measurement.

The EFA revealed a one-factor solution for the PSS. The results of the CFA indicated that the one-dimensional model showed appropriate goodness-of-fit indices. We assessed the reliability of the PSS through internal consistency procedures. As expected, it was demonstrated that the PSS has good internal consistency. However, the level of internal consistency was not so high as to indicate any redundancy in the contribution of each statement to the whole instrument.

Convergent validity of the PSS was established by way of a large or very large correlation (Cohen, 1988) between the PSS score and one item measuring the proneness to feel saudade. Discriminant validity was evaluated correlating the PSS scores with well-established



measures of SWB, mental health, and emotional intelligence. The PSS scores showed low positive correlations with negative affect, stress, anxiety, depression, self-emotion appraisals, others' emotion appraisals, and no significant correlations with satisfaction with life, positive affect, regulation of emotion, and use of emotion among Portuguese adolescents. No significant associations were found between the PSS scores and subjective well-being among Brazilian international students. These low correlations provide support for the discriminant validity of the PSS. The external validity of the PSS was demonstrated as its psychometric characteristics were adequate in a Brazilian sample.

The mean scores were significantly higher than the neutral score, which suggests a norm of general saudade in these samples. Our expectation was that females would report higher levels of experienced saudade than males (Neto & Mullet, 2020a, 2020b, 2020c). This expectation was well supported by the data. Although significant in all the analyses performed, the female-male difference was small. The finding was consonant with de Ridder's (2000) results reported above. It was also consonant with Pavot and Diener's (2008) results evidencing that in general women report more negative affect than men. However, gender differences may also vary according to the specific relationship (i.e., with peers, family, or romantic partner) in which saudade is experienced. Future research should examine relationship-specific types of saudade. Further research is also needed to compare the findings resulting from direct (PSS) and indirect (ESS) methods of saudade's measurement.

Like all studies, this one has its limitations. First, Russell et al. (1980, p. 479) have noted that "the validity of a measure is never proven"; so, it is necessary to learn more about the validity of the PSS, in particular, by future exploration of incremental validity. Second, the samples were relatively small, and replicating this on larger samples would allow for more confidence in the findings. In this regard, we suggest that future investigations address this issue by including participants of different age groups, namely elderly people. Further studies are needed which take into account more heterogeneous features of the participants to increase the external validity of the results obtained here. Third, notwithstanding that the PSS has displayed adequate levels of reliability and validity, the implementation of self-report measures may generate socially desirable responses. Finally, the PSS was completed at a single time-point and whether the measure shows test-retest reliability is unknown.

Despite these limitations, this study reports that the scale displays good internal consistency, adequate one-dimensional structure, a relationship with another measure of the construct, weak empirical relationship with other constructs. In this sense, the results contribute to

the scarce literature concerning saudade measurements with valid and reliable evidence.

The PSS is a brief psychometrically sound instrument, therefore enhancing its practicality in survey research. This measure focuses on dispositional (trait-level) proneness to saudade. It can be widely used to directly assess saudade for both research purposes and for clinical applications. For some people, the experience of saudade is mainly negative and they really suffer from it. One avenue of research would therefore be to explore whether drawing these people's attention to the positive aspects of the experience by means of a particular device would not succeed in alleviating depression and psychosomatic symptoms. Replicated administrations of the PSS can be used to follow up changes in saudade across practical interventions, the life span or in the acculturation of migrant people. Although the PSS has only been used in research with adolescents and young adults, it is reasonable to think that it can be used with a broad range of people, including adults and the elderly.

#### Acknowledgements

Not applicable

#### Author's contributions

The author(s) read and approved the final manuscript.

#### Funding

This work was funded by the Foundation for Science and Technology Portugal (CPUP UIDB/00050/2020).

#### Availability of data and materials

Not applicable. The dataset supporting the conclusions of this article will not be shared; all available data is included within the article.

#### Competing interests

The author declares that he has no competing interests.

Received: 20 August 2020 Accepted: 11 January 2021

Published online: 04 February 2021

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