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Psychometric Properties and Latent Structure of the Portuguese Version of the Penn State Worry Questionnaire

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Two studies evaluated the psychometric properties and the latent structure of the Portuguese version of the Penn State Worry Questionnaire (PSWQ) in a large Brazilian college student sample. Results indicated that PSWQ had an adequate internal consistency. Exploratory factor analyses yielded a two-factor solution. One factor was related to the worry presence and incorporated all the non-reversed items. The other factor was associated to worry absence and incorporated all the reversed items. Confirmatory factor analysis leaded to a three-factor solution. One factor included all the PSWQ items whereas the two other factors were linked to the reversed and non-reversed worded items. Correlations coefficients of these two reversed and non-reversed factors with the total scores of the PSWQ and the trait form of the State-Trait Anxiety Inventory suggest that PSWQ has a single meaningful construct.
Keywords: Penn State Worry Questionnaire, psychometric properties, factor structure, exploratory factor analysis, confirmatory factor analysis.

Dos estudios evaluaron las propiedades psicométricas y la estructura latente de la versión portuguesa del Penn Worry State Questionnaire (PSWQ) en una muestra de gran tamaño de estudiantes universitarios de Brasil. Los resultados indicaron que el PSWQ tenía una adecuada consistencia interna. Un análisis factorial exploratorio ofreció una solución de dos factores. Un factor estaba relacionado con la presencia de preocupación e incluía todos los ítems no invertidos. El otro factor estaba asociado a la ausencia de preocupación e incluía todos los ítems invertidos. Un análisis factorial confirmatorio condujo a una solución de tres factores. Un factor incluía todos los elementos del PSWQ mientras que los otros dos factores estaban relacionados con los ítems redactados de forma directa e inversa. Los coeficientes de correlación de estos dos factores (de los ítems invertidos y no invertidos) con las puntuaciones totales del PSWQ y la versión rasgo del Inventario de Ansiedad Estado-Rasgo (STAI) sugieren que un único constructo subyace a la estructura del PSWQ.
Palabras clave: Penn State Worry Questionnaire, propiedades psicométricas, estructura factorial, análisis factorial exploratorio, análisis factorial confirmatorio.

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Worry can be defined as a cognitive component of anxiety reaction that prepares the person for future risk. It involves the processing and organization information to deal with future threatening situation. Although it is generally experience as an unpleasant experience, worry has an adaptive function in the sense that it can improve task performance as well as cognitive planning to cope with environmental threats (Borkovec, 1994; Mathews, 1990). However, excessive and uncontrollable worry thoughts and images about possible negative events in the future characterizes a pathological functioning in all anxiety disorders (Barlow, 2002; Borkovec, Robinson, Pruzinsky & Depree, 1983) and constitutes the main feature of generalized anxiety disorder (GAD, American Psychiatry Association, 1994).

The worry construct has received considerable attention since the diagnosis of GAD shifted from a residual category in the DSM-III (American Psychiatry Association, 1980) to an independent anxiety disorder type in the 4th edition of the DSM (American Psychiatry Association, 1994). According to the DSM-IV, worry is generally associated with several symptoms such as muscle tension, feeling tired and restless, concentration difficulties and irritability. These worries are generally associated to impairments in academic, social, or personal functioning and related to multiple domains or activities. In order to be considered a pathological feature of GAD, worry must occur more days than not for a period of at least 6 months.

The Penn State Worry Questionnaire (PSWQ) is one of the most popular self-reported measures of worry. This instrument evaluates worry intensity independently of its content. It was originally developed by Meyer, Miller, Metzger and Borkovec (1990) and consists of a Likert-type scale ranging from 1 (not at all typical for me) to 5 (very typical for me). Eleven items are worded in a positive form (e.g. "I have been worrier all my life") whereas 5 items in a negative form (e.g. "I do not tend to worry about thing"). The scores of these five items are then reversed so that the entire 16 items can be summed to produce a final score to indicate the amount of worry. The total PSWQ scores may range between 16 and 80. The higher the score, the more intense the worry level.

Several reports showed that PSWQ has a high positive correlation with other self-reported measures of worry (Beck, Stanley & Zebb, 1995; Davey, 1993; van Rijsoort, Emmelkamp & Vervaeke, 1999). Moreover, PSWQ appears to be a useful screening device for GAD with high sensitivity and specificity parameters (Behar, Alcaine, Zuellig & Borkovec, 2003). In fact, there are reports indicating that PSWQ scores can discriminate GAD from other anxiety disorders among child and adolescents (Chorpita, Tracey, Brown, Collica & Barlow, 1997), adults (Brown, Antony & Barlow, 1992; Fresco, Heimberg, Mennin & Turk, 2002) and in elderly patients (Beck et al. 1995). Finally, it has been also shown that PSWQ can be employed as a monitor device to indicate changes in worry as a function of psychotherapy (Borkovec & Costello, 1993; Stanley, Novy, Bourland, Beck & Averill, 2001; Stöber & Bittencourt, 1998).

The PSWQ has received considerable psychometric support. For example, PSWQ presents high internal consistency among GAD patients (Beck et al., 1995) as well as among non-clinical samples of different classes of populations including undergraduate students (Myer et al., 1990), community subjects (Pallesen, Nordhus, Carlstedt, Thayer & Johnsen, 2006), older adults (Crittendon & Hopko, 2006; Hopko et al., 2003) and African-American and white-Americans college students (Carter et al., 2005). Furthermore, there are evidences indicating that the PSWQ presents high test-retest reliability over long periods of time such as 8 to10 weeks (Meyer et al., 1990; Molina & Borkovec, 1994).

Despite its wide psychometric support, there are still some controversies about the latent structure of the PSWQ. Initial exploratory factor analysis (EFA) of clinical (Brown et al., 1992; Fortune, Richards, Griffiths & Main, 2005) and non-clinical (Meyer et al., 1990) samples, indicated that the PSWQ latent structure is consisted with a unidimensional measure of worry. However, later factor analyses studies leaded to a two-factor solution (Carter et al., 2005; Hopko et al., 2003; Olatunji, Schottenbauer, Rodriguez, Glass & Arnkoff, 2007). Typically, the first factor incorporates the 11 items worded in a positive form, whereas the second factor comprises the five items written in a reverse form. This two-factor solution has been traditionally interpreted as a bidimensionality nature of the PSWQ. One dimension would be related to the measurement of the presence of worry whereas the other dimension would be associated with the measurement of absence of worry.

Recently, the worry absence factor has been questioned as a conceptually distinct worry dimension of the PSWQ. Confirmatory factor analysis (CFA) studies raised the possibility that this PSWQ factor, which incorporates all the reversed items, might represent an artifact or a method effect associated with response styles to the wording of these items (Brown, 2003; Hazlett-Stevens, Ullman & Craske, 2004; Hopko et al., 2003). In all these studies, a single structure of the PSWQ has been forwarded based on the fact that the second factor reflects a methodological artifact due to the reversal nature of the items, as opposed to a genuine underlying factor of the scale.

The PSWQ has been translated to other languages such as Spanish (Sandín, Chorot, Santed, Jiménez & Romero, 1994; Diaz, 2000; Nuevo, Montorio & Ruiz, 2002), Italian (Meloni & Gana**,** 2001), French (Gosselin, Dugas, Ladouceur & Freeston, 2001; Gana, Martin, Canouet, Trouillet & Meloni, 2002), German (Stöber, 1998), Dutch (van Rijsoort, Emmelkamp & Vervaeke, 1999) and Norwegian (Pallesen et al., 2006). These studies also indicate that the PSWQ structure remains unclear.

For example, results from a sample from Spanish subjects lead to a single factor structure of the PSWQ (Sandín et al., 1994) whereas results from a Peruvian sample lead to two-factor solution (Diaz, 2000). A two-factor solution has been also found in the French (Ladouceur, et al., 1992) and Dutch (van Rijsoort, Emmelkamp, & Vervaeke, 1999) versions of the PSWQ. Finally, methodological artifact due to the wording nature of the reversed items has been also found in the Spanish (Nuevo, Montorio & Ruiz, 2002), French (Gana et al., 2002), Italian (Meloni & Gana, 2001), German (Stöber, 1998) and Norwegian (Pallesen et al., 2006) versions of the PSWQ.

The PSWQ has not been yet translated into Portuguese. Therefore, the main purpose of the present study was to investigate the internal consistency and the factor structure of the Portuguese version of this questionnaire in a sample of college students from Brazil. Since this was the first attempt to examine its factor analytic structure, an initial study employed an exploratory instead of a confirmatory factor analysis to determine its latent structure. In a second study, a CFA was used to investigate eventual artifact factors due to methodological procedures associated to the reversed nature of the item, as it has been reported in the literature.

Study 1

Method

Participants

The sample consisted of 871 undergraduate students from different Universities of Rio de Janeiro ranging from 17 to 68 years of age ($M = 23.41$; $SD = 5.8$). The sample included 432 men (49.6%) with a mean age of 23.65 ($SD = 5.76$) and 439 women (50.4%) with a mean age of 23.18 ($SD = 5.85$).

Measures

Developing the Portuguese version of the PSWQ.

Two translators convert the original version of the PSWQ to Portuguese. Linguistic equivalence of this PSWQ version was assessed by translating it back into English by two other translators who had not seen the original version of the PSWQ. This back translation was then compared to the English original PSWQ by two of the authors. This analysis, which took into consideration linguistic and semantic equivalence between translations, resulted in several corrections and eventually leads to the first version of the Portuguese version of the PSWQ. Face validity of this first version was performed by a group of one psychologist and one psychiatrist bilinguals, which reached a final consensus after revising each of the 16 translated items. This second version of the PSWQ was then tested in a pilot sample of 60 subjects. This pilot study indicated that all subjects were able to perfectly understand the scale, so that no more adjustments to the translation were required.

State-Trait Anxiety Inventory – Trait Form (STAI-T).

The STAI-T (Spielberger, Gorsuch & Lushene, 1970), which was translated to Portuguese and validated for Brazilian population by Biaggio and Natalício (1979), was employed to evaluate general anxiety level of the subjects. The scale contains 20 items which measures the stable propensity (trait) to deal with anxiety. Excellent psychometric properties of the Portuguese version of the STAI-T have been reported among Brazilian college students (Andrade, Gorenstein, Vieira, Tung & Artes, 2001).

Procedure

All subjects were administered both instruments in a group setting during regular classes. Students were asked to voluntarily answer a set of questionnaires in their classroom at the beginning of their regular classes. Before distribution of the instruments, subjects were informed on the research nature of the project and all agreed to participate. Both instruments were distributed together but it was asked that the PSWQ should be answered first. There was no time limit to complete the questionnaires. Subjects took between 20 to 30 min to respond all the questionnaires. None of the participants demonstrate difficulties in understanding either the instructions or any of the items. No payment or course credits were offered to the subjects.

Statistical Analyses

One-way ANCOVA (controlling for trait anxiety) was employed to analyze differences in worry between men and women. The overall alpha level was set at .05. Cronbach's alpha for the whole scale, corrected item-total correlations and Cronbach's alpha if the item is deleted were employed to evaluate the scale reliability. Taking into account Nunnally's criteria (Nunnally, 1978), $\alpha \geq .70$ will be defined as "acceptable" and $\alpha \geq .80$ as "good", whereas a criterion of .2 is usually recommended for the corrected item-total correlation (Kline, 1993). The relationship among different variables was evaluated using Pearson's correlation coefficients and the Bonferroni´s correction (Bonferroni, 1936) in the correlational analyses in order to control for increased Type I errors. Therefore, a p-value of .008 (.05/6) would be required for significance.

EFA was performed with all the 16 items of the scale. The Bartlett's test of Sphericity (Bartlett, 1954) was calculated to verify if the correlations between the original

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variables are raised the sufficient so that the EFA has utility in the esteem of the common factors. In the test, H_0: $\Pi = I$ versus H_1: $\Pi \neq I$. About $H_{0,}$ this statistics has distribution qui-square with p(p-1)/2 degrees of freedom. H_0 is rejected, when $\chi^2 \geq \chi^2_{1-\alpha;\ p(p-1)/2}$. Initial Kaiser-Meyer-Olkin (KMO) was also performed to evaluate the sampling adequacy to carry out a factor analysis of the 16 PSWQ variables. The KMO value should be greater than .5 for proceed and interpret satisfactorily a factor analysis solution (Tabachnick & Fidell, 2001). Factors were extracted through the principal component extraction with varimax rotation. Factor loadings equal or higher that .3 are generally considered satisfactory (Kline, 1994). Screeplot examination (Cattell, 1966), parallel analysis (Hayton, Allen & Scarpello, 2004) and factor interpretability were employed to determine the number of factors that were extracted. Communalities were also examined in order to evaluate how much variance of each item was accounted for the extracted factor. High communality values indicate that the principal components have extracted a great amount of variance of a particular item. All of the statistical analyses were performed with the statistical package software SPSS 12.0 version for windows.

Results

Descriptive and Reliability Analysis

The mean of the total PSWQ score was 47.37 (*SD* = 9.76). One-way ANCOVA (controlling for trait anxiety) revealed that PSWQ for women (*M* = 48.86; *SD* = 10.14) was significantly higher that those for men (*M* = 45.85; *SD* = 9.12), $F(1,871) = 17.82$; $p < .001$. The internal consistency obtained with the Cronbach's alpha indicated values of .84 for the entire sample and .80 and .86 for the men and women set of data respectively.

Table 1 presents PSWQ individual items scores, SD, corrected item-total correlation coefficients and Cronbach's alphas if the item is deleted. Individual item mean scores ranged from 4.47 for item 10 "I never worry about anything" to 1.95 for item 15 "I worry all the time". The corrected item-total correlation coefficients were around the criterion value of .30, except for item 1 "If I do not have time to do everything, I don't worry about it" and item 11 "When there is nothing more that I can do about a concern, I don't worry about it anymore". These two items with low item-total correlation coefficients are worded in a reverse order and removal of either one from the scale lead to a Cronbach's alpha of .85.

Exploratory Factor Analysis

The Bartlett's test of Sphericity was highly significant (4592.34; $p < .001$), therefore, reject H_0, concluding that the variables are correlated significantly. KMO analysis revealed a value of .85, indicating that the correlation matrix was suitable for factor analysis. Parallel analyses suggested a three-factor solution. However, screeplot examination and interpretability of the factors indicated that a two-factor solution was a much adequate structure in order to explain the data. The loadings for this solution are shown in Table 2. The first factor was responsible for 31.63% of the variance with an eigenvalue of 5.06. This factor was consistent with the interpretation of worry presence since it was composed of all the 11 positively worded items and confirmed its high internal consistency since its Cronbach's alpha was .87. The second factor explained 13.31% of the variance with an eigenvalue of 2.13. This factor was consisted with the worry absence interpretation and incorporated all the negatively worded. Cronbach's alpha for this factor was .67 indicating its low level of internal consistency. Item communalities are depicted in the last column of Table 2. Item 9 "As soon as I finish one task, I start to worry about everything else I have to do" and item 11 "When there is nothing more that I can do about a concern, I don't worry about it anymore" presented slightly low values and therefore might not have strong contributions for factor 1 and 2 respectively.

PSWQ and STAI-T Correlations

The relationship between the two-factor solution for the PSWQ with the total PSWQ and STAI-T scores were obtained by means of Pearson's correlations and the Bonferroni´s correction presented a p-value of .008 (.05/6) for significance. A moderate correlation between total scores of PSWQ and STAI-T was detected ($r = .43$). Factors 1 and 2 had different patterns of correlation with PSWQ and STAI-T total scores. Factor 1 was strongly correlated with PSWQ total score ($r = .94$) while Factor 2 yielded a moderate correlation ($r = .56$). Moreover, Factor 1 was more associated with STAI-T ($r = .43$) than Factor 2 ($r = .15$). Finally, correlation between factor 1 and 2 was low ($r = .21$) reflecting a small overlap between these two factors. All correlation p values were less than .001.

Discussion

EFA of the present version of the PSWQ suggested a two-factor solution closely associated with the worry presence and worry absence interpretation. However, the analysis of the factor loadings provides indirect indications on the contribution of each item to each dimension. The low internal consistency of the worry absence factor as well as its low correlations with the total PSWQ scores might indicate that this factor does not represent a meaningful worry construct. Therefore, it is important to look to other sources of information in order to establish the dimensionality of the PSWQ.

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Table 1

PSWQ mean scores (M) and standard deviation (SD) for individual items, corrected item-total correlation and internal consistency (Cronbach's alpha) if the item is deleted

	Item	*M*	*S.D.*	Corrected item-total correlation	Cronbach's alpha if item is deleted
1.	If I do not have time to do everything, I don´t worry about it. (A falta de tempo para fazer todas as minhas coisas não me preocupa.)	4.00	1.01	.15	.84
2.	My worries overwhelm me. (Minhas preocupações me angustiam.)	2.60	1.18	.59	.82
3.	I do not tend to worry about things. (Não costumo me preocupar com as coisas.)	4.18	0.93	.26	.83
4.	Many situations make me worry. (Muitas situações me causam preocupação.)	2.55	1.10	.60	.82
5.	I know I should not worry about things, but I just cannot help it (Eu sei que não deveria me preocupar com as coisas, mas não consigo me controlar.)	2.46	1.23	.65	.81
6.	When I am in a pressure, I worry a lot. (Quando me encontro sob pressão fico muito preocupado(a).)	2.81	1.24	.55	.82
7.	I am always worrying about something. (Estou sempre preocupado (a) com algo.)	2.24	1.11	.54	.82
8.	I find it easy to dismiss worrisome thoughts. (Desligo-me facilmente das minhas preocupações.)	3.63	1.20	.37	.83
9.	As soon as I finish one task, I start to worry about everything else I have to do. (Ao terminar uma tarefa, começo a me preocupar com as outras coisas que tenho para fazer.)	2.67	1.25	.37	.83
10.	I never worry about anything. (Nunca me preocupo com nada.)	4.47	0.93	.31	.83
11.	When there is nothing more that I can do about a concern, I don´t worry about it anymore. (Não me preocupo com algo, quando já não há mais nada a fazer.)	3.93	1.20	.17	.84
12.	I have been worrier all my life. (Tenho tido preocupações durante toda a minha vida.)	2.27	1.12	.51	.82
13.	I have been worrying about things. (Noto que ando preocupado com as coisas.)	2.54	1.12	.62	.82
14.	Once I start worrying, I cannot stop. (Uma vez que começo a me preocupar, não consigo parar.)	2.05	1.08	.64	.82
15.	I worry all the time. (Fico preocupado o tempo todo.)	1.95	1.18	.32	.83
16.	I worry about projects until they are done. (Preocupo-me com as coisas até que elas estejam concluídas.)	3.02	1.25	.50	.82

In this regard, CFA may be usefully employed in an confirmatory context to further refine the results derived from EFA. Different from EFA, CFA allows restrictions in several important features between the observed items and the latent aspect of the factor. CFA provides fitting parameter that allows comparisons between different models previously defined and collected data. In order to perform a reliable CFA it is important to have different sample from the one which was analyzed through EFA. This was exactly the purpose of the second study.

Study 2

Method

Participants, Measures and Procedure

PSWQ and STAI-T were administered to a second sample composed by 978 college students. Sample characteristics and procedure were similar to those in Study 1. The sample included 459 men (47.0 %) with a

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mean age of 23.68 (*SD* = 6.4) and 519 women (53.0%) with mean age of 23.58 (*SD* = 5.99).

Statistical Analysis

Again, one-way ANCOVA, Cronbach's alpha, corrected item-total correlations, Cronbach's alphas if the item is deleted and Pearson's correlation coefficients were employed as in Study 1. CFA was used to investigate the goodness-of-fit of the present data to the referenced in the literature. Figure 1 presents the path diagram of three models examined. The first model, represented in the top portion of Figure 1, evaluated a one-factor structure of the PSWQ. According to this model, all the 16 items of the PSWQ were loaded onto a single latent variable. The second model, which is represented in the middle portion of Figure 1, tested the hypothesis that the PSWQ is composed by a factor related to the presence of worry and another factor associated to the absence of worry. This two-factor model loaded the 11 positively worded items onto one latent variable and the five negatively worded items onto a second latent variable. Finally, a third model, represented in the bottom portion of Figure 1, tested a possible method effect of both positively and negatively worded items. According to this model, all 16 items were loaded in one latent variable while the 11 positively and the five negatively worded items were loaded in two other independent latent variables.

Because there is no universally accepted fit index to evaluate each of these models, a variety of indices were employed to provide a comprehensive indication of a particular model fit. The chi-square test was conducted to evaluate the sample covariate matrix and the matrix of each model. A large chi-square value and a significant *p*-value ($\leq .05$) indicated a poor fit. However, chi-square is very sensitive to sample size, which makes this index not very attractive (Hu, Bentler & Kano, 1992). Consequently, other measures of model fit insensitive to sample size were also employed. Among these, we choose three incremental fit indices - the Comparative Fit Index (CFI), the Normed Fit Index (NFI) and the Non-Normed Fit Index (NNFI) - and five stand-alone fit indices - the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Residual (SRMR), the Goodness of Fit Index (GFI), the Expected Cross-Validation Index (ECVI) and the Akaike's Information Criterion (AIC).

The GFI is an indication of how much of the variance/covariance is accounted for by the proposed model. Unlike the GFI, the CFI represents the proportionate improvement in model fit by comparing the target model with a baseline null model in which all the observed variables are uncorrelated. Higher values for both of these indices, especially when they are greater than .90, indicate an adequate fit of the model (Bentler, 1990; Hu & Bentler, 1999). The NFI (Bentler & Bonett's, 1980) is a measure of the proportionate improvement in fit (defined in terms of *df* or χ^2) as one moves from the baseline to the target model; values greater than .9 are usually deemed desirable; problem that it is biased downward for small N (Hu & Bentler, 1999). The NNFI (Tucker & Lewis, 1973) is a measure of the proportionate improvement in fit (defined in terms of noncentrality) as one moves from the baseline to the target model, per *df*; Hu & Bentler (1999) recommend a cutoff value of .9.

The RMSEA and the SRMR represent an analysis of the residual values between a given model and the data collected since the model never holds exactly in the population. The RMSEA takes into account the error of approximation in the population in a covariance matrix. Values equal or lower than .08 represent a reasonable error of approximation in the population (Browne & Cudeck, 1993). Similar to the RMSEA, the SRMR represents the square root of the mean squared discrepancies of the correlation matrices between the hypothesized model and the observed data. Values equal or lower than .05 are considered to indicate a good fit (Bentler, 1990). The AIC (Akaike, 1987) is a relative fit index especially designed for comparing alternative factor models. The model with the smallest AIC value has the best fit. The ECVI (Browne & Cudeck, 1989) is an additional fit index, which is also provided in the Lisrel output. Lower values in the ECVI indicate better fit and it is appropriate for comparing not nested models. All parameters of the model were estimated simultaneously by lithe statistic package software LISREL version 8.53 for windows.

Results and Discussion

Descriptive and Reliability Analysis

The mean and standard deviation of the total PSWQ scores was very similar to study 1 ($M = 47.26$; $SD = 10.23$). Consistent with previous study, women presented higher PSWQ scores ($M = 48.45$; $SD = 10.22$) than men ($M = 45.98$; $SD = 9.98$), $F(1, 978) = 7.07$; $p < .01$. As in Study 1, internal consistency of the PSWQ was high for the entire sample (.85) as well as for the men (.84) and women (.85) sub samples. Corrected item-total correlation coefficients also followed the same pattern of Study 1 and ranged between .35 to .67, except from items 1 and 11, which were .16 and .18, respectively.

Confirmatory factor analysis

Table 3 shows the fit indices produced by the CFA on the three models. As can be observed, the model which tested the one-factor structure of the PSWQ fit the data poorly as none of the indices approached an acceptable level. The second model which tested a two-factor structure provided

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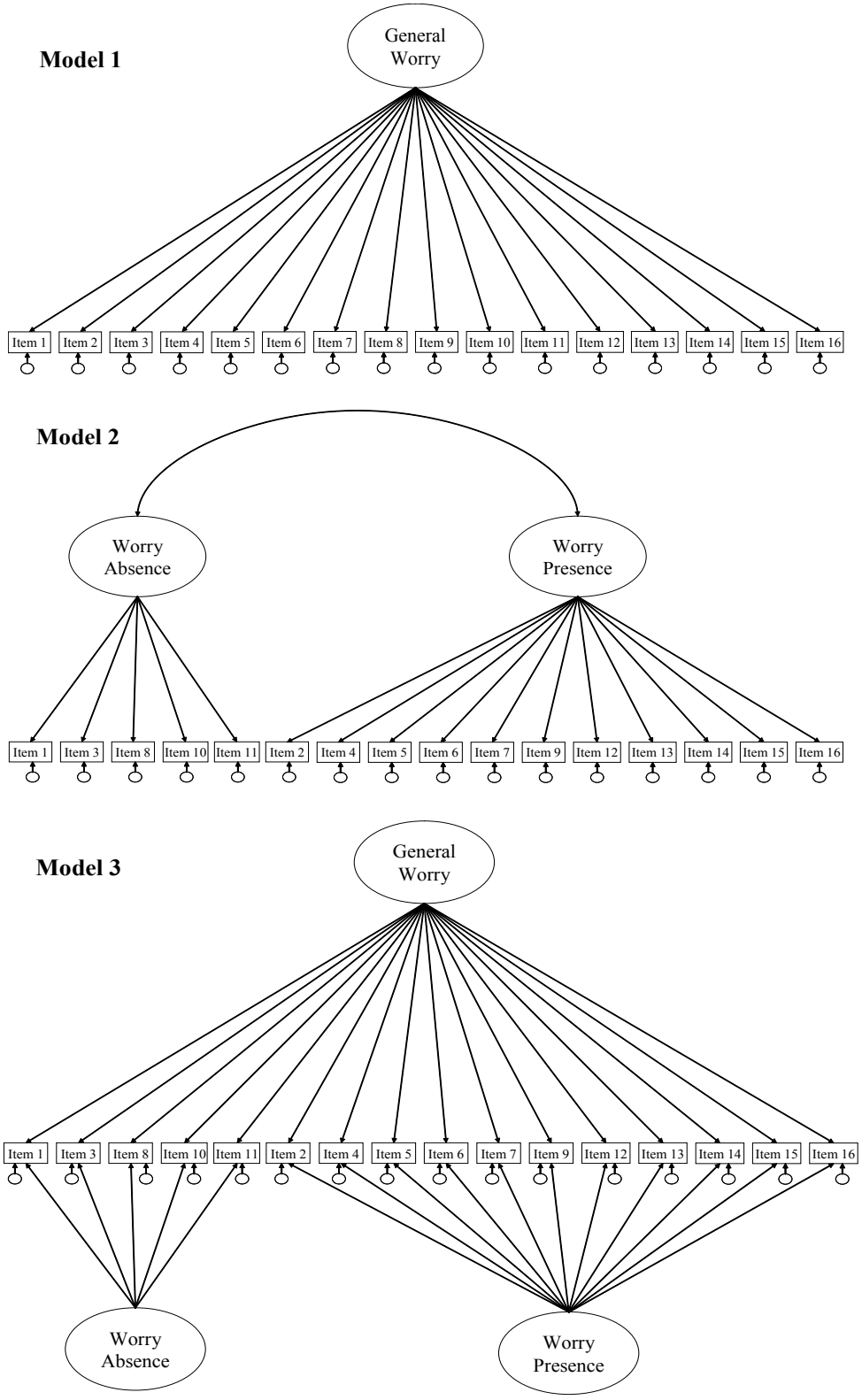

Figure 1. Three models for the confirmatory factor analysis. Model 1 = One general worry factor.; Model 2 = One factor associated with the positive items and other with negative items; Model 3 = One general factor and two other related to positive and negative items. Three models for the confirmatory factor analysis. Model 1 = One general worry factor.; Model 2 = One factor associated with the positive items and other with negative items; Model 3 = One general factor and two other related to positive and negative items.

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Table 2
Principal axis factoring analysis factor loading and communalities (h^2) of the 16 PSWQ scale items following varimax rotation

	Item	Factor 1	Factor 2	h^2
5.	I know I should not worry about things, but ...	**.75**	.12	.57
14.	Once I start worrying, I cannot stop.	**.75**	.13	.57
13.	I have been worrying about things.	**.74**	.11	.55
7.	I am always worrying about something.	**.70**	-.07	.49
6.	When I am in a pressure, I worry a lot.	**.70**	.04	.49
2.	My worries overwhelm me.	**.69**	.14	.50
4.	Many situations make me worry.	**.68**	.18	.50
12.	I have been worrier all my life.	**.67**	-.07	.46
16.	I worry about projects until they are done.	**.57**	.17	.36
15.	I worry all the time	**.53**	-.25	.34
9.	As soon as I finish one task, I start to ...	**.39**	.27	.23
10.	I never worry about anything.	.10	**.71**	.52
3.	I do not tend to worry about things.	.05	**.69**	.48
8.	I find it easy to dismiss worrisome thoughts.	.25	**.63**	.45
1.	If I do not have time to do everything, I ...	-.05	**.62**	.39
11.	When there is nothing more that I can do ...	0.1	**.53**	.29
Eigenvalue		5.06	2.13	
Variance (%)		31.63	13.31	
Cronbach´s alfa		.87	.67	

a better fit to the data. Although the chi-square test was highly significant, chi-square difference between the first and second models was statistically different ($\Delta\chi^2 = 617.18$, $\Delta df = 1$; $p < .001$). Therefore, there was an improvement of the second model in comparison to the first one. However, fit indices of the second model did not reach adequate level. Both GFI and CFI failed to exceed the suggested value of .9. Both AIC and ECVI had presented decreasing levels, of model 1 for model 3, representing a better adjustment of model 3. Neither of the SRMS and RMSEA indices was below the recommended level. Both NFI and NNFI indices presented increasing levels, of model 1 for model 3, representing a better adjustment of model 3; moreover, only this model presented values greater than .9. Therefore, the second model, although better that the first model also did not provide an adequate fit for the data.

Model 3, which tested the hypothesis that underlie the structure of the PSWQ is composed by a general worry factor together with two methodological factors related item wording closely fit the data. Although chi-square test was statistically significant, fit indices were adequate. Both GFI and CFI were above the cutoff value of .9, whereas SRMS and RMSEA were below acceptable levels. Moreover, the third model proved to be a better model than the second one since the chi-square difference between these two models was statistically significant ($\Delta\chi^2 = 546.53$, $\Delta df = 18$; $p < .001$).

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Table 3
Fit indices for the three PSWQ factor models tested according to confirmatory factor analysis. CFI = Comparative Fit Index; GFI = Goodness of Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Residual (SRMR); AIC = Akaike's Information Criterion; ECVI = Expected Cross-Validation Index; NFI = Normed Fit Index; and NNFI = Non-Normed Fit Index

Model	χ^2	df	GFI	CFI	RMSEA	SRMR	AIC	ECVI	NFI	NNFI
Model 1	1793,10	104	.81	.86	.13	.09	1857.10	1.90	.86	.84
Model 2	1175,92	103	.87	.90	.10	.07	1342.92	1.37	.88	.87
Model 3	629,35	88	.93	.95	.08	.05	725.35	0.74	.94	.93

PSWQ and STAI-T Correlations

As in the first study, PSWQ and STAI-T presented a moderate correlation (r = .40). The sum of all non-reversed positively worded items had an extremely high correlation with the total PSWQ (r = .94) and a moderate correlation with STAI-T total score (r = .40). On the other hand, the sum of the negatively worded items had a moderate correlation with PSWQ (r = .59) and a low correlation with STAI-T (r = .20). Finally, positively and negatively worded items also presented a low correlation (r = .28). Therefore, it appears that positively worded items have a much higher association with PSWQ and STAI-T as opposed to the negatively worded items. All correlation p values were less than .001.

General Discussion

The present study represents the first evaluation of the psychometric properties of the Portuguese translation of the PSWQ among Brazilians subjects. Results obtained substantially support the reliability of the present PSWQ version. First, Cronbach's alphas in both studies were high, ranging between .80 and .85. These results are in agreement with other studies performed with the original English version of the PSWQ (Beck et al., 1995; Brown et al., 1992; Davey, 1993; Meyer et al., 1990) as well as in other versions of this scale translated to different languages (Gana et al., 2002; Pallesen, et al., 2006; Stöber, 1998). Moreover, item-total correlations coefficients were within accepted levels, except for items 1 and 11 whose coefficients values were surprisingly low. This particular result suggests that subject answers to these two items were generally inconsistent in comparison to the remaining 14 items of the scale.

The low item-correlation coefficients of items 1 and 11 may not be attributed to translation problems, since it was rigorously conducted to ensure equivalence between languages. Alternatively, this effect might come from the fact that both of these items are worded negatively. It has been pointed out that reversed items require more cognitive effort, such as memory and attention, in order to better manipulate complex information present in negatively stated items (Schriesheim, et al., 1991; Rosenthal, 1980). Therefore, it might be possible that interpretation of these two items were problematic, leading to some confusion in their content or even careless reading, as it has been reported in the Italian (Meloni & Gana, 2001) and Spanish (Nuevo, Montorio & Ruiz, 2002) versions of this scale as well as in other instruments (Cordery & Sevastos, 1993; Schmitt & Stults, 1985).

The present version of the PSWQ also demonstrated good convergent validity with significant positive correlations with measures of trait anxiety. Moderate to robust correlations between PSWQ and STAI-T has been reported in the literature (Carter et al., 2005; Hopko et al., 2003; Meyer et al., 1990; Olatunji et al., 2007; Pallensen et al., 2006) and points out that worry and anxiety, yet different constructs, are directly related.

Finding from the present work also addressed the issue of gender differences in worry. This is an important question since there are inconsistencies in the literature regarding the prevalence of higher PSWQ scores among women as compared to men. Although some reports did not detect any gender differences in the PSWQ (Katz & Jardine, 1999; van Rijsoort et al., 1999), results from both of our studies indicated that women presented higher PSWQ scores than men. These results are consistent with other studies which found the same gender differences (Gana et al., 2002; Meyer et al., 1990; Olatunji et al., 2007; Pallesen et al., 2006). The fact that gender differences have been also reported in STAI-T (McCleary & Zucker, 1991; Nakazato & Shimonaka, 1989; Stanley, Beck & Zebb, 1996), including among Brazilian undergraduate students (Andrade et al., 2001), strengthens the suggestion that worry is dynamically associated with anxiety.

Another purpose of the present research was to examine the factor structure of the Portuguese version of the PSWQ. Factor structure was first evaluated though EFA. This analysis did not favor a single-factor as it has

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been previously reported (Brown et al., 1992; Fortune et al., 2005; Meyer et al., 1990) and suggested a two-factor solution, quite in agreement with other reports (Carter et al., 2005; Hopko et al., 2003; Olatunji et al., 2007). The first factor, which demonstrated a good internal consistency, was associated with the presence of worry and incorporated the 11 items worded in a positive form. The second factor was related to worry absence and included all the 5 items written in a reverse form. The reversed items associated with the second factor were not very homogeneous and revealed a somewhat low Cronbach's alpha.

Further analysis in a new sample of subjects with CFA yielded fit indices that were inadequate to the single and the two-factor models of the PSWQ. Instead, a three-factor model leads to a much better fit with the data. This three-factor solution was composed by one general worry incorporating all the 16 items as well as by two other factors linked to the 11 positively worded and the 5 negatively worded items. This same solution, employing CFA, was also found in the French (Gana et al., 2002) Italian (Meloni & Gana, 2001) and Norwegian (Pallesen et al., 2006) versions of the PSWQ.

The high correlation between the positive worded items with the total PSWQ indicate that this factor is intimately related to a similar underlying structure of the PSWQ. Moreover, a moderate correlation between this factor with STAI-T corroborates the idea that positively worded items are associated with a more general anxiety construct. On the other hand, negative worded items had a moderate correlation with total PSWQ scores and a very low correlation with STAI-T. These results suggest that this factor, which emerged from the reversed scored items, does not contribute in a meaningful way to the worry construct. Therefore, it appears that PSWQ has a single meaningful construct and the worry absence factor seems to be a methodological artifact due to a wording effect of the reversed items. In agreement with this conclusion is the fact that Study 1 found a higher internal reliability of the 11 non-reversed items (.87) when compared to the 16 items of the whole scale (.85), whereas internal reliability of the five reversed items was particularly low (.67).

It is generally accepted that the presence of negatively worded items are important in any self-rated instrument in order to prevent eventual response sets, such as responding to all items in the same form interestedly of its content. This procedure takes for granted that negatively and positively worded items have symmetrical cognitive representation and have the ability to measure the same underlying construct However, the assumption that reversing the score of a negatively worded item is equivalent to a score from a positively worded item has been seriously questioned (Spector, Van Katwyk, Brannick, Chen, 1997). In this sense, CFA techniques have been helpful to point out in many other instruments that the presence of factors yielded from EFA that might be related to methodological artifact as a consequence of reversed worded items (Marsh, 1996; Samuelstuen, 2003; Schriesheim & Eisenbach, 1995; Woods, 2006).

Based on the on the existence of a methodological artifact of the five PSWQ reversed items, it would be appropriate to compute only the 11 positively worded items to produce a final PSWQ score (Brown, 2003; Fresco et al., 2002). This procedure would improve the PSWQ validity of its unidimensionality structure without affecting eventual affirmative response bias.

A different alternative to deal with the methodological artifact of the reversed items would be to develop a shorter form of the PSWQ without the five reversed items. In conformity with this view, an abbreviated eight-item PSWQ scale has been proposed as a better depict of the underlying construct of this scale (Crittendon & Hopko, 2006; Hopko et al., 2003; Nuevo, Montorio & Ruiz, 2002). According to these reports, the abbreviated version of the PSWQ included items 2, 4, 5, 6, 7, 9, 12 and 13 from the original version. Our results are largely consistent with these findings. The only exception was item 9, which had a somewhat relatively lower loading and communality in comparison to other items. According to our first study, item 14, which was not included in this abbreviated version of the PSWQ, seems to play a better role in the PSWQ factor structure.

Finally, it is important to acknowledge that present study had several limitations. For example, data from the first and the second studies were based on student subjects drawn from a geographically narrow region which probably restraint the cultural diversity of our samples. An adaptation and psychometric examination of a clinical instrument requires at least two additional things: (1) analysis of the test-retest reliability (consistency of PSWQ scores over time) and (2) analysis of the construct validity Concerning the discriminative validity, the administration of the Portuguese version of the PSWQ to a clinical sample of patients with generalized anxiety disorder (GAD) as well as to anxious controls in order to compare their scores with those obtained by non clinical individuals would have considerably increased the quality and clinical interest of the paper (the inclusion of an anxious control group avoids the possibility that differences between GAD patients and normal individuals in PSWQ scores are due to the presence of anxiety in general, rather than specifically to GAD). Moreover, no attempt was made to employ subjects with anxiety disorder. This is an important issue, especially because worry is a central characteristic in all anxiety disorders and the main feature in GAD. In fact, PSWQ can be employed as an instrument to detect this anxiety disorder (Behar et al., 2003) and evaluate its changes induced by psychotherapy (Borkovec & Costello, 1993; Stanley et al., 2001; Stöber & Bittencourt, 1998). Therefore, future works will have to employ non-clinical samples with greater diversity as well as clinical samples

with different anxiety disorders are important to further investigate the psychometric properties and underlying structure of the present translation of the PSWQ; and to revise the items 1 and 11 of the PSWQ and still remove them in the case to continue to disturb it total of the scale.

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