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Psychometric Characteristics of the Original and Brief Version of the Penn State Worry Questionnaire (PSWQ) in Mexican Samples

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Background. In the XXI century anxiety disorders have become the most prevalent in Mexico, excessive worry is one of the first features that allows its identification. Have a valid and reliable instrument to assess the pathological worry is essential to identify the disorder from the beginning.

Method. The aim of this study was to analyze the psychometric properties of the Penn state worry questionnaire (PSWQ) in the four different versions used in clinical contexts in Spanish-speaking countries: the original scale (PSWQ-16), the direct form of the scale (PSWQ-16D) and two abbreviated versions (PSWQ-11 y PSWQ-8). A total of 2,267 participants were given those versions of the questionnaire.

Results. Our results suggest that the original scale (16 items) fits to two related factors model. However, the analysis of the PSWQ version with all the items in its direct form and short versions (11 and 8 direct items), together with other arguments indicate that it is more convenient to conceive a one dimensional construct. Besides high internal consistency and test-retest reliability, and adequate concurrent and discriminant validity.

Conclusions. Results suggest use of the short versions (11 and 8 direct items) which shows a one-dimensional structure and the best goodness of fit indices. Results are discussed and future research are suggested.

Keywords: Anxiety disorders, Generalized anxiety disorder, Confirmatory Factor Analysis, Assessment, Validity

Actas Esp Psiquiatr 2018;46(4):117-24

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Propiedades Psicométricas del Cuestionario de Preocupación Pensilvania (PSWQ) de las Versiones Original y Reducida en Muestras Mexicanas

Introducción. En el siglo XXI los trastornos de ansiedad se han convertido en los más prevalentes en México, la preocupación excesiva es una de las primeras características que permiten su identificación. Contar con un instrumento válido y fiable que evalúe la preocupación patológica es fundamental para identificar el trastorno en su inicio.

Metodología. El objetivo del presente trabajo fue analizar las propiedades psicométricas del cuestionario de Preocupación Pensilvania (PSWQ) en las cuatro diferentes versiones utilizadas en contextos clínicos en países de habla hispana: la escala original (PSWQ-16), la escala con ítems directos (PSWQ-16D) y dos versiones abreviadas (PSWQ-11 y PSWQ-8). Un total de 2.267 participantes respondieron a las diferentes versiones de los cuestionarios.

Resultados. Nuestros resultados sugieren que la escala original (de 16 ítems) ajusta mejor al modelo de 2 factores relacionados. Sin embargo, el análisis con la versión del PSWQ con los reactivos directos y las versiones reducidas (de 11 y 8 reactivos), junto a otros argumentos indican que es más conveniente concebir el constructo de forma unidimensional. Además se observó una elevada consistencia interna y fiabilidad test-retest, así como una adecuada validez concurrente y discriminante.

Conclusiones. Los resultados sugieren utilizar las versiones reducidas que muestran una estructura de un solo factor y mejores indicadores de ajuste. Se discuten los resultados y se sugieren futuras investigaciones.

Palabras clave: Trastornos de ansiedad, Trastorno de ansiedad generalizada, Análisis Factorial Confirmatorio, Evaluación, Validación

INTRODUCTION

Worry is as a mechanism that is common, can be constructive, and at times necessary for problem solving¹, although it can become pathological when high levels of anxiety and suffering affect the individual². Generalized Anxiety Disorder (GAD) is the epitome of pathologic worries, characterized by the very frequent presence of "anxious" worriedness about issues patients are unable to control³.

Anxiety disorders have become one of the most prevalent challenges in Mexico with lifetime cumulative incidence of 14.3% among the general population⁴. The Diagnostic and Statistical Manual of Disorders of the American Psychiatric Association³ reports annual prevalence rates of GAD between 0.4 and 3.6% and lifetime rates of 9% across different countries, with a ratio two females affected per male; estimates for GAD in the general population of Mexico are 0.7% and 1.2%, for annual and lifetime prevalence rates, respectively⁴.

The most widely instrument used to measure worry is the Penn State Worry Questionnaire (PSWQ), developed by Meyer, Miller, Metzger & Borkovec⁵. The PSWQ has demonstrated adequate psychometric characteristics in several countries, including Mexico. However, there remains controversy about the internal structure of the original questionnaire. For one part, some research suggests the underlying model consists of a singular factor⁵⁻¹¹. However, other studies provide evidence that support the notion of two dimensions, labeled as "presence of worry" and a second factor, labeled "absence of worry¹²⁻¹⁹." Moreover, it has been suggested that the two factors in the original version are a methodological artifact caused by difficulty in understanding the items with inverse statements, rather than dimen-

sions that are actually different¹⁶. Two strategies have been followed to address this problem, -namely, the construction of an instrument with all items written in positive sense²⁰, and the development of the PSWQ-11, a shorter version that includes the direct items of the original questionnaire only¹². A shorter version with eight items has been proposed as the PSWQ-8²¹. Yet, to date there is no evidence that these shorter versions hold similar psychometric properties when compared to the original version^{15,22}, or to the version in which all items are written in direct form²⁰.

In the absence of studies comparing the performance of these versions, all four of them are equally used in clinical settings. Under this framework, the first goal of the present study was to determine the internal structure of the PSWQ using the translation from the original into Spanish by Sandin et al.¹⁶, as well as another version with all the items written in direct form that has been used with older adults²⁰. This goal also included the study of the internal consistency of the four versions (i.e., the original PSWQ-16, the PSWQ-16D that has all items in direct form, and the two abbreviated version PSWQ-11 and PSWQ-8). The second goal of the study was to determine the reliability, the convergent and discriminant validity, as well as the relationship among versions.

METHOD

Participants

The total sample included 2,267 participants from five groups that were selected using non-probabilistic procedures. Sample characteristics are depicted in table 1. Sam-

Table 1	Sociodemographic characteristics of the samples A, B, C, D and E				
	A (General population) PSWQ-16	B (General population) PSWQ-16D	C (Students 1 ^a) PSWQ-16	D (Students 2 ^a) PSWQ-16	E (General population) PSWQ-11
<i>n</i>	228	247	335	174	1,431
Sex					
Female	123 (53.9%)	121 (49%)	258 (77.1%)	143 (82.7%)	841 (58.8%)
Male	105 (46.1%)	126 (51%)	77 (22.9%)	30 (17.3%)	590 (41.2%)
Age					
Mean	23.50	25.09	21.30	21.23	44.43
Standard deviation	8.90	9.86	2.77	2.76	15.97

ple groups "A", "B", and "E" included participants from the general population ($n=228$, 247 , and $1,431$, respectively). Sample group "C" included Psychology college students ($n=335$). A subsample of Group "C" comprised group "D" ($n=174$) four weeks later. Finally, group "E" included 5 equivalent age-range groups (i.e., 20–30, 30–40, 40–50, 50–60 y 60–70 years) of each sex, with approximately 140 participants each, for a total of 10 groups and 1,431 participants.

Instruments

Three versions of the PSWQ were used for this research. The PSWQ-16⁵, and its corresponding Spanish version¹⁶, includes 16 Likert-type items (with options ranging from "nothing" to "a lot", and scores ranging from 1 to 5, correspondingly); five of the items (1, 3, 8, 10, and 11) use an inverse option scale (i.e., scores range from 5 to 1) to assess a general tendency to worry or worry-trait, which plays an important role in GAD. The second version used for this research was the PSWQ-16D, which includes all 16 items written in direct form²⁰. Finally, the third version used in the present research was the PSWQ-11, which includes the original direct items only¹⁶.

SSGAD. Carroll and Davidson's screening scale for DSM-IV Generalized Anxiety Disorder²³ includes 12 dichotomous items that assess the presence of DSM-IV diagnostic criteria for GAD (2000). The Spanish-version adapted by Bobes, García-Calvo, Prieto, García-García & Rico-Villademoros²⁴ was used in the present study, with a 0.83 Cronbach's alpha coefficient.

BAI. The Beck Anxiety Inventory includes 21 items that use a 4-point scale (scored 0–3). For the present study, the adaptation done by Robles, Varela, Jurado & Páez²⁵ was used, with Cronbach's alpha coefficients of 0.84 and 0.83 among college students and general population, respectively.

BDI. The Beck Depression Inventory also includes 21 items that use a 4-point scale. The present study used the version adapted by Jurado et al.²⁶, for which an internal consistency of 0.87 was estimated among a sample of the general population.

PANAS. The Positive and Negative Affect Schedule by Watson, Clark & Tellegen²⁷ was used, with the short version adapted to the Mexican population by Robles and Páez²⁸ that includes 10 items that assess the presence of positive affect and 10 items that assess negative affect, for a total of 20 items, with a 5-point, Likert scale that ranges from 1 for "nothing or very little" to 5 for "extremely". The PANAS scales have excellent internal consistency among the Mexican population, with $\alpha=0.84$ for positive affect and $\alpha=0.87$

for negative affect, and low correlation between both affects (ranging from $r=-0.12$ to $r=-0.23$).

Procedure

The data for the present study are from five sample groups. Data from sample groups "A" and "B" (general population) were gathered through anonymous and voluntary participation, prior informed consent. Group "A" was given the PSWQ-16¹⁶, while Group "B" was given the PSWQ-16D²⁰. Group "C" (College students majoring in Psychology) answered the PSWQ-16D, SSGAD y BDI, after informed consent. One month later, a subsample of students who participated in Group "C" were recruited for Group "D", and after informed consent were given the PSWQ-16D. Finally, group "E" participants responded the SSGAD, BAI, and PANAS.

Statistical Approach

Confirmatory Factor Analyses (CFA) sought to determine: (1) if a model with two factors fits the data better than the unifactorial model; and (2) how well the short scale performs against the full version of the questionnaire. For the later goal, the one-dimensional model including all 11 items is compared to a recently proposed version that eliminates the items 2, 4, and 7 ("There are many things that worry me", "When I am under stress I worry very much", and "I have been worried all my life", correspondingly, which in the original version were items 4, 6, and 12^{21,22,29}).

The CFA were performed using data from sample groups "A," "B," and "E" using Weighted Least Squares Mean and Variance Adjusted (WLSMV), an appropriate approach for CFA with categorical data³⁰. All analyses where items served as indicators took into account their categorical nature, running the factor analyses on the polychoric correlation matrix. The chi-square statistic (χ^2) is presented to assess the fit of each model. Since this indicator is sensitive to sample size other model fit indicators are used as well³¹, such as the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), as well as the Root Mean Square Error of Approximation (RMSEA) and its corresponding 90% Confidence Interval (90% CI). Acceptable model fit is defined according to the following criteria: $RMSEA < 0.08$ (90% CI), $CFI > 0.90$, $TLI > 0.90$, but a good fit of the model is attained when $RMSEA < 0.05$, $CFI > 0.95$, $TLI > 0.95$ ^{31,32}. The analyses were performed using MPlus7.1³⁰.

Reliability and Validity Evidence

The internal consistency and the stability were analyzed for the PSWQ-16, PSWQ-16D and the two abbreviated ver-

sions (PSWQ-11 and PSWQ-8). Criterion validity for the PSWQ-16D, PSWQ-11 and PSWQ-8 were estimated through Pearson's correlation with other measures of anxiety and depression.

RESULTS

Normative data

Table 2 conveys the means, standard deviations, and ranges of each sample group, as well as total scores for the original PSWQ-16, PSWQ-16D, PSWQ-11 and PSWQ-8 among the general population and the sample of students.

Confirmatory Factor Analysis (CFA)

As shown in table 3, the two-factor model fits the data better as compared to a single-factor solution, both in the original version (PSWQ-16) as well as in the version where items were modified to have a direct meaning (PSWQ-16D) but here model indicators worsen considerably to the point as to indicate poor fit (CFI=0.86, TLI=0.84, γ RMSEA=0.10). On the other hand, the fit of the model is adequate when the model includes the 11 direct items only of the original version (i.e., CFI=0.97, TLI=0.96, and RMSEA=0.09, given the reduction of observable variables) and improve for PSWQ-8 (CFI =0.98, TLI=0.97, and RMSEA=0.07. The fit of the model

Table 2	Descriptive statistics for different versions of PSWQ from the general population and a sample of students				
	A <i>(General population)</i>	B <i>(General population)</i>	C <i>(Students 1^a application)</i>	D <i>(Students 2^a application)</i>	E <i>(General population)</i>
PSWQ 16					
Mean	41.79				
Standard deviation	10.97				
Rank	16-71				
n	206				
PSWQ 16-D					
Mean		39.78	24.57	23.95	
Standard deviation		11.20	12.80	13.42	
Rank		17-68	2-61	0-63	
n		244	335	174	
PSWQ-11					
Mean	29.17	27.38	16.49	16.20	29.22
Standard deviation	9.30	7.95	8.83	9.19	9.55
Rank	11-54	11-47	11-43	11-43	11-55
n	215	247	335	174	1,431
PSWQ-8					
Mean	21.09	19.56	15.26	14.89	20.87
Standard deviation	6.84	5.87	6.54	7.14	7.03
Rank	8-40	8-38	8-35	8-35	8-40
n	215	247	335	174	1,431

for the PSWQ-16 of the original version was much better than the PSWQ-16D, both when one and two factors were tested. In turn, the brief version, PSWQ-11, showed very good fit (CFI=0.97, TLI=0.96, and RMSEA=0.08) with similar indicators to those obtained for the original questionnaire, with the additional feature that the fit improved considerably when the selected 8 items are used (CFI=0.99, TLI=0.99, y RMSEA=0.07).

Nested Models Comparison

A χ^2 difference test (χ^2_{diff}) was computed to analyze competing nested models (i.e. when one of the models could be obtained simply by fixing or eliminating parameters in the other). This test helps decide whether a given model fits significantly better or worse than a competing model. To compute a χ^2 difference test, the difference of the χ^2 values of the two models (χ^2_{diff}) is taken as well as the difference of the degrees of freedom (df_{diff}). This χ^2_{diff} value is distributed

with df_{diff} degrees of freedom. A statistically significant test favors the model with the smaller chi-square. The last three columns of table 3 show that all comparisons were significant, indicating that models with fewer items had better fit in all versions of the PSWQ. Likewise, corresponding goodness of fit indices were better in shorter versions compared to models containing more observable variables.

Reliability

Internal consistency of the three versions given to the general population was assessed through Cronbach's Alpha. The original version, PSWQ-16, had the lowest reliability ($\alpha=0.860$). Four of the five inverse items had item-rest correlations lower than 0.30. The version with all direct items, PSWQ-16D, had the highest reliability ($\alpha=0.917$), noting that item #1 had an item-total correlation of 0.34. Finally, the two Abbreviated versions, PSWQ-11 and PSWQ-8 also had adequate reliability in this population ($\alpha_{PSWQ-11}=0.88$, α_p .

Table 3		Model fit indices based on a confirmatory factor analysis comparing a two-factor model and one-factor model for three different versions (16, 11 and 8 items)						
Model/scale	χ^2	df	p	CFI	TLI	RMSEA (90% CI)	Nested Models Comparison	
							χ^2_{diff} (df _{diff})	p
PSWQ-16								
2 factors	197.24	103	< 0.001	0.96	0.95	0.07 (0.05. 0.08)		
1 factor 16 items	404.23	104	< 0.001	0.91	0.90	0.06 (0.05. 0.08)		
1 factor 11 items	116.24	44	< 0.001	0.97	0.96	0.09 (0.07. 0.11)	287.99 (60)	< 0.001
1 factor 8 items	45.82	20	< 0.001	0.98	0.97	0.07 (0.05. 0.10)	70.42 (24)	< 0.001
PSWQ-16D								
2 factors	502.89	103	< 0.001	0.93	0.92	0.13 (0.12. 0.14)		
1 factor 16 items	503.69	104	< 0.001	0.86	0.84	0.10 (0.09. 0.11)		
1 factor 11 items	176.98	44	< 0.001	0.96	0.95	0.11 (0.10. 0.13)	326.91 (60)	< 0.001
1 factor 8 items	124.31	20	< 0.001	0.94	0.92	0.15 (0.12. 0.17)	52.67 (24)	< 0.05
PSWQ-11								
1 factor 11 items	756.10	44	< 0.001	0.97	0.96	0.08 (0.06. 0.09)		
1 factor 8 items	168.48	20	< 0.001	0.99	0.99	0.07 (0.06. 0.08)	587.62 (24)	< 0.001

χ^2 : chi-square; df: degrees of freedom; p: statistical significance; χ^2 / gl : chi-square divided by degrees of freedom; CFI: Comparative fit index; TLI: Tucker Lewis Index; RMSEA: Root mean square error of approximation, CI: Confidence Interval; χ^2_{diff} (df_{diff}): chi-square difference (degrees of freedom of difference).

$r_{SWQ-8} = 0.85$), with item-total correlations that exceeded 0.45 for all items and observing that the total alpha coefficient could not be improved by eliminating any item.

Temporal Stability

Scores from student who participated in both group "C" and "D" samples were used to estimate the test-retest correlation ($n=174$), since they had been given the questionnaires with a one-month interval for test-retest. The three versions PSWQ-16, PSWQ-11 and PSWQ-8 showed adequate statistically significant estimates ($r=0.782$, $r=0.776$ and $r=0.754$ respectively, with $p<0.001$).

Evidence of Validity

Concurrent and discriminant validity were evaluated through Pearson correlation, first between PSWQ-16D,

PSWQ-11 and PSWQ-8 in relation to the GAD and depression measures (SSGAD and BDI, respectively). As shown in table 4, there was a strong correlation between the three versions of the PSWQ, a moderately high correlation with SSGAD and somewhat lower with BDI. Of note is that the estimated correlations between PSWQ-8, SSGAD, and BDI were stronger than those corresponding to the PSWQ-16 and PSWQ-11.

Table 5 conveys results from group "E", the subsample of students who were re-tested one month after the initial survey, and given several additional measures. The estimated correlation between PSWQ-11 and SSGAD remained strong and was even higher, compared to the PSWQ-16D, followed by negative affect (NA) and anxiety symptoms (BAI), but no correlation with positive affect (PA).

CONCLUSIONS

The first goal of the present study was to analyze the internal structure of the Penn State Worry Questionnaire (PSWQ-16). The evidence suggests that the original version has a two-factor structure, with a first factor that is comprised of the direct items and a second factor comprised of the negative items, which is in line with other studies^{5,9,12,14-18,33}. On the other hand, results from factor analysis of the questionnaire that has all direct items (i.e., PSWQ-16D) also indicate a two-factor solution, which departs from prior studies with other populations¹⁵⁻¹⁷. However, it was observed that four of the five negative items of the original version had poor psychometric properties, and also in the version with all direct items (i.e., PSWQ-16D), it is not clear that item 1 is adequate. The evidence, thus, supports the idea that the bi-factorial structure of the original scale reported in earlier studies might be due to methodological artifact.

On the other hand, the unifactorial structure of the brief version PSWQ-11 was confirmed, as prior evidence had suggested with model goodness of fit better than the original scale^{12,16}.

The internal consistency of the PSWQ-11 and PSWQ-8 was found to be adequate, even better than the original version but slightly inferior to the version with all direct items (PSWQ-16D). In addition, the strong correlations between the PSWQ-11, PSWQ-8 and the other two versions suggest that these instruments are equivalent, and it should also be noted that the brief versions showed high one-month test-retest reliability, as at least another study has found¹⁶.

The correlation between PSWQ-11 and PSWQ-8 and other measures was tested. The strongest correlation was estimated to be with the SSGAD, although not strong enough as to suggest that both measure the same construct.

Table 4 Pearson Correlations between 16 items, 11 and 8 items versions of PSWQ with each of the scales applied				
Scale	PSWQ-11	PSWQ-8	SSGAD	BDI
PSWQ-16	0.960**	0.972**	0.545**	0.429**
PSWQ-11		0.981**	0.555**	0.438**
PSWQ-8	0.974**		0.587**	0.473**

SSGAD: Carroll and Davidson Generalized Anxiety Disorder Screen; PSWQ: Penn State Worry Questionnaire; BDI; Beck Depression Inventory. * $p<0.01$, ** $p<0.001$

Table 5 Pearson Correlations between the PSWQ-11 and PSWQ-8 with each of the scales applied in general population				
Scale	SSGAD	BAI	NA	PA
PSWQ-11	0.521**	0.481**	0.500**	-0.016
PSWQ-8	0.519**	0.473**	0.492**	-0.014

SSGAD: Carroll and Davidson Generalized Anxiety Disorder Screen; PSWQ: Penn State Worry Questionnaire-reduced versions; BAI: Beck Anxiety Inventory; NA: Negative affect and PA: Positive affect. * $p<0.01$, ** $p<0.001$

In fact, the PSWQ was designed to measure the presence and severity of worry, a core symptom of GAD, but did not intend to assess the presence of other diagnostic criteria, like somatic symptoms such as muscle tension, being easily fatigued, and sleep disturbance, among other, which are necessary for GAD diagnosis³, and are actually assessed by the SSGAD but not by the PSWQ.

Moderate and positive correlations were observed with the BDI, which was expected due to the frequent comorbidity between anxiety symptomatology and depression. A similar correlation occurs for negative affect, consistent with a tripartite model³⁴, which posits that it is common that negative affect manifests in both depressive and anxiety disorders, as well as with evidence from other studies^{10,13,16,35}. Finally, the correlation with positive affect was weak and did not reach statistical significance. This was expected too because positive affect is not connected conceptually³⁴ nor empirically¹⁶ with anxiety or pathological worry. This evidence supports the idea that the PSWQ has adequate concurrent validity.

In summary, the evidence about adequate internal consistency, test-retest reliability, as well as convergent and concurrent validity, is consistent with a body of research about PSWQ-Spanish version(s) in Spain¹⁶ and Argentina¹⁰, as well as in other languages, such as English^{5,15,36}, French⁹, German¹⁸, Dutch^{11,37}, Italian¹⁴, Norwegian³⁸, Korean¹³, Turkish¹⁷ and Chinese¹⁹.

The evidence in the present study documents the PSWQ-11 also have adequate psychometric properties, in congruence with other research^{16,35,37}. Hence, it can be concluded that the PSWQ-11 is a valid and reliable measure of worry for the studied Mexican populations. However, some of the analyses indicated that accounting for the error covariance among some items (such as between items 1 and 2, 1 and 4, and 7 and 8) would result in better model fit indices for the confirmatory factor analysis of the PSWQ-8, which suggests that the number of items could actually be reduced even further. In fact, ancillary analyses suggest an 8-item version shows better model fit, as other studies also have found^{21,22,29,39}.

A final recommendation would be that future research study the discriminant validity of the PSWQ, as well as to study the scale's sensitivity to measure change among patients who experience significant improvement after an effective treatment.

EXPERIMENT PARTICIPANTS

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional review board and with the 1964 Helsinki

declaration and its later amendments or comparable ethical standards.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

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