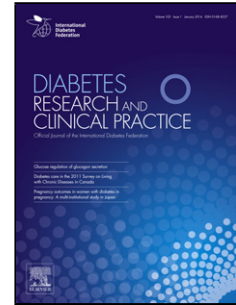


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Validation of the Spanish version of the Problem Areas in Diabetes (PAID-SP)**Scale**

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Abstract

This study aimed to assess the psychometric properties of the Spanish version of the Problem Areas in Diabetes (PAID-SP) scale. Data were collected from patients with type 1 and type 2 diabetes. The findings suggested that the PAID-SP is a reliable and valid measure of diabetes-specific emotional problems

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1. Introduction

The Problem Areas in Diabetes (PAID) is the most widely used measure for assessing the emotional impact of living with diabetes [1] and is considered as a key diabetes-specific instrument in terms of its validity and appropriateness for clinical use [2]. Therefore, this scale is a valuable tool for the screening of depressive symptoms [3,4] and has demonstrated an adequate sensitivity to change [5]. Despite its proven utility in different cultural settings [6-11], studies aim to test the validity of the scale for Spanish speaking patients from Spain (PAID-SP) are lacking. The aim of the present study is to develop the PAID-SP Scale and to examine its psychometric properties.

2. Materials and methods

2.1. Participants and measures

Data were collected on 173 adults with type 1 (68.8%) and type 2 diabetes (31.2%), aged 18-83 years, recruited consecutively from two hospitals located in Spain when they attended their routine appointments. The study protocol was approved by the hospitals' research committee and the patients provided informed consent.

Information about demographic and diabetes (type, duration, treatment regimen, complications) were collected along with the last glycated haemoglobin (HbA1c) value. Participants completed the following measures: the Spanish version of the Trait Anxiety subscale of the State-Trait Anxiety Inventory (STAI), a measure of anxiety proneness [12]; the Worry subscale of the Spanish version of the Hypoglycaemia Fear Survey, that assess the degree of worry about hypoglycaemic episodes [13]; and the PAID-SP. The PAID comprises 20 items related to the emotional problems from living with diabetes and each item is rated from 0 ("not a problem") to 4 ("a serious problem"). The PAID-SP was developed from the Hispanic version [7] with minor changes in the wording of

some items. Although the exploratory factor analysis of the original version suggested one general 20-item factor [14] some of the following studies have proposed alternative factor structures based on two, three or four factors [6,8,10].

2.2. Statistical analysis

A series of confirmatory factor analyses (CFA) were conducted comparing the fit of previously proposed models. Cronbach's alpha coefficient was determined to establish internal consistency. Regarding concurrent and convergent validity, correlations between PAID-SP scores and other scales and hemoglobin values were calculated using the Pearson correlation coefficients. Based on previous research, we expected that higher PAID-SP scores would be related to greater anxiety, fear of hypoglycemia and hemoglobin values. Known-groups validity was studied through the comparison (using a T-test for independent samples) between PAID-SP scores of males and females and between PAID-SP scores of participants with type 1 and type 2 diabetes. Thus, we expected to find higher PAID-SP scores among females and among participants with type 1 diabetes. The data analysis was carried out using Lisrel 8.80 (Scientific Software International, Lincolnwood, IL) and SPSS 19.0 (SPSS Inc., Chicago, IL).

Results

The sample comprised 64.2% females, the majority (75.2%) had at least high school education and approximately 54% were employed. The mean duration of diabetes was 14.16 ± 9.97 years and the mean HbA1c was $7.8 \pm 1.3\%$ (61 ± 14 mmol/mol). A total of 61.4% of the participants were treated with insulin injections, 18.1% with insulin pump, 7.6% with oral agents and 12.9% with combination of oral agents and insulin.

Construct validity of the PAID-SP was examined using CFA based on Maximum Likelihood method. The study met the recommendation of a sample size of at least 5-10 times the number of estimated parameters [15]. There were very few missing values (\leq

1.73% per item) and were replaced with the series mean. Five alternative factor structures were tested (see Table 1). Given that item 15 (“feeling unsatisfied with your diabetes physician”) was related both to “social support problems” (Model 3) as well to “treatment problems” (Model 4) we tested an alternative four-factor structure (Model 5) in which item 15 was included in “social support problems” factor. As can be seen in Table 1 the indices suggested that Model 5 showed the best fit. Moreover, as suggested by the modification indices, fit for this model was improved with the addition of three error covariances between items 3-6, 7-8, and 12-13: $\chi^2/df = 1.86$, RMSEA (90% CI) = 0.07 (0.05-0.08), SRMR = 0.05, CFI = 0.98, NNFI = 0.97. The standardized factor loadings for the items ranged from 0.53 to 0.91. Cronbach's alpha for the full scale was 0.93 and for the subscales ranged from 0.73 to 0.92. Table 2 displays the means and standard deviations of the total PAID-SP scale and subscales scores. The highest scored items were from the “emotional problems” subscale. Thus, items “worrying about the future and the possibility of serious complications” (mean, 2.46) and “worrying about low blood sugar reactions” (mean, 2.03) were endorsed as a somewhat serious or serious problem by 51.4% and 35.3% of patients, respectively.

Regarding convergent validity, as expected, participants with higher scores in the PAID-SP (total and subscales) had also higher scores in trait anxiety and were more likely to be worried about hypoglycemic episodes (see Table 2). In addition, participants with higher HbA1c values scored higher in the total PAID-SP and the emotional problems subscale. As compared with males, females were more likely to report more emotional problems from living with diabetes ($p = 0.023$) and scored higher on total PAID-SP ($p = 0.051$). Likewise, participants with type 1 diabetes had higher scores in PAID-SP total scale ($p = 0.018$), treatment problems ($p = 0.011$), and emotional problems ($p = 0.008$).

Discussion

This study aimed to examine the psychometric properties of the Spanish version of the PAID. Confirmatory factor analysis supported a four-factor structure similar to that found with Dutch and US samples [6]. The internal consistency for the full scale and the four factors was adequate. Moreover, the pattern of relationships between the PAID-SP and stress-related measures on the one hand, and diabetes variables on the other hand, suggested the validity of the scale. In this sense, the “emotional problems” dimension was significantly more associated with anxiety, fear of hypoglycaemia and metabolic control than any of the other factors. Additionally, the highest scored items were from this dimension. These results might indicate the relevance of the “emotional problems” subscale and its appropriateness for assessing the essential content of diabetes-related stress [18]. Therefore, further research is needed to validate a short version of PAID-SP. In conclusion, our findings suggest that the PAID-SP is a reliable and valid measure for the assessment of diabetes-specific stress in Spanish-speaking populations from Spain.

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Table 1. Comparison of fit indices for the different PAID-SP factor solutions

Model	χ^2	df	χ^2/df	RMSEA (90% CI)	SRMR	CFI	NNFI	AIC
Model 1 ¹	618.91	170	3.64	0.12 (0.11; 0.13)	0.080	0.93	0.92	698.91
Model 2 ²	490.92	169	2.90	0.11 (0.094; 0.12)	0.070	0.95	0.94	572.92
Model 3 ³	401.44	167	2.40	0.09 (0.07; 0.10)	0.065	0.96	0.96	487.44
Model 4 ⁴	380.35	164	2.31	0.088 (0.07; 0.09)	0.062	0.96	0.96	472.35
Model 5 ⁵	354.39	164	2.16	0.082 (0.07; 0.09)	0.059	0.97	0.96	446.39

¹1-factor model; ²2-factor model: emotional problems (15 items) and support/treatment problems (5 items); ³3-factor model: emotional problems (15 items), treatment problems (2 items) and social support problems (3 items); ⁴4-factor model: emotional problems (12 items), treatment problems (3 items), food-related problems (3 items) and social support problems (2 items); ⁵4-factor model: emotional problems (12 items), treatment problems (2 items), food-related problems (3 items) and social support problems (3 items)

df: degrees of freedom; χ^2/df : normed chi-square (≤ 2 good fit); RMSEA: Root Mean Square Error of Approximation (< 0.08 acceptable fit, < 0.05 good fit); SRMR: Standardized Root Mean Square Residual (< 0.08 good fit); CFI: Comparative Fit Index (> 0.95 good fit); NNFI: Non-normed Fit Index (> 0.95 good fit); AIC: Akaike Information Criterion (lower AICs, better model fit) [16,17].

Table 2. Correlations between PAID total and subscales with other measures

	Mean (SD)	STAI-T	FoH	HbA1c
PAID-Total Score (0-80)	28.37 (16.07)	0.48**	0.49**	0.19**
Emotional distress (0-48)	18.47 (10.70)	0.50**	0.51**	0.20**
Food problems (0-12)	4.02 (2.58)	0.41**	0.23**	0.17*
Treatment problems (0-8)	3.43 (2.48)	0.16*	0.36**	0.13
Support problems (0-12)	2.43 (3.16)	0.29**	0.30**	0.07

* $p < 0.05$. ** $p < 0.01$; SD, standard deviation; STAI-T, State-Trait Anxiety Inventory, Trait version; FoH, Fear of Hypoglycaemia; HbA_{1c} (Glycated haemoglobin)