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Psychometric Validation of the Prenatal Distress Questionnaire (PDQ) in Pregnant Women in Spain

Abstract

The Prenatal Distress Questionnaire (PDQ) was developed among English-speaking women in the United States to assess specific worries and concerns during pregnancy. Our aim was to analyze the factor structure of the PDQ, using confirmatory factor analysis, and assess its convergent validity in Spanish women. A sample of 233 pregnant women with ages ranging from 19 to 42 years in the south of Spain (Europe) (January 2015 – March 2016) completed the translated PDQ, the Perceived Stress Scale (PSS) and the Symptom Checklist-90-revised (SCL-90-R). Confirmatory factor analysis revealed a three-factor structure supporting the original PDQ factor structure ($\chi^2(31) = 55.43, p = 0.004; CFI = 0.96; RMSEA = 0.058; WRMR = 0.702$). The Spanish PDQ significantly correlated with the PSS and SCL-90-R (r 's 0.18 - 0.49, p 's < 0.05), providing evidence of convergent validity. These results illustrate that the stress dimensions investigated by the PDQ adequately represent pregnant women's distress across a different cultural context and corroborate the psychometric properties of this instrument previously demonstrated in English-speaking women. The Spanish version of the PDQ can be used by clinical practitioners to evaluate specific worries and concerns women experience during pregnancy.

Keywords: Pregnancy; Stress; Questionnaire; Structure; Factor analysis

Introduction

Pregnancy is a time of adaptations, which can lead to considerable stress (Lynn et al. 2011; Gourounti et al. 2016). Maternal stress during pregnancy has been related to adverse pregnancy outcomes such as anxiety, low birth weight, prematurity, and poor infant neurodevelopment (Duthie and Reynolds 2013; Lobel and Dunkel-Schetter 2016; Razurel et al. 2017).

The Royal College of Midwives declared that excessive and persistent levels of stress can lead to psychological and physical illnesses, anxiety and depression (RCM 2018). It is estimated that up to 25% of women suffer from stress during pregnancy (Matvienko-Sikar and Dockray 2017). Further, the prevalence of antepartum anxiety and depression among pregnant women is 17% and 10.3% respectively (Gelaye et al. 2017; Nath et al. 2018). According to the National Institute for Health and Care Excellence (NICE), every pregnant women should be assessed their emotional health, including stress levels, during pregnancy (Henderson, Jomeen, and Redshaw 2018; NICE 2014).

As pregnancy is a major life event, pregnancy-specific stress may be more strongly associated with adverse outcomes than general stress (Alderdice and Lynn 2009; Lobel et al. 2008; Lobel and Dunkel-Schetter 2016). Pregnancy-specific stress refers to pregnant women's concerns about physical symptoms, the health of the fetus, labor, relationships, and parenting (Alderdice, Lynn, and Lobel 2012). Among

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4 15 questionnaires identified to measure pregnancy-specific stress (Alderdice, Lynn,
5 and Lobel 2012), the Prenatal Distress Questionnaire (PDQ) (Yali and Lobel 1999) has
6
7 been used in a wide range of studies and has been recommended to assess stress
8
9 related to pregnancy (Nast et al. 2013). In addition to the original English version
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11 used in the U.S., Ireland and the United Kingdom (Alderdice et al. 2013; Gennaro,
12
13 Shults, and Garry 2008; Heberlein et al. 2016; Lobel et al. 2000; Lynn et al. 2011; Yali
14
15 and Lobel 1999), the PDQ has been translated in German samples (Bolten et al. 2011;
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17 Koletzko, La Marca-Ghaemmaghami, and Brandstätter 2015; Pluess et al. 2010).
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24 Two studies have explored the factor structure of the PDQ in English-
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26 speaking low and high-risk pregnant women (Alderdice and Lynn, 2011; Alderdice
27
28 et al. 2013), and it was found to be stable with three factors identified: “Concerns
29
30 about Birth/Baby,” “Concerns about Weight/Body Image,” and “Concerns about
31
32 Emotions/Relations”. Convergent validity with the Perceived Stress Scale (PSS), the
33
34 State-Trait Anxiety Inventory-State (STAI-S), and the Edinburgh Postnatal
35
36 Depression Scale (EPDS) has been demonstrated (Alderdice, Lynn, and Lobel 2012).
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41 The original PDQ (Yali and Lobel 1999) has not been administered to Spanish-
42
43 speaking samples.
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46 The aim of the present research was to translate the PDQ into Spanish, analyze its
47
48 factor structure using Exploratory Factor Analysis (EFA) and Confirmatory Factor
49
50 Analysis (CFA), and assess its convergent validity when applied to pregnant women
51
52 in Spain. Because dimensionality of the PDQ has only been explored across two
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54 studies (Alderdice and Lynn, 2011; Alderdice et al. 2013) and the three underlying
55
56 dimensions identified by these studies are considered to display construct validity
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3
4 (Alderdice, Lynn, and Lobel 2012), we first used EFA for investigating the structure
5
6 of the scale. Then, Confirmatory Factor Analysis was performed with the aim of
7
8 examining how closely the three-factor structure adequately represents the patterns
9
10 of responses in our Spanish sample. In this way, our overarching aim was to
11
12 investigate whether these factors embody significant facets of women's experiences
13
14 of pregnancy in a different cultural context.
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17

18 **Methods**

19 **Sample**

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21
22 This study was based on data from a longitudinal study of perinatal stress in Spain
23
24 (GESTASTRESS) (Caparros-Gonzalez et al. 2018). Eligible participants were low-risk
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26 pregnant women, proficient in the Spanish language, and over 18 years old.
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31 Participants were identified and recruited by two community midwives (January
32
33 2015 – March 2016) while attending a prenatal appointment at two Health Centers in
34
35 the south of Spain. The two midwives screened potential participants for eligibility
36
37 according to medical data in the Pregnancy Health Document (Andalusian Ministry
38
39 of Health 2010), which is the official record of every pregnant woman in Spain. A
40
41 total of 305 pregnant women were approached to participate, and 288 women
42
43 consented to participate. Subsequently, six women were excluded (pregnancy ended
44
45 in miscarriage); 37 declined to participate, after initially agreeing to collaborate,
46
47 referring to lack of time, and 12 were excluded because they provided only
48
49 sociodemographic information. This resulted in a final sample of 233 women, which
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51 was above the minimum sample size required to conduct both an EFA and a CFA: At
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4 least 10 participants per estimated item is the general consensus (Schreiber et al.
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6
7 2006). All 233 participants completed each of the PDQ items with no missing data.
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9 **PDQ translation procedure**

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11
12 This process was performed in accordance with international guidelines for cross-
13
14 cultural adaptations of questionnaires (Epstein, Santo, and Guillemin 2015; Martin
15
16 and Savage-McGlynn 2013).
17

18
19 An expert team in perinatal health and proficient in both languages translated
20
21 the PDQ into Spanish separately (Version 1). Version 1 was translated back into
22
23 English (Version 2) by a professional translator-editor. According to the expert team,
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25
26
27 Version 2 was grammatically and semantically equivalent to the original
28
29 questionnaire. No variability was found among versions. A pilot sample of 40
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31 participants completed the final translated version and found it easy to understand
32
33 and adequately reflected their concerns. No further changes were made following
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35
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37 piloting.
38

39 **Study instruments**

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41 The Prenatal Distress Questionnaire (PDQ) is a 12-item scale to assess specific
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43 worries and concerns during pregnancy regarding physical symptoms, relationships,
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45 parenting, medical problems, labor and delivery, and the health of the baby (Yali and
46
47 Lobel 1999). The psychometric properties reported for the PDQ substantiate its
48
49 reliability and validity (Alderdice et al. 2013; Gennaro, Shults, and Garry 2008; Lobel
50
51 et al. 2000; Lynn et al. 2011; Pluess et al. 2010; Yali and Lobel 1999). Responses are on
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53 a 5-point Likert scale from 0 (Not at all) to 4 (Extremely). Responses to the 12-item
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59 PDQ are summed, providing a prenatal distress score ranging from 0 to 48.
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4 The convergent validity of the PDQ was assessed through two psychosocial stress
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6 instruments:

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9 The Perceived Stress Scale (PSS): The Spanish version of the 14-item Perceived Stress
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11 Scale (PSS) (Cohen, Kamarck, and Mermelstein, 1983; Remor 2006) was used to assess
12
13 perceptions of general stress during the last month. Responses are on a 5-point Likert
14
15 scale from 0 (never) to 4 (very often). The Cronbach's alpha reliability coefficient of
16
17 the Spanish version is $\alpha = 0.81$.

18
19
20 The Symptom Checklist-90-Revised (SCL-90-R) (Caparros-Caparros et al. 2007;
21
22 Derogatis 1994): This scale is used to assess psychopathological symptoms and has
23
24 been translated into 26 languages. It consists of 90 items scored by a 5-point Likert
25
26 scale from 0 (never) to 4 (extremely) and is used to assess nine dimensions:

27
28 Somatization, Obsession Compulsion, Interpersonal Sensitivity, Depression, Anxiety,
29
30 Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. The scale also has
31
32 three global indexes of distress: GSI (overall psychological distress), PSDI (intensity
33
34 of symptoms) and Positive Symptom Total (number of self-reported symptoms). The
35
36 Cronbach's alpha reliability coefficients of the Spanish version range from 0.67 to
37
38 0.94.

39
40
41 Socio-demographic and obstetric data were collected from the Pregnancy Health
42
43 Document (Andalusian Ministry of Health 2010).

44 45 46 **Data Analysis**

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49 Data were analyzed using Stata 13 (StataCorp 2013). The appropriateness of the
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51 factor model was checked using the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of
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53 sphericity. KMO test was applied to assess the sample size adequacy (KMO values
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4 between 0.7 and 0.8 are good). Bartlett´s test of sphericity was used to assess whether
5
6 the correlation between variables was different from zero. Bartlett´s test of sphericity
7
8 must be significant ($p < 0.05$) (Field, 2009). Bartlett´s test of sphericity ($\chi^2(1) = 541, p$
9
10 < 0.001) and the Kaiser-Meyer-Olkin ($KMO = 0.76$) to test the three-factor structure
11
12 described previously (Alderdice and Lynn 2011; Alderdice et al. 2013) were
13
14 satisfactory. Components with eigenvalues over Kaiser´s criterion of 1 were selected
15
16 as factors (Braeken & Van Assen, 2017). The principle underlying EFA and CFA is
17
18 that items are indicators of latent constructs, i.e., constructs that cannot be observed
19
20 directly. For example, we cannot observe intelligence directly, but we can infer the
21
22 level of someone´s intelligence by observing her performance across a number of
23
24 tasks (items). The assumption is that the performance in these tasks will be
25
26 correlated. Performance in a task (or answer to an item) is therefore the result of the
27
28 underlying ability (e.g., intelligence) (Field, 2009).
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37 First, an EFA, using maximum likelihood and the oblimin rotation method with Kaiser
38
39 normalization, was conducted on half of the sample ($n = 116$) for searching the structure of
40
41 the scale (Field, 2009). Half of the sample was randomly selected at a 1:1 ratio by means of
42
43 an Excel RAND function (Microsoft Excel, 2010). Many items in the questionnaire
44
45 displayed skewed and asymmetric distributions. To allow for this skewness and
46
47 asymmetry, we conducted Confirmatory Factor Analysis using a Weighted Least
48
49 Squares Means and Variance adjusted (WLSMV) estimator, which is more adequate
50
51 in analyzing categorical data with non-normal distributions than Maximum-
52
53 Likelihood (ML) estimators (Beauducel and Herzberg 2006; Rhemtulla, Brosseau-
54
55 Liard, and Savalei, 2012). Analyses were run using Mplus 7.1 (Muthén and Muthén
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4 2013): Model fit was assessed by using the Likelihood ratio χ^2 of the model of interest
5 compared against the saturated model: A non-significant result is indicative of good
6 model fit with the data (Acock 2013). We also used other goodness of fit indicators
7 including the Comparative Fit Index (CFI), with values over 0.95 indicating good fit
8 of the model; the Root Mean Squared Error of Approximation (RMSEA), with values
9 less than 0.05 indicating a close fit; and The Weighted Root Mean Squared Residuals
10 (WRMR), with values less than 1 indicating good fit (Hu and Bentler 1999).
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22 We estimated factor scores in the latent dimensions of the CFA model with the
23 best fit. Relationships between these factor scores and other concurrent measures of
24 anxiety and mental health variables were assessed using Pearson correlations to test
25 convergent validity, which provides information about the extent to which two
26 instruments measure a similar construct (Carlson and Herdman 2012).
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32 Ethics

33 The Human Ethics Research Committee of the University of Granada (reference
34 881), the Biomedical Ethics Research Committee and the Ethics Research Committee
35 of the Health Centers, and the hospital where this study was implemented approved
36 the study protocol. This study was conducted according to the guidelines of the
37 Helsinki Declaration (AMM, 2008) and the Good Clinical Practice Directive
38 (Directive 2005/28/EC) of the European Union. Participation was voluntary, and
39 every participant read and signed an informed written consent document.
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54 Results

55 Sample characteristics and descriptive statistics

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4 The majority of participants were between 26 and 35 years old, from Spain, married
5 or co-habiting, working part-time, with no previous miscarriages and wanted to be
6 pregnant (Table 1). The Spanish PDQ mean scores and standard deviations (in
7 brackets) in our sample are presented from the lowest distressing (handling the baby
8 after coming home from hospital) to the most distressing (the possibility of having an
9 unhealthy baby) (Figure 1).
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18 (Please place Table 1 about here)

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21 (Please place Figure 1 about here)

22 23 24 **Exploratory Factor Analysis**

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27 Statistical analysis using EFA indicated that three components had eigenvalues over
28 Kaiser´s criterion of 1 (Braeken & Van Assen, 2017), explaining in combination
29 34.37% of the variance. Item selection was performed by excluding items with
30 loadings < 0.32 (Nues et al., 2016). [Table S1 shows the factor loading after rotation.]
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36 The items that clustered on the same components were: Factor 1 represents Birth
37 Concerns (items 3, 9, 10, 11, and 12), Factor 2 Relationships (items 4, 5, and 8) and
38 Factor 3 Physical Symptoms (items 1, 2, and 7). Item no 6 did not load on any factor
39 and was thus excluded from the identified factors. Goodness of fit indicated
40 significant model fit, $\chi^2(33) = 59.12$, $p = 0.346$. Item 6 did not load in any factor, so
41 we decided to exclude it from our factors.
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50 51 **Confirmatory Factor Analysis**

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53 Confirmatory Factor Analysis on half of the sample (n = 117) revealed Factor 1 refers
54 to Birth Concerns (items 3, 9, 10, 11, and 12), Factor 2 Relationships (items 4, 5, and 8)
55 and Factor 3 Physical Symptoms (items 1, 2, and 7). This structure is identical to the
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4 one identified in the EFA conducted in this study. This three-factor structure is the
5 same as described in previous studies (Alderdice and Lynn 2011; Alderdice et al.
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9 2013), except for item 2, which was excluded in a previous study (Alderdice and
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11
12 Lynn 2011), due to not loading on any factor. The three-factor structure indicated a
13
14 good fit of the model $\chi^2(32) = 40.42, p > 0.01$; CFI = 0.955; RMSEA = 0.048; WRMR =
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16
17 0.058.
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19 Then, we tested the three-factor structure model reported by Alderdice and Lynn
20
21 (2011) using the complete sample (N = 233). Factor 1 was made up of items reflecting
22
23 concerns over the baby and giving birth (items 3, 6, 9, 10, 11 and 12); factor 2 was
24
25 constituted from items reflecting worries about body and weight (items 1, 2, and 7);
26
27
28 and factor 3, reflecting concerns about relationships and emotions (items 4, 5 and 8).
29
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31 Consistent with the previous study (Alderdice and Lynn, 2011), item 2 (physical
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33 symptoms) was excluded from the model as it did not load on any factor (Model 1,
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35
36 Table 2). Although excluding item 2 improved goodness of fit statistics,
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39 improvements were still needed (Model 2, Table 2). Successively, we considered item
40
41
42 6 (concerns about eating a healthy and balanced diet) may be a culturally-sensitive
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44
45 item (in countries with a traditional Mediterranean diet (such as Spain) that is low in
46
47
48 saturated fat and in which fresh fruit and vegetables are more easily available
49
50
51 (Willett et al. 1995), individuals may have less concerns and emphasis on healthy
52
53
54 eating during pregnancy compared to North-European countries. Indeed, excluding
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56
57 item 6 from the scale resulted in an improvement of fit (Model 3, Table 2), although
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60 the fit obtained was still not adequate.

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4 Due to associations between concerns about emotions and concerns about
5
6 relationships (Rosand et al. 2011), in Model 4 we tested the inclusion of a correlation
7
8 between the error terms of item 4 (concerns about emotions) and item 5 (concerns
9
10 about relationships). Due to reported associations between prematurity and the
11
12 health of newborns (NICE 2015), an association between the error terms of item 9
13
14 (concerns about health of newborn) and item 11 (concerns about birth before term)
15
16 was assessed in Model 4. The results of this final model indicated a good fit of the
17
18 model (Model 4, Table 2).
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20
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22 (Please place Table 2 about here)

23
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25 All the associations between indicators and underlying factors were statistically
26
27 significant ($p < 0.001$). Bivariate correlations of the three factors were all statistically
28
29 significant ($p < 0.01$, Figure 2). Factor 1 (Birth Concerns) correlated with Factor 2
30
31 (Physical Concerns) ($r = 0.35$; $p < 0.001$). Factor 1 (Birth Concerns) correlated with
32
33 Factor 3 (Relations Concerns) ($r = 0.71$; $p < 0.001$). Factor 2 (Physical Concerns)
34
35 correlated with Factor 3 (Relations Concerns) ($r = 0.68$; $p < 0.001$).
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40 (Please place Figure 2 about here)

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43 Although the CFA supported the presence of three underlying factors, the
44
45 PDQ has been used as a uni-dimensional scale, assuming a single underlying factor.
46
47 We also tested the fit of a model whereby all 10 items considered above were
48
49 assumed to be indicators of a single underlying factor. Once we modelled some
50
51 additional associations between error terms (items 9 and 10; 9 and 11; 10 and 11; 1
52
53 and 7; 4 and 5), the fit indices overall indicated adequate model fit, $\chi^2(30) = 55.7$, $p >$
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55 0.05 ; $CFI = 0.95$; $RMSEA = 0.061$; $WRMR = 0.710$. To compare the three-factor model
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4 and the one-factor model, we ran these models using an MLR estimator in Mplus 7.1
5
6 (Muthén and Muthén 2013). The information criteria of the uni-dimensional and tri-
7
8 dimensional model were very similar ($BIC = 6190.4$ and $BIC = 6190.3$; $AIC = 6069.6$
9
10 and $AIC = 6069.5$ for the uni-dimensional and tri-dimensional models respectively),
11
12 suggesting that the one-factor and three-factor models provided comparable fit to the
13
14 data.
15
16

17 18 **Evidence of convergent validity** 19

20
21 Pearson's correlations to test convergent validity between the PDQ, the PSS and the
22
23 SCL-90-R indicated that the three PDQ factors and the one-factor solution were
24
25 significantly (all p values < 0.01) positively correlated with the PSS and the SCL-90-R
26
27 (Table 3).
28
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31 (Please place Table 3 about here)
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34 Results did not indicate significant associations of factor scores in the three
35
36 dimensions with age or marital status (all ANOVAs $p > 0.05$). Women pregnant for
37
38 the first time reported higher Birth Concern ($Mean = 7.56$ compared to $Mean = 5.72$
39
40 for multiparous women), $t(150) = 3.63$, $p < 0.05$. Indeed, parity was significantly
41
42 inversely related to Birth Concern factor scores ($\beta = -0.23$, $p = 0.007$), even when we
43
44 controlled for age and marital status, $F(4, 146) = 2.85$, $p = 0.026$, adjusted $R^2 = 0.05$.
45
46 No significant differences were found between primiparous and multiparous women
47
48 for the other factors.
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53 Considering the 12 items of the questionnaire, the Cronbach's alpha was $\alpha = 0.743$.
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56 The change in Cronbach's alpha by deleting an item from the scale and inter-total
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4 correlation matrix were satisfactory with internal consistency values in the range 0.696-0.756

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6
7 (Table 4).

8
9 (Please place Table 4 about here)

10 **Discussion**

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14 The PDQ is a valuable psychometric instrument used to assess pregnancy-specific
15
16 stress related to pregnancy (Alderdice, Lynn, and Lobel 2012; Auerbach et al. 2017;
17
18 Kerry et al. 2015; Nast et al. 2013). Although it has not been adapted to Spanish-
19
20 speaking countries yet, the Revised Prenatal Distress Questionnaire (NuPDQ), a
21
22 slightly expanded (17-item) version (Lobel et al. 2008), has already been translated
23
24 and applied to Latin-American (Arroyo 2013; Coussons-Read et al. 2012;
25
26 Chaponniere 2009) and Turkish (Yuksel, Akin, and Durna 2014) women.
27
28
29 Nevertheless, no publications of which we are aware have reported the use of the
30
31 original PDQ in Spanish-speaking samples. The aim of this study was to confirm the
32
33 three-factor structure of the Spanish version of the original PDQ and report evidence
34
35 of convergent validity among pregnant Spanish women.
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40
41 Consistent with previous studies (Alderdice and Lynn 2011; Alderdice et al
42
43 2013), the CFA revealed a three-factor structure. Factor 1 (Birth Concerns) (items 3, 9,
44
45 10, 11 and 12); factor 2 (Relations Concerns) (items 4, 5 and 8); and factor 3 (Physical
46
47 Concerns) (items 1 and 7). Covariances between errors in items 9 (unhealthy baby)
48
49 and 11 (premature birth) and between items 4 (emotional concerns) and 5
50
51 (relationships) were included in our final model. Based on the content of these items,
52
53 their overlap appears sensible and suggests that they share some common meaning
54
55 beyond what they share with other items on the stress factor where they loaded.
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4 We excluded item 2 (physical symptoms) because it did not load on its underlying
5
6 factor (Physical Concerns). A similar result was reported by Alderdice and Lynn
7
8 (2011) with low-risk pregnant women. A CFA conducted on high-risk pregnant
9
10 women (Alderdice et al. 2013) included item 2 in the Physical Concerns factor,
11
12 although it exhibited the lowest loading. These differences that correspond to sample
13
14 characteristics suggest that worries about physical symptoms may not be related to
15
16 other indicators of pregnancy-specific stress in low-risk pregnancies, particularly
17
18 during the second trimester. Furthermore, to improve model fit in the present study,
19
20 item 6 (eating healthy food) was not included, as it was not significantly associated
21
22 with any of the three factors. In countries with a traditional Mediterranean diet (such
23
24 as Spain) that is low in saturated fat and where fresh fruit and vegetables are more
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26 easily available (Willett et al. 1995), individuals may have less concerns and
27
28 emphasis on healthy eating during pregnancy compared to North-European
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30 countries, which traditionally have adopted diets rich in saturated fat.
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39 A uni-dimensional factor structure was found to have good fit, revealing this
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41 instrument can be used to evaluate a single underlying construct, namely pregnancy-
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43 specific stress. Pregnancy-specific stress is manifested by high stress levels related to
44
45 the health of the fetus, medical symptoms, labor and delivery and parenting, and is a
46
47 major risk factor for preterm birth and fetal growth restriction that can alter
48
49 fetoplacental hemodynamics (Levine et al. 2017). Prior studies have underscored the
50
51 importance of assessing pregnancy-specific stress, given its association with health-
52
53 impairing behaviors during pregnancy and with adverse perinatal outcomes
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58 (Auerbach, Lobel, and Cannella 2014; Coussons-Read et al. 2012; Lobel et al 2008).
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4 Incorporating brief and robust psychological questionnaires, such as the PDQ, into
5
6 clinical care may improve the identification of women at risk of high levels of
7
8 prenatal stress and promote healthier birth outcomes (Cannella, Auerbach, and
9
10 Lobel, 2013).
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14 The convergent validity between the Spanish version of the PDQ and other
15
16 constructs appeared to be good. All three factors were significantly correlated with
17
18 the PSS. This finding corroborates previous research using the English version of the
19
20 PDQ, which was positively correlated with the PSS (Lobel et al. 2000; Yali and Lobel
21
22 1999). Although previous studies have used the SCL-90-R with pregnant women
23
24 (Peñacoba et al. 2017), the present study is the first of which we are aware to explore
25
26 and find significant correlations of PDQ factors with the SCL-90-R. However, even
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28 the strongest correlations were of moderate magnitude (approximately 0.4),
29
30 suggesting that while pregnancy-specific stress is significantly related to general
31
32 stress and to emotions such as anxiety and depression, this type of stress is still
33
34 sufficiently independent to be defined as a unique construct (Yali and Lobel, 1999).
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36
37 With this in mind, the Spanish version of the PDQ appears to be an adequate
38
39 measure to assess pregnancy-specific stress, as that level of stress women have
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41 during pregnancy specifically related to physical symptoms, health of the fetus,
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43 relationships, labor and delivery and emotional well-being (Lobel et al. 2000; Yali
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45 and Lobel 1999.)
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54 Although the internal consistency of the three factors was below 0.7, the
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56 Cronbach's alpha is a measure that depends on the observed correlation of the items
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58 and the number of items, not taking into account error variance of the items. CFA
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4 allows isolating the variance items share with an underlying dimension from the
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6 error variance of the individual items, thus providing a reliable measure of the
7
8 underlying dimension (Acock 2013).
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11 The Spanish version of the PDQ is a brief measure with good psychometric
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13 properties that provides information about the worries and concerns of pregnant
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15 women both in clinical and research settings. Although it was first developed to
16
17 assess overall levels of pregnancy-related stress, the three-factor structure reported in
18
19 this study gives evidence of the additional detail that can be collected when using
20
21 this measure. Although the results of this study suggest that ten items were sufficient
22
23 as indicators of the three underlying constructs, the two items excluded (physical
24
25 symptoms and eating healthy foods) may be important independent contributors to
26
27 prenatal stress, and we would not recommend eliminating them from the
28
29 instrument. The Revised PDQ, which has been successfully used in a variety of
30
31 recent studies (Arroyo 2013; Auerbach, Lobel, and Cannella 2014; Cannella,
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33 Auerbach, and Lobel 2013; Coussons-Read et al. 2012; Lobel et al. 2008; Yuksel, Akin,
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35 and Durna 2014), expands the instrument by the addition of several items that may
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37 slightly alter, and perhaps improve the factor structure observed for the original
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39 instrument.
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49 Although the Spanish version of the PDQ was applied to a moderately large
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51 sample of low-risk pregnant women in the second trimester of pregnancy, this study
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53 had some limitations. First, selection of the study sample from only two clinical
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55 centers may not have provided a representative sample because it did not include
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57 pregnant women from all health centers nor pregnant women who do not visit
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4 health centers. Further, Spanish was not the first language for a small portion of the
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6 women in this study (6.4%). Additionally, given the cross-sectional design, results
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8 only reflected measurement at one time point and thus cannot provide temporal and
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10 thus potentially causal relations. Future studies should explore variations in
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12 responses and stability of the structure throughout pregnancy. Finally, the potential
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14 for reporting and social acceptability biases should be considered as limitations.
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18 Evaluation of the psychometric properties of questionnaires is imperative.
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21 Although the development of psychological questionnaires is a long methodological
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23 process, studies assessing reliability and validity of measures will improve the
24
25 quality of psychological assessment and enable more appropriate and effective
26
27 application in clinical settings (Gourounti et al. 2016).
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30 31 **Implications for research and practice**

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33 Future research may investigate if the dimensions found in the present study are also
34
35 adequate in representing the experience of women from other cultural backgrounds.
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37 Forthcoming studies need to examine these dimensions throughout gestation and
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39 assess the potential capability of the PDQ to be associated with adverse outcomes in
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41 a population-based sample. Prospective studies could assess the psychometric
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43 properties of the PDQ in high-risk pregnant women (Alderdice et al. 2013). Good
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45 assessment is an important first step in both research and practice in developing
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47 effective care to support women experiencing stress in pregnancy (Gourounti et al.
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49 2016). Health care providers can assess pregnancy-specific stress using the PDQ. The
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51 fact that the PDQ is a short pregnancy-specific stress measure may benefit clinical
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4 practice by starting conversations on specific aspects of pregnancy that women might
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6 want additional support.
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9 **Conclusions**

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11 The three-factor structure identified in a prior EFA was confirmed in this CFA using
12
13 a sample of Spanish women with low-risk pregnancies. The results indicated that
14
15 three factors explained the participants' pattern of responses to ten questions. These
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17 factors represented concerns about birth and the baby, emotions and relationships,
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19 weight gain and bodily changes. These PDQ factors were significantly correlated
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21 with measures of general perceived stress and emotions, indicating good convergent
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23 validity. Results indicated that a one-factor structure also provided an adequate fit to
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25 the data; this factor represents an underlying pregnancy-specific stress construct. The
26
27 Spanish version of the PDQ is a reliable and valid instrument to assess stress levels
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29 during pregnancy. The results of this study also provide evidence that the
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31 dimensions investigated by the PDQ represent significant dimensions of women's
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33 experience of distress during pregnancy across different western cultural contexts.
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Figure 1 Spanish PDQ mean scores and standard deviations (in brackets) in the study sample for each item (N = 233)

Figure 2 Standardized estimates of the final three factors model of the CFA (Model 4) (N = 233)

Table 1. Sociodemographics and obstetric history of participants (N = 233)

Variables	Frequency (%)
<i>Sociodemographics</i>	
Age group (years)	
19-25	30 (12.9)
26-35	155 (66.5)
36-42	48 (20.6)
Country of origin	
Spain	172 (73.8)
Latin America	46 (19.7)
Europe (not Spain)	12 (5.1)
Morroco	2 (0.9)
Russia	1 (0.4)
Marital status	
Married/Co-habiting	225 (96.6)
Single/Separated/Divorced	8 (3.4)
Employment	
Full-time job	36 (15.5)
Part-time job	119 (51.1)
Unemployed	62 (26.6)
Student	8 (3.4)
Student and employed	8 (3.4)
Level of education completed	
Primary School	15 (6.4)
Secondary School	71 (30.5)
University	147 (63.0)
<i>Obstetric history</i>	
Weeks of gestation	
7-15	16 (6.9)
16-30	206 (88.4)
31-37	11 (4.7)
Previous miscarriages	
None	169 (72.5)
1 miscarriage	49 (21.1)
2 miscarriages	11 (4.7)
3 or more miscarriages	4 (1.7)
Living children	
None	133 (57.1)
1 child	79 (33.9)
2 children	14 (6.0)
3 or more children	7 (3.0)
Wantedness	
I wanted to be pregnant	200 (85.8)
I did not want to be pregnant then or any time in the future	33 (14.2)
Pregnancy method	
Spontaneous	215 (92.3)
In vitro fertilisation	11 (4.7)
Artificial insemination	7 (3.0)

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Table 2. Fit indices for the Spanish PDQ CFA for the three-factor Models (N = 233).

	Model 1	Model 2	Model 3	Model 4
	From Alderdice & Lynn (2011)	Excludes item 2	Item 2 and item 6 removed	Item 2 and item 6 removed; includes associations between items 4 and 5, as well as 9 and 11.
LR χ^2	$\chi^2(51)=164.8, p < 0.001$	$\chi^2(41)=101.1,$ $p < 0.001$	$\chi^2(32)=65.1,$ $p < 0.001$	$\chi^2(30)=47.1,$ $p < 0.001$
CFI	0.86	0.90	0.94	0.97
RMSEA*	0.098 (90% CI 0.081 to 0.115)	0.079 (90% CI 0.06 to .09)	0.067 (90% CI 0.04 to 0.09)	0.049 (90% CI 0.01 to 0.07)
WRMR	1.105	0.920	0.769	0.640

* Following the standard of reporting for RMSEA, 90% CI was applied (Curran et al., 2003).

Table 3. Correlation coefficients between the Prenatal Distress Questionnaire (PDQ), Perceived Stress Scale and Symptom Checklist-90 (SCL-90-R) and internal consistency of the PDQ (N = 233)

		Three-factor Solution			One-factor solution
		Factor 1 (Birth Concerns)	Factor 2 (Physical Concerns)	Factor 3 (Relations Concerns)	
Perceived Stress Scale		0.29**	0.18**	0.30**	0.321**
SCL-90-R sub-scales	Somatization	0.411**	0.266**	0.440**	0.496**
	Obsession Compulsion	0.267**	0.269**	0.337**	0.352**
	Interpersonal Sensitivity	0.296**	0.271**	0.338**	0.344**
	Depression	0.387**	0.230**	0.413**	0.451**
	Anxiety	0.383**	0.256**	0.421**	0.451**
	Hostility	0.356**	0.149	0.318**	0.341**
	Phobic Anxiety	0.224**	0.149	0.241**	0.266**
	Paranoid Ideation	0.246**	0.195*	0.285**	0.282**
	Psychoticism	0.284**	0.185*	0.261**	0.313**
	GSI	0.386**	0.269**	0.418**	0.447**
	PSDI	0.333**	0.138	0.314**	0.398**
	Positive Symptom Total	0.343**	0.280**	0.400**	0.371**
	Cronbach's alpha	0.642	0.529	0.684	0.743

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Note. PSS, Perceived Stress Scale

* $p < 0.05$

** $p < 0.01$

Table 4. Inter-total Correlation Matrix and Cronbach's alpha if an item was deleted (N = 233)

	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10	Item11	Item12
Item1												
Item2	0.355											
Item3	0.049	0.188										
Item4	0.138	0.494	0.225									
Item5	0.156	0.283	0.087	0.348								
Item6	0.023	0.001	0.206	0.057	-0.018							
Item7	0.520	0.413	0.116	0.249	0.241	0.171						
Item8	0.262	0.210	0.321	0.219	0.257	0.219	0.346					
Item9	0.206	0.207	0.131	0.060	0.092	0.102	0.149	0.195				
Item10	0.234	0.360	0.297	0.209	0.148	0.023	0.237	0.291	0.333			
Item11	0.087	0.246	0.211	0.132	0.063	0.031	0.086	0.171	0.409	0.441		
Item12	0.046	0.177	0.121	0.176	0.218	-0.129	0.091	0.232	0.113	0.237	0.263	
Cronbach's alpha if item deleted	0.717	0.696	0.721	0.714	0.723	0.756	0.705	0.705	0.718	0.697	0.715	0.729

Table S1. Summary of exploratory factor analyses results for the Prenatal Distress Questionnaire (n = 116).

	Rotated Factor Loadings		
	Factor 1 Concerns about Birth	Factor 2 Concerns about Relationships	Factor 3 Concerns about Physical Symptoms
Item 1 (weight gain)	-0.15	0.11	0.65
Item 2 (physical symptoms)	0.32	0.39	0.43
Item 3 (handling baby)	0.44	0.08	-0.12
Item 4 (emotional symptoms)	0.27	0.95	-0.08
Item 5 (relationships people)	-0.01	0.47	0.29
Item 6 (healthy food)	0.01	-0.01	0.04
Item 7 (body shape)	-0.11	0.13	0.68
Item 8 (relationship partner)	0.07	0.64	0.23
Item 9 (unhealthy baby)	0.41	-0.31	0.24
Item 10 (labour and delivery)	0.48	0.11	0.11
Item 11 (prematurity)	0.63	0.01	-0.04
Item 12 (emotional attachment)	0.42	-0.04	0.01
Eigenvalues	1.56	1.46	1.41
% of variance	14.55	8.34	11.48

Note. Factor loadings > 0.32 appear in bold.

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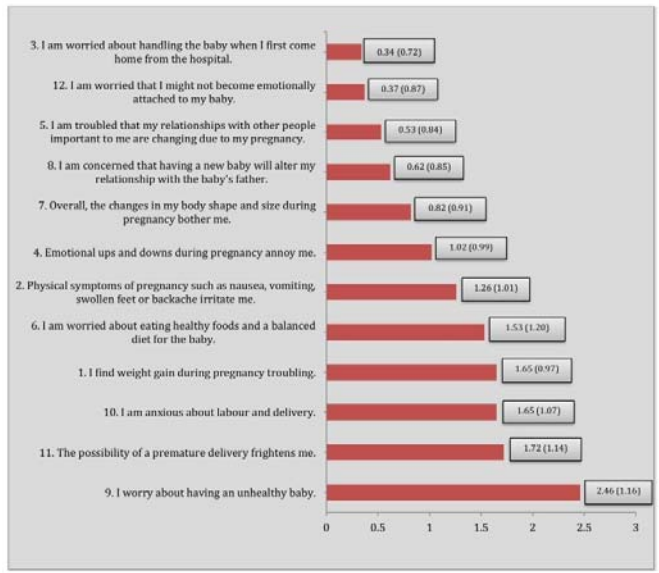


Fig 1 Spanish PDQ mean scores and standard deviations (in brackets) in the study sample for each item (N = 233)

297x209mm (300 x 300 DPI)

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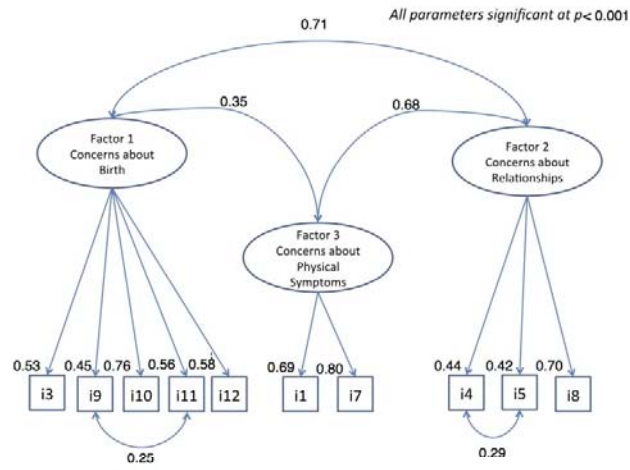


Figure 2 Standardized estimates of the final three factors model of the CFA (Model 4) (N = 233)

209x296mm (200 x 200 DPI)