

Psychometric Properties of the PDRQ-9 in Cancer Patients: Patient-Doctor Relationship Questionnaire

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Abstract

Background: The patient-doctor relationship is an important concept in health care. The aim of this study was to evaluate the psychometric properties, convergent validity, and factorial invariance of the Patient-Doctor Relationship Questionnaire (PDRQ-9). **Method:** Confirmatory factor analysis was conducted to explore the scale's dimensionality and test for strong measurement invariance across sex, age, and tumor site in a prospective, multicenter cohort of 560 patients who completed the PDRQ-9, Health-related Quality of Life Questionnaire (EORTC-QLQ-C30), and Brief Symptom Inventory (BSI) scales. **Results:** The data supported a unidimensional structure. Thresholds and factor loadings could be constrained to be invariant across sex, age, and tumor site, indicating strong measurement invariance. Scores derived from the unidimensional structure exhibited satisfactory degrees of reliability and determinacy. Evidence of convergent validity was supported by modest positive correlations with functional ($p < .001$) and global quality-of-life ($p < .001$) and negative correlations with psychological distress ($p < .001$). Low satisfaction with the oncologist was associated with anxiety ($p = .006$), and depression ($p = .004$). **Conclusions:** The PDRQ-9 is a suitable, valid instrument for assessing the quality of patient-doctor relationships in cancer patients.

Keywords: Invariance; factor analysis; patient-reported outcome measures; oncology; validity.

Resumen

Propiedades Psicométricas del PDRQ-9 en Pacientes con Cáncer: Cuestionario de Relación Médico-Paciente. Antecedentes: la relación médico-paciente es un concepto importante en cuidado de la salud. El objetivo de este estudio fue evaluar las propiedades psicométricas, la validez y la invariancia factorial del Cuestionario de Relación Médico-Paciente (PDRQ-9). **Método:** se realizó un análisis factorial confirmatorio para explorar la dimensionalidad de la escala y la invariancia de medición a través del sexo, la edad y la localización del tumor en una cohorte prospectiva multicéntrica de 560 pacientes que completaron el PDRQ-9, el Cuestionario de Calidad de Vida (EORTC-QLQ-C30) y el Inventario Breve de Síntomas (BSI-18). **Resultados:** los datos apoyaron una estructura unidimensional. Los umbrales y las cargas de los factores podían considerarse invariantes en función del sexo, la edad y localización de tumor (invariancia fuerte). Las puntuaciones derivadas de la estructura unidimensional mostraron grados satisfactorios de confiabilidad y determinación. La evidencia de validez convergente fue apoyada por correlaciones positivas modestas con la escala funcional ($p < .001$) y la calidad de vida ($p < .001$) y correlaciones negativas con malestar psicológico ($p < .001$). La baja satisfacción con el oncólogo estuvo asociada a mayor ansiedad ($p = .006$) y depresión ($p = .004$). **Conclusiones:** el PDRQ-9 es un instrumento válido y adecuado para evaluar la calidad en la relación médico-paciente en pacientes con cáncer.

Palabras clave: invariancia; análisis factorial; medidas de resultado informadas por el paciente; invariancia; oncología; validez.

The patient-physician rapport is central to medical practice and fundamental when evaluating quality of care at diagnosis and during treatment (Kayser et al., 2018). A good patient-doctor relationship correlates with patient satisfaction, better treatment

compliance, and better prognosis (Mazor et al., 2018; Pedersen et al., 2019). Efforts have been made in recent years to develop tools to quantify this relationship from the patient's perspective.

The Patient-Doctor Relationship Questionnaire (PDRQ-9) was originally developed in the Netherlands as a short questionnaire to examine the relationship between patient and primary care physician from the patient's point of view (Van der Feltz-Cornelis et al., 2004). The PDRQ-9 was created on the basis of the Dutch version of the 11-item Helping Alliance Questionnaire (HAQ) (Horvath et al., 1993). The PDRQ originally comprised 15 items and its factorial structure was evaluated by means of a principal

components analysis (PCA) in a sample of 110 general practice patients and 55 patients in a Epilepsy Clinic (Van der Feltz-Cornelis et al., 2004). The factorial analysis of the scale indicated two factors; the first one with good internal consistency probed the physician's empathic, approachable style, while the second, with moderate consistency, integrated the patient's medical symptoms. With the aim of creating a patient-doctor relationship rating scale, the second-factor items were eliminated, and the final, unidimensional 9-item PDRQ-9 scale was developed. This questionnaire collects aspects such as communication, satisfaction with the treatment and accessibility to the doctor.

The PDRQ-9 has been translated to and validated in Spanish (Martín-Fernández et al., 2010; Mingote et al., 2009), Portuguese (Wollmann et al., 2018), German (Zenger et al., 2014), Turkish (Mergen et al., 2012), and Bengali (Arafat, 2016). Scale scores show excellent internal-consistency reliability (Cronbach's alpha of .94), satisfactory test-retest reliability, and adequate validity relations in the context of Primary Care. However, as suggested (Van der Feltz-Cornelis et al., 2004), studies with other patient populations are needed to confirm these findings. In this regard, the PDRQ-9 has been used with a sample of individuals with schizophrenia (Aloba et al., 2015) and in patients with mental disorders (Arafat, 2016), endorsing the scale's psychometric properties.

Another relevant aspect of the PDRQ-9's factor structure is the study of intergroup measurement invariance (e.g., gender, age, or tumor site). Testing the measurement invariance hypothesis enables comparisons to be made across groups, yielding easily interpretable results, as opposed to scenarios in which this premise is not examined. So far as we know, the psychometric properties of the PDRQ-9 and the invariance study have not been analyzed in a sample of oncology patients. Therefore, the aim of this study is to analyze the PDRQ-9's factor structure, convergent validity, and factor invariance across gender, age, and tumor site in a sample of individuals with cancer.

Method

Participants

The study included 560 patients with cancer, predominantly female (58.4%), aged 26-85 years ($M=58.9$, $SD=12.0$), married or partnered (79.8%), and inactive (60.4%). Most of the participants had colorectal (44.3%) or breast (34.3%) cancer, stage I-II (54.1%), and all received adjuvant chemotherapy; 31.6% also received radiotherapy. Men were more satisfied with their physician than women ($F_{(1,559)}=6.39$; $p=.012$; $\eta^2=.011$), as well as patients who were married or partnered versus unmarried, widowed, or divorced ($F_{(1,599)}=4.60$; $p=.032$; $\eta^2=.008$) (see Table 1).

Instruments

Patient-Doctor Relationship Questionnaire (PDRQ-9) (Van der Feltz-Cornelis et al., 2004) is a 9-item scale that assesses patients' perception of the relationship with the physician (in the context of this study, the oncologist); thus, it serves as a brief measure to quantify the therapeutic dimensions of the patient-doctor relationship. Items are scored on a 5-point Likert scale ranging from 'not at all appropriate' to 'totally appropriate'. Raw sum scores range from 9 to 45, with higher scores indicating that the patient's perception of the patient-doctor relationship is more favorable.

Table 1
Association between PDRQ-9 and socio-demographic and clinical characteristics of the sample

Characteristics	n	%	M	SD	F	P
<i>Gender</i>					6.39	.012
Male	233	41.6	42.6	4.5		
Female	327	58.4	41.5	5.3		
<i>Marital status</i>					4.60	.032
Married or partnered	447	79.8	42.2	4.9		
Single/widowed, divorced	113	20.2	41.1	5.6		
<i>Educational level</i>					1.77	.183
Primary	312	55.7	42.2	4.4		
High school or above	248	44.3	41.6	5.7		
<i>Age group (years)</i>					1.09	.337
≤ 55	203	36.3	41.6	5.4		
56-65	173	30.9	42.3	4.6		
≥ 66	184	32.9	42.2	5.0		
<i>Employment status</i>					1.54	.214
Inactive	338	60.4	42.2	4.8		
Active	222	39.6	41.6	5.4		
<i>Tumor site</i>					2.43	.089
Colon	248	44.3	42.5	4.4		
Breast	192	34.3	41.7	5.1		
Others	120	21.4	41.4	6.0		
<i>Tumor stage (15 missing values)</i>					2.52	.081
I-II	303	54.1	41.6	5.2		
III	242	43.2	42.5	4.3		
<i>Tumor treatment</i>					2.73	.099
Chemotherapy	383	68.4	42.2	4.9		
Chemo- & radiotherapy	177	31.3	41.4	5.3		

Note: Bold values indicate significance at the 5% level

Participants completed the PDRQ-9 without the presence of the oncologist under which they were registered for treatment. This was done to encourage patients to provide their honest opinion. The internal consistency reliability estimates for sum scores based on the scale's nine items for this study was high ($\alpha=.97$).

European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) is used extensively in Europe to assess quality of life and its validity has been well established (Aaronson et al., 1993). The 30 items comprise three subscales: 'Functioning,' 'Symptom,' 'Global QoL'. Score categories range from 1 (not at all) to 4 (very much), except for the global QoL scale, where item scores range from 1 (very poor) to 7 (excellent). All sum-scale scores are linearly transformed into a 0-100 scale. For the functioning scales and the global QoL scale; higher scores represent higher levels of functioning or QoL. For the symptom scales, higher scores represent more symptom burden.

Brief Symptom Inventory (BSI) was used to evaluate anxiety and depression. It includes 12 symptoms to assess the degree of anxiety and depression on a five-point scale ranging from 'total absence of symptom' (1) to 'full presence of symptom' (5) (Derogatis, 2001). Cronbach's alpha estimates ranged from .75 to .88 (Calderón et al., 2020).

Demographic and clinical variables. Age, gender, marital status (married/partnered, not partnered), five age group (≤ 55 , 56-65, ≥ 66 years), employment status (inactive, active), tumor site (colon, breast, others), cancer treatment (chemotherapy, chemotherapy and radiotherapy) and tumor stage (I-II, III).

Procedure

Five hundred and seventy-five patients were recruited consecutively at 15 tertiary referral hospitals in Spain. Adults >18 years old (1) with a pathologic diagnosis of cancer of any type (2) with nonmetastatic, resected cancer eligible for adjuvant chemotherapy (3). All participants were informed of study procedures, data collection, and anonymization of all personal data. Written informed consent was obtained from all patients prior to study commencement, and the protocol was approved by the Ethics Review Board at each institution and by the Spanish Agency of Medicines and Medical Devices (AEMPS). STROBE guidelines were used to ensure reporting of this study (von Elm et al., 2008). The questionnaire was administered six months after initiating chemotherapy. Of the 673 patients screened, 113 were not eligible (23 did not meet inclusion criteria; 29 met exclusion criteria, and 61 had incomplete data).

Data analysis

Preliminary data analyses were conducted using SPSS software Version 23.0 (SPSS, Inc. Chicago, IL). Descriptive statistics were calculated for demographic and clinical characteristics. One-way analysis of variance (ANOVAs) were conducted to gauge variations in PDRQ-9 with respect to sociodemographic and clinical variables.

Confirmatory factor analyses (CFAs) were performed in two steps. In the preliminary step, the unidimensional FA model assumed for the PDQR-9 items was fitted to the entire sample of participants. In the second step, measurement invariance was appraised in groups defined by gender, age, and tumor site. All factor analysis (FA) models were fitted using robust weighted least squares estimation with second order (mean and variance) corrections as implemented in Mplus (see Muthén, 2007). Model fit and appropriateness were evaluated with three types of measures. Model residuals and relative fit (first type) were assessed with SRMS and RMSEA statistics. Comparative fit (second type) was examined using the CFI index (as a relative measure of fit with respect to the null independence model). Finally, the third type (see Calderón et al., 2019) was performed in the overall analysis and included additional indices of appropriateness for evaluating the strength and replicability of the solution (H index), as well as closeness to unidimensionality (ECV index). These indices were obtained by using the Factor Program (Ferrando & Lorenzo-Seva, 2013, 2019). As for reference values, CFI values $\geq .95$ are indicative of good model fit (Schermelleh-Engel et al., 2003), whereas SRMR values $\leq .08$ and RMSEA values $\leq .06$ are considered satisfactory fitting models (Hair et al., 2010; Schermelleh-Engel et al., 2014).

The purposes for which the PDQR-9 is intended include validly interpreting individual and mean group comparisons. More specifically, scores of individuals belonging to different groups (e.g., male vs. female) need to be comparable and mean intergroup differences, validly interpreted. These requirements determined the degree of invariance that was assessed in the multiple-group

analyses. Strong or scalar invariance (Millsap & Meredith, 2007) suffices to meet the afore-named requirements (see Ferrando, 1996), and was deemed a reasonable aim for the PDRQ-9 items. Stricter forms of invariance are not only unnecessary for our purposes, but can lead to biased parameter estimates when forced in a solution (see Little, 1997). So, strong invariance will be evaluated in the multiple-group CFAs, and, if attained, mean differences in groups defined by gender, age, and tumor site will then be examined.

The appropriateness and accuracy of the PDQR-9 scores was ascertained in several ways. First, the reliability and determinacy of the factor score estimates was established by the factor determinacy index (FDI) and marginal reliability estimate of these scores. Second, reliability of the simpler sum scale scores as proxies for factor scores was verified using McDonald’s omega estimate. Thirdly, the relations between the factor score estimates and the sum scores was further assessed graphically. Finally, the local accuracy at different trait levels was assessed using the conditional reliability estimates.

Lastly, evidence of convergent validity was explored in two ways. First, product-moment correlations were obtained between PDQR-9 raw scores and four of the EORTC indices (functional scale, symptom scale, overall health, and QoL), as well as the anxiety and depression scores from the BSI. Second, a structural equation model was fitted to the data, in which the CFA was extended to include the external scores above. The first type of validity coefficients is empirical, with no error corrections. The standardized validity coefficients estimated from the structural model are disattenuated and correct the PDQR-9 scores for measurement error.

Results

Descriptive statistics for PDRQ-9 items

Table 2 presents the descriptive statistics of the PDRQ-9. The mean satisfaction index was 42.0 (SD=5.1); half of the participants

Table 2
Characteristics of PDRQ-9 items

Items	M	SD	Skewness	r_{ii}	α if item deleted
1. My oncologist helps me	4.6	.51	-2.61	.84	.94
2. My oncologist physician has enough time for me	4.5	.70	-1.92	.70	.95
3. I trust my oncologist.	4.7	.36	-3.36	.82	.94
4. My oncologist understands me	4.6	.50	-2.43	.81	.94
5. My oncologist is dedicated to helping me	4.9	.44	-2.67	.88	.94
6. My oncologist and I agree about the nature of my medical symptoms	4.6	.48	-2.58	.83	.94
7. I can talk to my oncologist	4.7	.40	-3.16	.79	.95
8. I feel content with my oncologist’s treatment	4.7	.41	-3.23	.80	.94
9. I find my oncologist easily accessible	4.6	.55	-2.54	.80	.94
PDRQ-9 total	42.0	4.66			
Note: r_{ii} = Item Discrimination Index					

expressed the maximum satisfaction possible. This result could be anticipated by inspecting the distribution, and particularly the skewness of the PDRQ-9 items: unimodal and asymmetrical left skewed distribution, indicating that most of the values were concentrated to the right of the mean. Corrected item-total correlations (item discrimination indices) were all $>.70$, showing that all items accounted for a substantial amount of the variance of the total scale.

Confirmatory factor analysis and measurement invariance

Given that the item scores were ordered-categorical, with strongly negative skewed distributions and the sample size was large, we decided that the most suitable factor-analysis procedure was the non-linear item factor analysis model based on an underlying-variables approach, which proved to be feasible for all the analyses that follow. In this model, the item scores are treated as ordered-categorical variables and the FA solution is fitted to the inter-item polychoric correlation matrix (see Ferrando & Lorenzo-Seva, 2013, for further details). As mentioned above, the fitting function was robust unweighted least squares, with mean-and-variance corrected fit statistics (Ferrando & Lorenzo-Seva, 2018).

Preliminary inspection of the thresholds under the ordered-categorical chosen FA model, showed that, even with the stronger skews, no zero frequencies existed in any of the categories and the item thresholds were finite and increasing. As for the structural results, those at the overall sample level suggested that the unidimensional FA model fitted the data quite well and the values of the standard indices displayed good fit in all cases: SRMS=.02; RMSEA=.05, and CFI=.99. Furthermore, the H value was .98, signifying that the factor was well defined by the 9 items and that the solution was strong and replicable. Finally, the ECV value was .98, indicating that 98% of the common variance of the item scores could be explained by the fitted single factor. So, clearly, the solution can be considered as essentially unidimensional (Calderón et al., 2019). As for the structural estimates, standardized factor

loadings for the 9 items can be found in Figure 1. All are noticeably high, which attests to excellent internal consistency and low measurement error, albeit, possibly, some redundancy in content.

As for invariance, strong measurement invariance was attained for the three grouping variables contemplated here. In all cases the strong models' fit was better in relative terms than that of the previous baseline and weak invariance models; thus, only strong invariance results are shown in Table 3, together with mean group estimates. To interpret these results, the reader must take into account that the mean of the first group is fixed to zero for identification purposes and that the remaining means are to be compared with this fixed value in terms of their standard errors.

Results can be summarized as follows. In terms of gender, women reveal statistically significantly low levels of satisfaction with their relationship with the physician, as the fixed zero value in the men group falls outside the 95% confidence interval around the mean for women. The effect size for this difference (Cohen's *d*) is approximately .50, which would qualify as medium. In terms of tumor site, no significant differences between group means emerge. Finally, levels appear to increase with age. Nevertheless, the difference between the oldest and the youngest group fails to achieve statistical significance.

Measurement accuracy

The marginal reliability of the factor scores estimates based on the unidimensional factor-analytic solution exceeded .98 and the FDI value was .99. McDonald's omega reliability estimate based on the simple sum scores was .98, while the alpha estimate was .97. Taken together, these results can be interpreted as follows (see Ferrando & Lorenzo-Seva, 2018). Factor score estimates derived from the solution in Figure 1 are highly accurate and comprise univocal indicators of the factor they intend to measure (the favorableness of the perceived patient-doctor relationship). Furthermore, reliability of the simpler sum scores approaches that of the factor score estimates, suggesting that sum scores can be used as proxies for factor score estimates with minimal loss of accuracy.

Figure 2 displays the regression of the sum scores on the factor score estimates and illustrates the strong relation and almost virtual

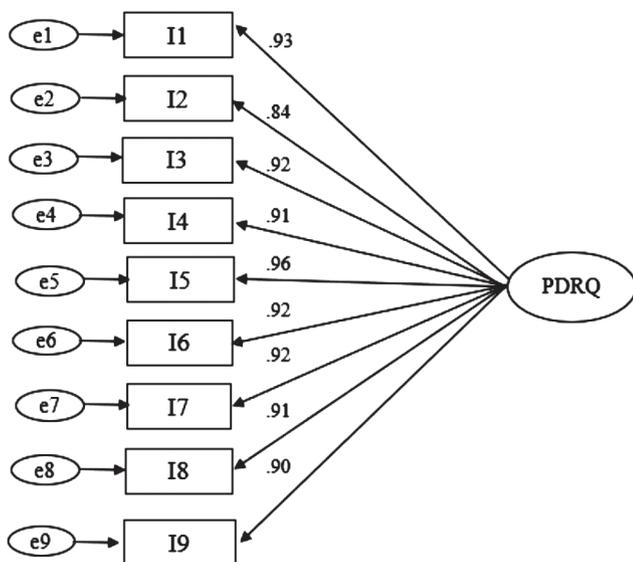


Figure 1. Unidimensional Factorial Analysis model with standardized loading

Table 3
Strong invariance results for gender, age, and tumor site

Groups	Mean	SE	χ^2 (df)	CFI	RMSEA	(90% CI)
Gender			114.83 (88)	.99	.03	(.01-.04)
Men (fixed)	.00					
Women	-.38	.13				
Age group (years)						
Group 1 (≤ 55) (fixed)	.00		213.49 (149)	.99	.04	(.03-.06)
Group 2 (56-65)	.17	.17				
Group 3 (≥ 66)	.27	.16				
Tumor site						
Breast (fixed)	.00		224.61 (149)	.99	.052	(.03-.06)
Colon	-.32	.21				
Others	-.20	.21				

Note: se= standard error; CFI= Comparative Fit Index; RMSEA= Root Mean Square Error of Approximation; CI= Confident Interval

exchangeability discussed above. Some non-linearity appears in the upper right corner of the graphic, which evidences the ceiling effects due to the asymmetrical item and total score distributions.

Finally, figure 3 shows the curve of the conditional reliability of the factor score estimates as a function of trait level. Clearly, the PDRQ-9 scores highly provide accuracy at low to medium trait levels and decreases abruptly from this level on. In terms of sum scores, accuracy will be very high for scores between 0 and about 40. This profile would be advantageous if the aim is to detect or measure precisely those patients that express low levels of satisfaction in the patient-doctor relationship.

Convergent validity evidence

Validity results in Table 4 can be summarized as follows. First, the extended structural validity model yields an acceptable fit

(a) Empirical and model-based validity relations between the PDQR-9 and external scale scores			
Scale scores	Empirical	Model-based	
Depression	-.12**	-.15**	
Anxiety	-.11**	-.01**	
Functioning	-.17**	-.15**	
Symptoms	-.14	-.15**	
Global QOL	-.19**	-.21**	
(b) Goodness-of-fit results for the structural validity model			
χ^2 (df)	CFI	RMSEA	(90% CI)
539.62 (190)	097	.04	(.04; .05)
<i>Note:</i> CFI= Comparative Fit Index; RMSEA= Root Mean Square Error of Approximation; CI= Confident Interval * $p < .01$; ** $p < .001$			

with the data. Second, both empirical and model-based validity estimates are remarkably similar. This result is expected, given the appropriateness of the model and high reliability of the raw PDRQ-9 scores. As for substantive results, PDRQ-9 correlates negatively with Depression and Anxiety (BSI scales) and Functioning scale, symptom scale, and global QoL scale (EORTC QLQ-C30 scales). Overall, therefore, the most unfavorable patient perception of the patient-doctor relationship is associated with all BSI and EORTC QLQ-C30 scales, but particularly with worse Quality of Life.

Normative Table

In order to help the applied psychologist to interpret the responses obtained in a practical situation, we constructed a normative table to convert raw scores to T-scores and centiles (table 5).

Centile	Raw Score	T-Score	Centile
1	9 - 25	0 - 16	1
2	26 - 28	18 - 22	2
3	29 - 30	24 - 26	3
4	31	28	4
5	32	30	5
6	-	-	6
7	33	32	7
8	34	34	8
9	-	-	9
10 - 15	35 - 36	36 - 38	10 - 15
16 - 20	37 - 38	40 - 42	16 - 20
21 - 30	39 - 40	44 - 46	21 - 30
31 - 40	41 - 42	48 - 50	31 - 40
41 - 50	43 - 44	52 - 54	41 - 50
51 - 99	45	56	51 - 99
Mean	42		
S.D.	5.1		
Reliability	.981		

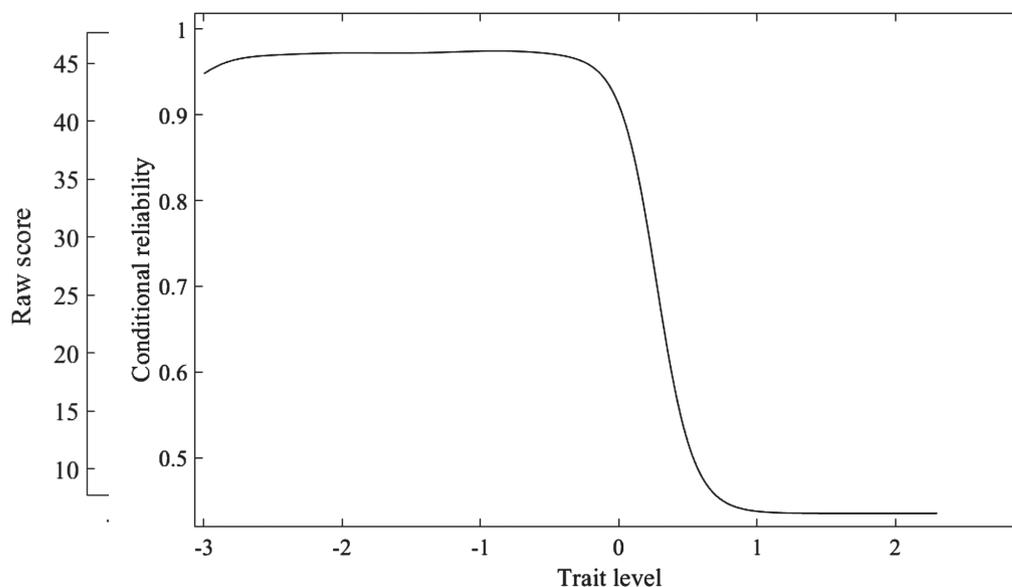


Figure 3. Curve of the conditional reliability of the factor score estimates as a function of trait level

Discussion

The objective of this study was to evaluate certain psychometric properties of the PDRQ-9, a useful instrument to quantify patient satisfaction with their relationship with their oncologist. This study has confirmed the one-dimensional structure of the PDRQ-9 in a sample of adults with non-metastatic, resected cancer. The scale exhibits high internal consistency, a well-defined, strong unifactorial structure, and achieves strong invariance in terms of gender, age, and tumor localization.

Participants' satisfaction with their oncologist was high ($M=42$), higher than the German ($M=37$) (Zenger et al., 2014) and Spanish ($M=40$) (Martín-Fernández et al., 2010) samples. This high scoring implies a ceiling effect (Van der Feltz-Cornelis et al., 2004; Zenger et al., 2014). Our results show in detail that the PDRQ-9 scores measure quite accurately at low to medium trait levels but are unable to discriminate well between subjects with high satisfaction. The ceiling effect is very common in this kind of instrument (Eveleigh et al., 2012), and might partly reflect socially desirable responding (Van der Feltz-Cornelis et al., 2004) an issue that requires further research. For the moment, however, and substantively the result is especially satisfactory in or study, bearing in mind that the patients were under the care of an oncologist in a specialized setting. In contrast, Van der Feltz-Cornelis et al.'s findings that point toward worse satisfaction in specialized compared to primary care (Van der Feltz-Cornelis et al., 2004). Likewise, the PDRQ-9's ability to detect those patients with low levels of satisfaction in the doctor-patient relationship, allows it to make subtle discriminations between the doctor-patient relationships established by the faculty doctor (that is, an expert in communication) and well-meaning residents (Porcerelli et al., 2014).

As for the characteristics that are associated with greater satisfaction with the patient-doctor relationship, our study revealed that men and individuals who are married or partnered are more satisfied with their oncologist. In general, marital status and gender have been linked to cancer patients' positive perception of the care received (Jiménez-Fonseca et al., 2018). Recent reviews have reinforced the notion that having a supportive spouse can help with the process of adjusting to cancer; spouses can provide external, observable, objective information and complement their partners' perspective that is more internal, personal, and subjective when facing their medical situation (Eveleigh et al., 2012; Kayser et al., 2018).

The high *internal consistency* detected in this study is similar to that found in other populations, such as the Dutch ($\alpha=.94$) (Van der Feltz-Cornelis et al., 2004), German ($\alpha=.95$) (Zenger et al., 2014), Spanish ($\alpha=.95$) (López, 2009), American ($\alpha=.96$) (Porcerelli et al., 2014), and Turkish ($\alpha=.91$) (Mergen et al., 2012). Likewise, there is no item that when eliminated, increases the scale's consistency. Nonetheless, item 2, "My oncologist has enough time for me" presents less saturation and the classical item discrimination is the lowest. Time is one of oncology patients' chief complaints; oncologists typically see between 25 and 40 individuals daily – patients with complex medical situations. This, together with the emergencies and unexpected events that arise negatively impact the time these physicians have per appointment, which is why patients perceive this more negatively than the remaining indicators. The confirmatory factor analysis would confirm the questionnaire's unifactorial structure also found in

other research (Arafat, 2016; López, 2009; Martín-Fernández et al., 2010; Van der Feltz-Cornelis et al., 2004; Zenger et al., 2014) with a high amount of common variance. It must be pointed out that PDRQ-9 does not include reverse-worded items which could have been useful for controlling for the effects of acquiescence (Vigil-Colet et al., 2020). However, the patients with cancer who answer PDRQ-9 tend to be highly motivated to participate in the assessment process, so 'a priori acquiescence is not likely to be a determinant here.

No gender differences were observed at the level of factor loadings, signaling metric or weak invariance across gender in the total sample. This means that the latent variable is related to the items in the same way for men and women. In terms of gender, Women exhibited low levels of satisfaction with their relationship with their physician. In age-defined groups, results of the invariance study indicated that there is no differential functioning in any of PDRQ-9 items; consequently, the test's structure is equivalent throughout the life span. As for age, levels of satisfaction with physician appear to rise with age. However, the difference between the oldest and the youngest age group still does not reach statistical significance. Strong invariance was also found with respect to tumor site, this being the first study that analyzes invariance on the basis of tumor characteristics. No significant differences were detected between mean levels of patient satisfaction with their relationship with the oncologist across the three groups: colon, breast, and others.

The PDRQ-9 scores also showed evidence of convergent validity, with moderate correlations with the BSI and EORTC QLQ-C30 scales. The most anxious and/or depressed subjects exhibited less satisfaction with the patient-doctor relationship. This suggests that the PDRQ-9 is capable of discriminating between good and moderate satisfaction (Van der Feltz-Cornelis et al., 2004). Similar findings were encountered in cardiac (Schenker et al., 2009) and oncology patients (Porcerelli et al., 2015). Associations were also found with quality-of-life indicators (functional status, symptoms, and Global QoL), slightly higher than on the emotional component. Many health studies have used the PDRQ-9 as an indicator of good therapeutic alliance among people undergoing medical procedures and/or therapies (Zenger et al., 2014). A good patient-physician relationship has been correlated with better treatment compliance, greater patient satisfaction, and better prognosis (Pedersen et al., 2019; Rogers et al., 2019).

There are several limitations to this study. First, our sample consisted of individuals with a heterogeneous, localized tumor who had undergone surgery. Thus, the results cannot be generalized to patients with advanced tumors or cancer survivors. Second, the application of the questionnaire in the health context can lead to socially acceptable answers and overestimate patients' judgment towards their oncologist. Third, all the patients eligible to participate did so voluntarily, which may have introduced a self-selection bias. Finally, we administered the questionnaire at a specific point in time; we do not have data as to how satisfaction with the patient-doctor relationship evolves over time. Future studies should include follow-up evaluations.

In conclusion, the PDRQ-9 adapted to the context of oncology has proven to be a valid, consistent, and convenient instrument that makes it possible to use to appraise patients' opinions of their patient-doctor relationship and can be helpful in both clinical care, as well as research. This study can help oncologists and hospitals assess patients' quality of care.

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References

- Aaronson, N. K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N. J., Filiberti, A., Flechtner, H., Fleishman, S. B., & de Haes, J. C. (1993). The European Organization for Research and Treatment of Cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *Journal of the National Cancer Institute*, 85(5), 365-376. <https://doi.org/10.1093/jnci/85.5.365>
- Aloba, O., Esan, O., & Alimi, T. (2015). Psychometric qualities of the 9 item patient doctor relationship questionnaire in stable Nigerian patients with schizophrenia. *Journal of Behavioral Health*, 4(4), 112. <https://doi.org/10.5455/jbh.188856>
- Arafat, S. M. Y. (2016). Psychometric Validation of the Bangla Version of the Patient-Doctor Relationship Questionnaire. *Psychiatry Journal*, 9385364. <https://doi.org/10.1155/2016/9385364>
- Calderón, C., Ferrando, P., Lorenzo-Seva, U., Hernández, R., Oporto-Alonso, M., & Jiménez-Fonseca, P. (2020). Factor structure and measurement invariance of the Brief Symptom Inventory (BSI-18) in cancer patients. *International Journal of Clinical and Health Psychology*, 20(1), 71-80. <https://doi.org/10.1016/j.ijchp.2019.12.001>
- Calderón, C., Navarro-González, D., Lorenzo-Seva, U., & Ferrando, P. J. (2019). Multidimensional or essentially unidimensional? A multi-faceted factor-analytic approach for assessing the dimensionality of test and items. *Psicothema*, 31(4), 450-457. <http://doi.org/10.7334/psicothema2019.153>
- Derogatis, L. R. (2001). BSI 18, Brief Symptom Inventory 18: Administration, scoring and procedures manual. NCS Pearson, Inc.
- Eveleigh, R. M., Muskens, E., van Ravesteijn, H., van Dijk, I., van Rijswijk, E., & Lucassen, P. (2012). An overview of 19 instruments assessing the doctor-patient relationship: Different models or concepts are used. *Journal of Clinical Epidemiology*, 65(1), 10-15. <https://doi.org/10.1016/j.jclinepi.2011.05.011>
- Ferrando, P. J. (1996). Calibration of Invariant Item Parameters in a Continuous Item Response Model Using the Extended Lisrel Measurement Submodel. *Multivariate Behavioral Research*, 31(4), 419-439. https://doi.org/10.1207/s15327906mbr3104_2
- Ferrando, P. J., & Lorenzo-Seva, U. (2013). Unrestricted item factor analysis and some relations with item response theory. <http://psico.fcep.urv.es/utilitats/factor/>
- Ferrando, P. J., & Lorenzo-Seva, U. (2018). Assessing the quality and appropriateness of factor solutions and factor score estimates in exploratory item factor analysis. *Educational and Psychological Measurement*, 78(5), 762-780. <https://doi.org/10.1177/0013164417719308>
- Ferrando, P. J., & Lorenzo-Seva, U. (2019). On the Added Value of Multiple Factor Score Estimates in Essentially Unidimensional Models. *Educational and Psychological Measurement*, 79(2), 762-780. <https://doi.org/10.1177/0013164418773851>
- Hair, J. F., Black, W. C., & Babin, B. J. (2010). *RE Anderson Multivariate data analysis: A global perspective*. Pearson Prentice Hall.
- Horvath, A., Gaston, L., & Luborky, L. (1993). The therapeutic Alliance and its measures. In N. Miller, J. Barber & J. Docherty (Eds.), *Psychoanalytic Treatment Research: A Handbook for Clinical Practice* (pp. 247-273). Harper Collins.
- Jiménez-Fonseca, P., Calderón, C., Carmona-Bayonas, A., Muñoz, M. M., Hernández, R., Mut Lloret, M., Ghanem, I., Beato, C., Cacho Lavín, D., Ivars Rubio, A., Carrión, R., & Jara, C. (2018). The relationship between physician and cancer patient when initiating adjuvant treatment and its association with sociodemographic and clinical variables. *Clinical and Translational Oncology*, 0123456789, 1-8. <https://doi.org/10.1007/s12094-018-1870-z>
- Kayser, K., Acquati, C., Reese, J. B., Mark, K., Wittmann, D., & Karam, E. (2018). A systematic review of dyadic studies examining relationship quality in couples facing colorectal cancer together. *Psycho-Oncology*, 27(1), 13-21. <https://doi.org/10.1002/pon.4339>
- Little, T. D. (1997). Mean and Covariance Structures (MACS) Analyses of Cross-Cultural Data: Practical and Theoretical Issues. *Multivariate Behavioral Research*, 32(1), 53-76. https://doi.org/10.1207/s15327906mbr3201_3
- López, P. R. (2009). Psychometric validation of the Spanish version of the Patient-Doctor Relationship Questionnaire (PDRQ). *Actas Española Psiquiatría*, 37(2), 94-100.
- Martín-Fernández, J., del Cura-González, M. I., Gómez-Gascón, T., Fernández-López, E., Pajares-Carabjal, G., & Moreno-Jiménez, B. (2010). Patient satisfaction with the Patient-Doctor Relationship measured using the Questionnaire (PDRQ-9). *Atención Primaria*, 42(4), 196-203. <https://doi.org/10.1016/j.aprim.2009.09.026>
- Mazor, K. M., Kamineni, A., Roblin, D. W., Anau, J., Robinson, B. E., Dunlap, B., Firmeno, C., & Gallagher, T. H. (2018). Encouraging Patients to Speak up About Problems in Cancer Care. *Journal of Patient Safety*. <https://doi.org/10.1097/PTS.0000000000000510>
- Mergen, H., Van der Feltz-Cornelis, C. M., Karoglu, N., Mergen, B. E., & Ongel, K. (2012). Validity of the Turkish patient-doctor relationship questionnaire (PDRQ-Turkish) in comparison with the Europep instrument in a family medicine center. *HealthMed*, 6(5), 1763-1770.
- Millsap, R. E., & Meredith, W. (2007). Factorial invariance: Historical perspectives and new problems. In R. Cudeck & R. C. MacCallum (Eds.), *Factor analysis at 100: Historical developments and future directions* (pp. 131-152). Lawrence Erlbaum Associates Publishers.
- Mingote, A. J., Moreno, J. B., Rodríguez, C. R., Gálvez, H. M., & Ruiz, L. P. (2009). Psychometric validation of the Spanish version of the Patient-Doctor Relationship Questionnaire (PDRQ). *Actas Españolas de Psiquiatría*, 37(2), 94.
- Muthén, L., & Muthén, B. (2004). *Mplus user's guide: Statistical analysis with latent variables: User's guide*. Muthén & Muthén.
- Pedersen, A. F., Andersen, C. M., Ingeman, M. L., & Vedsted, P. (2019). Patient-physician relationship and use of gut feeling in cancer diagnosis in primary care: A cross-sectional survey of patients and their general practitioners. *BMJ Open*, 9(7), e027288. <http://dx.doi.org/10.1136/bmjopen-2018-027288>
- Porcerelli, J. H., Bornstein, R. F., Porcerelli, D., & Arterbery, V. E. (2015). The complex role of personality in cancer treatment: Impact of dependency-detachment on health status, distress, and physician-patient relationship. *The Journal of Nervous and Mental Disease*, 203(4), 264-268. <https://doi.org/10.1097/NMD.0000000000000276>
- Porcerelli, J. H., Murdoch, W., Morris, P., & Fowler, S. (2014). The Patient-Doctor Relationship Questionnaire (PDRQ-9) in primary care: A validity study. *Journal of Clinical Psychology in Medical Settings*, 21(3), 291-296. <https://doi.org/10.1007/s10880-014-9407-2>
- Rogers, H. L., Dumenci, L., Epstein, R. M., & Siminoff, L. A. (2019). Impact of Patient Gender and Race and Physician Communication on Colorectal Cancer Diagnostic Visits in Primary Care. *Journal of Women's Health*, 28(5), 612-620. <https://doi.org/10.1089/jwh.2018.6961>
- Schenker, Y., Stewart, A., Na, B., & Whooley, M. A. (2009). Depressive symptoms and perceived doctor-patient communication in the Heart and Soul study. *Journal of General Internal Medicine*, 24(5), 550-556. <https://doi.org/10.1007/s11606-009-0937-5>
- Schermelleh-Engel, K., Kerwer, M., & Klein, A. G. (2014). Evaluation of model fit in nonlinear multilevel structural equation modeling. *Frontiers in Psychology*, 5, 181. <https://doi.org/10.3389/fpsyg.2014.00181>
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the Fit of Structural Equation Models: Tests of Significance and

- Descriptive Goodness-of-Fit Measures. *Methods of Psychological Research Online*, 2, 23-74.
- Van der Feltz-Cornelis, C. M., Van Oppen, P., Van Marwijk, H. W. J., De Beurs, E., & Van Dyck, R. (2004). A patient-doctor relationship questionnaire (PDRQ-9) in primary care: Development and psychometric evaluation. *General Hospital Psychiatry*, 26(2), 115-120. <https://doi.org/10.1016/j.genhosppsych.2003.08.010>
- Vigil-Colet, A., Navarro-González, D., & Morales-Vives, F. (2020). To reverse or to not reverse Likert-type items: That is the question. *Psicothema*, 32(1), 108-114. <https://doi.org/10.7334/psicothema2019.286>
- von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2008). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Journal of Clinical Epidemiology*, 61(4), 344-349. <https://doi.org/10.1016/j.jclinepi.2007.11.008>
- Wollmann, L., Hauser, L., Mengue, S. S., Agostinho, M. R., Roman, R., Van Der Feltz-Cornelis, C. M., & Harzheim, E. (2018). Cross-cultural adaptation of the Patient-Doctor Relationship Questionnaire (PDRQ-9) in Brazil. *Revista de Saude Publica*, 52, 71. <https://doi.org/10.11606/S1518-8787.2018052000380>
- Zenger, M., Schaefer, R., van der Feltz-Cornelis, C., Brähler, E., & Häuser, W. (2014). Validation of the Patient-Doctor-Relationship Questionnaire (PDRQ-9) in a representative cross-sectional German population survey. *PLoS One*, 9(3), e91964. <https://doi.org/10.1371/journal.pone.0091964>