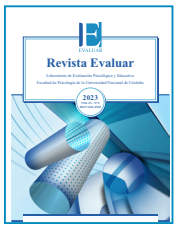
2023, Vol. 23, No. 2
ISSN 1667-4545
Recuperado de https://revistas.unc.edu.ar/index.php/revaluar

Laboratorio de Evaluación Psicológica y Educativa
Facultad de Psicología - Universidad Nacional de Córdoba



Psychometric Properties of the Psychological Capital Questionnaire (PCQ-12) in Dominican Secondary School Students

Propiedades psicométricas del Cuestionario de Capital Psicológico (PCQ-12) en estudiantes de secundaria dominicanos

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Recibido: 25/02/2023 **Revisado:** 10/04/2023 **Aceptado:** 17/04/2023

Abstract

This research aimed to analyze the psychometric properties of the 12-item Psychological Capital Questionnaire (PCQ-12) in secondary school students from the Dominican Republic. The questionnaire was completed by a total of 708 students aged 11 to 19 (M = 15.49 years; SD = 1.58), with 64.7% being females. Through Confirmatory Factor Analysis (CFAs), the different dimensionalities proposed in the previous literature were tested and the structure of four factors with a second-order factor was retained. Next, the reliability of the dimensions was studied and problems in optimism were identified, especially, in resilience. The second-order structure showed to be invariant to the students' gender, supporting its absence of gender bias. Consequently, the present study supports the use of the scale to measure the Psychological Capital as a second-order construct, but calls for the development of research that improves the measuring of resilience.

Keywords: *psychological capital, adolescents, resilience, optimism, self-efficacy, hope, psychometric properties, invariance*

Resumen

El objetivo de esta investigación fue analizar las propiedades psicométricas del Cuestionario de Capital Psicológico PCQ-12 en estudiantes de educación secundaria de República Dominicana. El cuestionario fue completado por un total de 708 estudiantes de entre 11 y 19 años (M = 15.49 años; DT = 1.58) entre los cuales el 64.7% fueron mujeres. Mediante Análisis Factoriales Confirmatorios (AFCs), se pusieron a prueba las distintas dimensionalidades propuestas en la literatura previa y se retuvo la estructura de cuatro factores con un factor de segundo orden. A continuación, se estudió la fiabilidad de las dimensiones y se identificaron problemas en las dimensiones de optimismo y, especialmente, resiliencia. La estructura de segundo orden mostró ser invariante al género de los estudiantes, lo que respaldó su ausencia de sesgo de género. Consecuentemente, se respalda el uso de la escala para la medición del Capital Psicológico como constructo de segundo orden y se invita al desarrollo de investigaciones que mejoren la medición de la resiliencia.

Palabras clave: *capital psicológico, adolescentes, resiliencia, optimismo, autoeficacia, esperanza, propiedades psicométricas, invarianza*

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Author's note: Las autoras no tienen conflictos de interés.

How to cite: Martínez-Gregorio,S., Gómez-Cruz, D., & Oliver, A. (2023). Psychrometric Properties of the Psychological Capital Questionnaire (PCQ-12) in Dominican Secondary School Students. *Revista Evaluar*, *23*(2), 19-27. Retrieved from https://revistas.unc.edu.ar/index.php/revaluar

Acknowledgments: Sara Martínez-Gregorio es beneficiaria del Programa de Formación del Profesorado Universitario del Ministerio de Universidades (FPU18/03710).

Participaron en la edición de este artículo: Vanesa Mariela Toledo, Andrea Suárez, Eugenia Barrionuevo, Abigail Peréz, Gloria Rebeca Nieve, Florencia Ruiz, Jorge Bruera.

Introduction

Strengths such as self-efficacy, optimism, hope, and resilience are essential when it comes to positively assessing a circumstance or to predicting the success of individuals based on aspects such as perseverance and effort (Azanza et al., 2014). In this context, Psychological Capital arises. It is a construct that alludes to a state of positive individual development shaped by four dimensions, which correspond precisely to characteristics such as self-efficacy, optimism, hope, and resilience (Luthans et al., 2007; Luthans et al., 2015).

To understand the delimitation of the construct, it is worth specifying the definitions of each of its four dimensions to deepen and have a closer view of the elements that constitute Psychological Capital (Luthans et al., 2007; Stajkovic & Luthans, 2003). We understand self-efficacy as the person's confidence and effort to face a challenging task successfully (Bandura, 1997). Optimism consists of making positive attributions about current and future success. On the other hand, hope consists of people's perseverance toward their goals and redirecting alternatives to achieve them successfully (Vuyk & Codas, 2019). Finally, resilience is defined as the ability to sustain oneself and cope with problems and adversities that arise in individuals' lives (Peña-Contreras et al., 2020).

The construct of Psychological Capital emerged in the context of organizations (Luthans & Youssef, 2004) and many studies and research have been conducted on its impact, having identified a positive relationship between this concept and psychosocial and organizational variables such as leadership, confidence, creativity, and performance, among others (Clapp-Smith et al., 2009; Rego et al., 2012). However, although some authors have indeed transferred the application of this idea to the student population, research in the educational context is recent and limited compared to that developed in the organizational literature (Martínez et al., 2021; Schönfeld & Mesurado, 2020; Tomás et al., 2022). Previous research shows that there is a significant relationship between Psychological Capital and variables such as students' grade point average, their satisfaction with school, their development, retention, and success, and even with academic performance (Azanza et al., 2014; Carmona-Halty et al., 2019; Datu et al., 2018; Luthans et al., 2012).

In this context of growing academic interest in the construct and, specifically, in adolescents, it is essential to have an adequate conceptualization and measurement of the Psychological Capital through psychometric instruments adapted and validated for this new use. Among the scales present in the literature for measuring Psychological Capital, the 12-item Psychological Capital Questionnaire (PCQ-12; Avey et al., 2011) is currently one of the most widely used questionnaires to measure Psychological Capital in adolescents. Despite the popularity of the PCQ-12, there is some debate about its structure and reliability problems (Djourova et al., 2019). There are recent studies about the psychometric properties of this instrument in academic contexts (Martínez et al., 2021; Schönfeld & Mesurado, 2020; Tomás et al., 2022). Martínez et al. (2021) found problems concerning the reliability of the scale in two of its dimensions and factor loadings when testing the model with a second-order factor and not having it compared with the alternative four correlated factors. In contrast, Schönfeld and Mesurado (2020) found no reliability problems, although they did not test the structure of the four correlated factors.

Along the same lines, Tomás et al. (2022) compared the three competitive models around which there has been controversy: one factor, four correlated factors, and a second-order structure through estimations with Bayesian methods. Additionally, these authors introduced in the literature

the possibility of a bifactor model. Conclusions of the research indicated that the second-order structure is the one most supported by the evidence, showing a similar fit to the bifactor but with a more parsimonious structure. In addition, the scale also found difficulties in measuring resilience in adolescents by showing low reliability scores.

To date, these questionnaires have not been used in the Dominican Republic context where the consideration of Psychological Capital has been scarce in national studies. There are no studies that introduced some of its dimensions, but none considered the entire construct. For example, Tomás et al. (2020) showed the relevance of hope and self-efficacy in the academic context, both being precursors of commitment and, indirectly, of self-concept and academic performance. These previous studies serve as an encouragement to show the potential of conceptualizing the positive student state in a more complex way, including optimism and resilience. The lack of consideration of Psychological Capital means that, to date, there are no psychometric studies conducted in the Dominican context that report on the suitability of the scale for use with students.

Additionally, these psychometric studies should examine the absence of gender bias in the measurement of Psychological Capital, as Avey (2014) suggested, by considering gender differences when investigating Psychological Capital in adolescents. These gender differences can only be studied if the scale works comparably for both genders, an issue that has not been tested yet in previous psychometric studies with adolescents.

Consequently, this research work proposes the study of the psychometric properties of the PCQ-12 in a sample of adolescents from the Dominican Republic. For this purpose, (1) the descriptive statistics of the items were calculated; (2) the dimensionality of the scale was explored; (3) the reliability of its dimensions was studied; and (4) a routine was established to evaluate the gender invariance of the scale.

Method

Participants and procedure

The study sample consisted of 708 secondary school students from the Dominican Republic. The mean age was 15.49 years (SD = 1.58), with a minimum of 11 and a maximum of 19 years. From the sample, 64.7% were female (n = 458) and 34% male (n = 241), and a total of 9 students did not declare their gender (1.3%).

Instruments

For this research, the instrument used was the 12-item Psychological Capital Questionnaire (PCQ-12; Avey et al., 2011) in its adaptation for Spanish-speaking secondary school students (Tomás et al., 2022). The questionnaire presents a total of 12 items through which the four dimensions of psychological capital are assessed: self-efficacy (items 1, 2, and 3), hope (items 4, 5, 6, and 7), resilience (items 8, 9, and 10), and optimism (items 11 and 12). The adaptation for secondary school students differs from the original for adults by replacing references to work with "studies". The response format is a five-anchor Likert scale ranging from *Strongly disagree* to *Strongly agree*.

Along with the instrument, a series of sociodemographic data, such as the gender and age of the participants, were collected.

Data analysis

The study of the psychometric properties in the questionnaire was conducted by following

Table 1
Descriptive statistics of the items.

	M	SD	g^1	g^2	1	2	3	r_{it}
SE1	3.93	0.95	-0.98	0.89				.65
SE2	3.95	0.95	-0.96	0.71	.65			.76
SE3	3.94	0.92	-0.95	0.84	.54	.68		.67
HO1	4.06	0.80	-1.20	2.51				.45
HO2	3.79	0.89	-0.45	0.03	.33			.54
HO3	4.20	0.81	-1.46	3.52	.42	.41		.57
HO4	3.85	0.92	-0.95	0.96	.33	.51	.48	.58
RE1	3.76	0.93	-0.76	0.44				.21
RE2	3.44	1.14	-0.49	-0.57	.17			.28
RE3	3.68	0.96	-0.79	0.49	.16	.26		.28
OP1	3.80	0.92	-0.71	0.42				.49
OP2	3.89	0.87	-0.80	0.97	.49			.49

Note. M = Mean; SD = Standard deviation; g^1 = Kurtosis; g^2 = Skewness; r_{it} = Item-total correlation. All correlations in the table were statistically significant $p < .001$.

a series of steps. First, the descriptive statistics of the items that constitute the scale were calculated (mean, standard deviation, skewness, kurtosis, inter-item correlations, and corrected item-total correlation). Next, its factorial structure was studied. For this purpose, a series of Confirmatory Factor Analyses (CFA) were tested with the different factorial solutions observed in the previous literature: (a) one factor, (b) four correlated factors, and (c) four first-order factors with a second-order factor.

The estimation method used was Maximum Likelihood Robust (MLR). The adequacy of the AFCs was evaluated by considering several fit indices: chi-square, CFI, RMSEA, and SRMR. A CFI is considered adequate when it presents a value above .90, with a value above .95 being desirable. For the RMSEA and SRMR, adequate values should be below .08 (Marsh et al., 2004). Once the most appropriate factor structure was identified, the reliability of the dimensions was studied. Composite Reliability Indexes (CRI) were calculated to estimate reliability for each dimension and the total scale. The formula presented by Raykov and Marcoulides (2012) was used to calculate the reliability of the second-order factor.

To conclude, the invariance of the scale by gender was tested as a method for studying the possible differential functioning of the items. For this purpose, since it is a second-order structure, the procedure proposed by Chen et al. (2005) and the syntax presented by Dimitrov (2010) were followed. These authors propose five nested models for the study of invariance. First, it tests the configural invariance of the scale, thus checking the fit of the structure for both genders. Next, it tests the metric invariance of the factor loadings of the items (Metric 1). If the metric invariance at the item level is satisfied, it continues to fix factor loadings of the first-order factors (Metric 2). If met, the scalar invariance of the items is tested, setting their intercepts equal for both groups

Table 2
Fit indices of the models proposed.

Model	χ^2	*df*	*p*	CFI	RMSEA	90% CI	SRMR
A factor	317.676	54	< .01	.86	.08	.07, .09	.05
Four-correlated factors	110.675	48	< .01	.97	.04	.03, .05	.03
Second-order model	114.647	50	< .01	.97	.04	.03, .05	.03

(Scalar 1). Finally, the intercepts of the first-order factors are additionally fixed (Scalar 2). The different nested models are compared using two complementary procedures (Little, 1997). On the one hand, a formal statistical test is performed using chi-square differences, the absence of statistical significance being the evidence of invariance. This method has been criticized in the literature for being too strict, identifying trivial differences in practice (Cheung & Rensvold, 2002). Therefore, an assessment of the changes in the model fit indices was performed. To consider that the invariance assumption is met, the CFI should not vary by more than .01 (Wang & Wang, 2012).

Descriptive analyses were performed with the statistical program IBM SPSS Statistics version 28, while CFAs were performed in the program Mplus 8.6 (Muthén & Muthén, 2017).

Results

Descriptive statistics

Table 1 shows the descriptive statistics of all the items included in the scale, as well as the correlations between the items that compose each dimension and the item-factor correlations for each of them. As it can be observed, the mean scores of the subjects on the items are above the centre point (3) in all cases. All the items show positive, statistically significant, with higher correlations with the rest of the items of their dimension, except for those that make up the resilience dimension. Despite being positive and statistically significant, the correlations of the dimension items are below .3.

Factor structure

Table 2 shows the fit results of the different models proposed. The single-factor model did not show an adequate fit to the data, its CFI being below .9. In contrast, both the four-factor correlated model and the model with a second-order factor showed a good fit to the data, with CFIs above .95 and the RMSEA and SRMR below .05. Given their fit equality, the second-order model is chosen as the best model because of its parsimony.

Figure 1 shows the results for the four-factor correlated model and the second-order model. In both cases, all item factor loadings in their corresponding factor are above .3, ranging from .37 (for item 3 of the resilience dimension) to .86 (of the second item of the self-efficacy dimension). All of them were statistically significant ($p < .001$). In the case of the second-order model, all the loadings of the first-order factors are high, the lowest being that of the self-efficacy dimension.

Reliability

Reliability was calculated using the CRI for each dimension and the total psychological capital. The self-efficacy and hope dimensions showed adequate scores above .7 (.84 and .74,

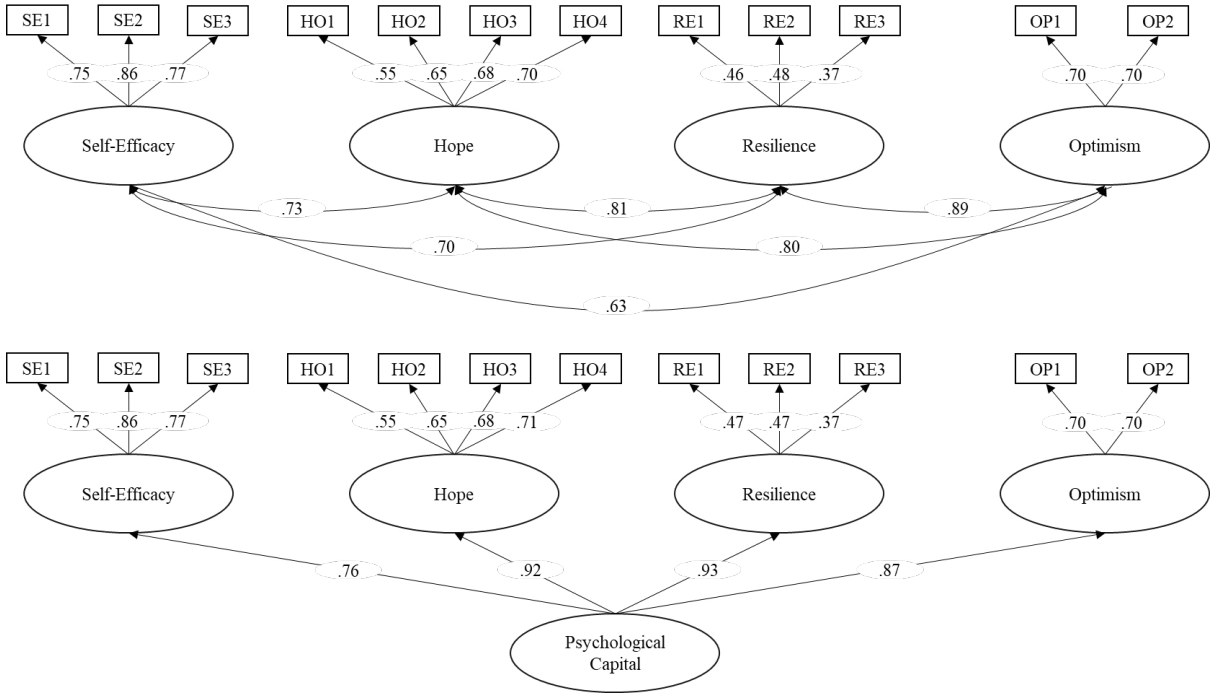

Figure 1
Four-factor correlated and second-order factor models.

respectively). In contrast, the results for the resilience (.42) and optimism (.66) dimensions were lower, with the resilience result being particularly poor. The reliability score for the psychological capital factor is .69, very close to .7.

Gender invariance

Once the second-order factor model was established as the most parsimonious among those with the best fit, its invariance across gender was tested. The fit of the different nested models is shown in Table 3. As it can be observed, the model is invariant for boys and girls at the configural and metric levels. That is, the structure is adequate for the data of both groups and the factor loadings are identical. When we reach the scalar invariance of the item intercepts (Scalar 1), we see that the model slightly worsens the fit, the CFI dropping above .01, although it is very close. Consequently, we continue with the last step, where no differences were found between the intercepts of the first-order factors in both groups.

Discussion

Psychological Capital is a construct that has recently burst into research related to adolescent academic success (Azanza et al., 2014; Carmona-Halty et al., 2019; Datu et al., 2018; Luthans et al., 2012). This growing interest has been accompanied by the development of studies for improving its measurement. Specifically, in recent years, different researchers have focused on the psychometric properties of one of the most widely used instruments in the literature of the PCQ-12. Its dimensionality and reliability have been tested in samples of students from Spain, Chile, and Argentina (Martínez et al., 2021; Schönfeld

Table 3
Goodness-of-fit indices for each group (men and women) and a set of nested models to test gender invariance.

Model	χ^2	*df*	*p*	$\Delta\chi^2$	Δgl	*p*	CFI	ΔCFI	SRMR	ΔSRMR	RMSEA	ΔRMSEA	90% CI
Configural	186.850	100	< .001	--	--	--	.955	--	.042	--	.050	--	.039-.061
Metric 1	195.759	108	< .001	9.441	8	.31	.955	.000	.052	.010	.048	-.002	.037-.059
Metric 2	197.252	111	< .001	2.080	3	.55	.956	.001	.054	.002	.047	-.001	.036-.058
Scalar 1	230.788	122	< .001	36.778	11	< .001	.944	-.012	.062	.008	.051	.004	.040-.060
Scalar 2	231.101	123	< .001	.032	1	.86	.944	.000	.062	.000	.050	-.001	.040-.060

Note. *df* = degrees of freedom; Δ = differences.

& Mesurado, 2020; Tomás et al., 2022). These studies highlighted some controversies regarding its factorial structure and some limitations with the reliability of some of its dimensions. Two aspects require more attention: (1) the Psychological Capital construct has received less attention in the Caribbean context and, specifically, there are no psychometric studies for this population, and (2) the gender invariance of the scale has never been tested in adolescents. Given this situation, this study was developed.

Regarding the factorial structure, the alternatives of four correlated factors and that of a second-order factor presented an identical fit. Consequently, the second-order model is considered more appropriate as it is more parsimonious and supports the use of Psychological Capital as a unitary construct that has been proposed in previous research (Carmona-Halty et al., 2019; Slåtten et al., 2021). This result is consistent with that shown in the Spanish and Argentinean samples (Schönfeld & Mesurado, 2020; Tomás et al., 2022).

Regarding reliability, previous authors identified repeated reliability problems in the Dominican sample. Specifically, the dimensions of resilience and optimism did not show an adequate reliability score. The result for optimism is not alarming, being close to .7, but the resilience dimension shows poor reliability. These results replicate those found by Tomás et al. (2022). As in this study, it is item 10 that presents the greatest problems. This study supports the generalization of the problem identified by Tomás et al. (2022) in the Spanish-speaking context. The content of item 10 could be confusing or could simultaneously pose two independent questions that prevent the student from answering adequately.

Despite the problems identified, the scale performs equally well in boys and girls. The invariance routine shows that the scale structure, first and second-level factor loadings, and intercepts are identical in both genders. It is true, however, that by constraining the item intercepts, the model fit worsened significantly. Even so, as the CFI loss was very close to .01, we considered accepting the invariance. Future studies could develop a detailed analysis of the differential items' performance to identify whether this loss of fit is due to the poor performance of any particular item.

Finally, concerning the limitations of this study, it is worth mentioning that it is focused exclusively on secondary school students. Thus, the generalizations of the results to younger-age or university students has not been demonstrated. We could anticipate that if reliability problems of the resilience dimension are related to difficulties in understanding a complex statement, they could increase in younger samples. Thus, an invariance study considering university stages would be interesting.

In conclusion, it should be noted that the instrument presents certain psychometric limita-

tions that question its use in the sample to assess some of its specific dimensions: resilience and optimism. Although it could be useful for a general assessment of Psychological Capital, given the evidence of the existence of this second-order factor and the gender invariance of the scale, other alternatives should be explored if an assessment of each of its dimensions is desired.

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