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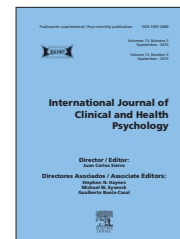
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ORIGINAL ARTICLE

Evaluation of the Latin American version of the Life Orientation Test-Revised

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Abstract The Life Orientation Test (LOT-R) is the most intensively used instrument for the assessment of optimism, but empirical evidence of its psychometric quality in Latin America is lacking. The aim of this study was to test psychometric properties of this questionnaire based on a representative sample of the general population of Colombia ($N = 1,500$). Confirmatory factor analyses confirmed the bi-dimensionality of the questionnaire with two factors, namely *Optimism* and *Pessimism*. The sum scores of the optimism and pessimism subscale correlated with $r = -.12$. Convergent validity aspects were studied by correlating LOT-R values with anxiety, depression, quality of life, fatigue, mental health, hopelessness, and self-efficacy. Optimism was more strongly correlated with these variables than pessimism. Normative data and mean values for both genders and different age groups are given. Generally, there were only small age and gender effects. Compared to the German norm data, the Colombian participants scored on average one scale point higher in the dimension of optimism. In summary, the LOT-R in its Spanish version is an appropriate and practical tool for screening purposes in individual diagnostics and epidemiological research in Latin American samples.

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PALABRAS CLAVE

Optimismo;
 Pesimismo;
 Valores normativos;
 Valores de referencia;
 Estudio descriptivo
 mediante encuesta

Resumen El Test de Orientación ante la Vida (LOT-R) es el instrumento más empleado para la medición del optimismo, pero falta evidencia sobre las propiedades psicométricas de la versión en español. El objetivo del presente estudio fue la evaluación de las propiedades psicométricas de dicho cuestionario, con base en una muestra representativa de la población colombiana ($N = 1.500$). Los análisis factoriales confirmatorios corroboraron la bi-dimensionalidad del instrumento en dos factores: *Optimismo* y *Pesimismo*. Las sumas totales de cada subescala correlacionaron entre sí ($r = -0,12$). Se estudiaron aspectos de la validez convergente, al correlacionar los valores del LOT-R con ansiedad, depresión, calidad de vida y otros constructos. El optimismo correlacionó de manera más fuerte con estas variables que el pesimismo. Se proveen datos normativos y valores promedio para ambos sexos y distintos grupos de edad. En general, se encontraron solo efectos pequeños en edad y sexo. En comparación con datos normativos de la población alemana, los participantes colombianos, en promedio, puntuaron un punto más alto en la dimensión de optimismo. En conclusión, el LOT-R en su versión en español es un instrumento apropiado y práctico para el tamizaje, tanto en diagnósticos individuales como en investigación epidemiológica.

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In recent years, examinations of resource-oriented variables have attracted growing interest and have been recognised as an important extension of the deficit-oriented perspective in clinical psychology (Fernández-Ríos & Novo, 2012). Optimism is one of these personal resources. The dispositional construct of optimism is defined as a relatively stable generalized tendency to expect positive versus negative life outcomes (Scheier & Carver, 1985). It is most frequently measured with the Life Orientation Test - Revised (LOT-R; Scheier, Carver, & Bridges, 1994).

Optimism has been examined in a broad variety of clinical and non-clinical settings. Investigations have found remarkable associations between optimism and psychological adjustment to stressful life events such as receiving a cancer diagnosis (Stiegelis et al., 2003; Zenger, Brix, Borowski, Stolzenburg, & Hinz, 2010). While the tendency to expect positive life outcomes was connected with adaptive and active coping styles, pessimism was found to co-occur with maladaptive coping mechanisms like denial and avoidance (Ramírez-Maestre, Esteve, & López, 2012). Furthermore, optimism was related to physical and mental health, health behaviour, and recovery after surgery (Peterson & Kim, 2011; Rasmussen, Scheier, & Greenhouse, 2009; Zenger, Glaesmer, Höckel, & Hinz, 2011).

The LOT-R was originally designed as a uni-dimensional scale to measure the construct on a continuum with optimism and pessimism acting as the poles. In recent years, several studies found evidence for the bi-dimensionality of the questionnaire with optimism and pessimism appearing as partially independent dimensions (Herzberg, Glaesmer, & Hoyer, 2006; Ribeiro, Pedro, & Marques, 2012; Segerstrom, Evans, & Eisenlohr-Moul, 2011; Ten Klooster et al., 2010). Nevertheless, there are several studies done on samples of undergraduates that support the assumption that the LOT-R is uni-dimensional with substantial negative correlations between optimism and pessimism (Kam & Meyer, 2012; Scheier & Carver, 1985; Steed, 2002). Following the assumption that age may play a role in the development of the (in-) dependence of both

factors, Herzberg et al. (2006) found support for this hypothesis in a large cross-sectional study with more than 46,000 participants. The results indicated that optimism and pessimism become more independent of each other with increasing age.

In a recently published study (Glaesmer et al., 2012), the bi-dimensional structure of the LOT-R was confirmed. Additionally, psychometric properties and population-based norms of a representative German sample were provided. However, the application of translated questionnaires in other cultures or countries presents some potential difficulties and loss of precision with regard to the meanings of the items and the comparison of norms (Fischer & Chalmers, 2008; Roberts et al., 2012; Spielberger, 2006). To our knowledge, norms of the general population and examinations of psychometric properties, derived from a representative study sample, are currently lacking for the Spanish version of the LOT-R. Several studies that used the Spanish version of the LOT-R found evidence for its bi-dimensionality (Ferrando, Tous, & Tous, 2002; Vera-Villaruel, Cordova-Rubio, & Celis-Atenas, 2009), but others did not (Martínez-Correa, Reyes del Paso, García-León, & González-Jareño, 2006). The correlation coefficients of the subscales for optimism and pessimism ranged between $-.38$ and $-.58$. However, all of these studies included student samples, mostly aged between 18 and 25 years. Differences between men and women were not found (Vera-Villaruel et al., 2009). The potential influence of education has yet to be studied in a larger Spanish speaking sample, but some evidence was found in the German study of Glaesmer et al. (2012) that less educated people were less optimistic and more pessimistic.

The aims of the present study are a) to test the dimensionality of the Spanish version of the LOT-R in Latin America with a latent trait model approach, b) to test the invariance of the resulting model across gender and age, c) to examine the correlation between the optimism and pessimism subscale with respect to age groups, gender, and groups of different educational level, d) to investigate

Table 1 Sociodemographic characteristics of the study population.

	Total	Males	Females
	<i>N</i> = 1,500	<i>n</i> = 724	<i>n</i> = 776
<i>Age M (SD)</i>	41.82 (16.23)	42.00 (16.79)	41.66 (15.70)
<i>Age range</i>	18-90	18-90	18-86
<i>Age groups</i>	<i>N</i> (%)	<i>n</i> (%)	<i>n</i> (%)
18-30 years	459 (30.60)	229 (31.60)	230 (29.60)
31-40 years	309 (20.60)	135 (18.60)	174 (22.40)
41-50 years	278 (18.50)	129 (17.80)	149 (19.20)
51-60 years	237 (15.80)	116 (16.00)	121 (15.60)
61-70 years	150 (10.00)	79 (10.90)	71 (9.10)
≥ 71 years	67 (4.50)	36 (5.00)	31 (4.00)
<i>Civil status</i>			
Married/living with partner	764 (50.90)	384 (53.00)	380 (49.00)
Single	510 (34.00)	264 (36.50)	246 (31.70)
Divorced	152 (10.10)	57 (7.90)	95 (12.20)
Widowed	74 (4.90)	19 (2.60)	55 (7.10)
<i>Education</i>			
≤ 5 years	259 (17.30)	111 (15.30)	148 (19.10)
6-9 years	544 (36.30)	236 (32.60)	308 (39.70)
10-13 years	266 (17.70)	152 (21.00)	114 (14.70)
≥ 14 years	431 (28.70)	225 (31.10)	206 (26.50)
<i>Employment status</i>			
Pupil/student	183 (12.20)	96 (13.30)	87 (11.20)
Working	730 (48.70)	445 (61.50)	285 (36.70)
Unemployed	107 (7.10)	59 (8.10)	48 (6.20)
House wife/man	348 (23.20)	38 (5.20)	310 (39.90)
Handicapped	21 (1.40)	11 (1.50)	10 (1.30)
Retired	111 (7.40)	75 (10.40)	36 (4.60)
<i>Household income*</i>			
< 400,000	145 (9.70)	63 (8.70)	82 (10.60)
400,000-< 800,000	403 (26.90)	196 (27.10)	207 (26.70)
800,000-< 1,600,000	317 (21.10)	154 (21.30)	163 (21.00)
≥ 1,600,000	393 (26.20)	208 (28.70)	185 (23.80)
Missing	242 (16.10)	103 (14.20)	139 (17.90)

Note. *SD* = standard deviation.

*Income in Colombian Pesos COP. 1000 COP = 0.43 EUR = 0.57 USD.

the construct validity of the questionnaire, e) to test differences with regard to socioeconomic variables (gender, age, education), and f) to provide population-based norms. The writing of this paper is based on the guidelines of Hartley (2012).

Method

Sample

Trained interviewers asked 2,372 people to participate in this survey. The study was conducted in 2012 using adult participants belonging to all socioeconomic strata of the general Colombian population. The research market company "Brandstrat Inc." was hired to conduct the interviews in the eight main cities of Colombia. The sampling procedure guaranteed that each socioeconomic

stratum was representatively included in the sample. Therefore, the sample can be assumed to be roughly representative of the Colombian population. Finally, 1,500 out of the 2,372 contacted people agreed to take part in the study and completed the interview. Informed consent was obtained from all participants. The mean age of the sample was 41.80 years, and the percentage of women was 51.70 %. Further characteristics of the study sample are given in Table 1.

Instruments

- Dispositional optimism. Dispositional optimism was assessed with the Spanish version of the Life Orientation Test - Revised (LOT-R) (Otero, Luengo, Romero, Gómez, & Castro, 1998). The questionnaire consists of 10 items; three items for optimism, three for pessimism and four filler items, which are included to cover the aim of the

instrument. Respondents were asked to rate the extent to which they agreed with each statement on a five-point Likert scale. The scores of the optimism and pessimism subscales were calculated by summing up the scores of the corresponding items. Since many studies reported only a total sum score of the LOT-R, this score is also reported here to make the results of the present study comparable to those of others. The total sum score was calculated by adding the raw scores of the optimism subscale with the inverted pessimism raw scores.

- Anxiety and depression. The Hospital Anxiety and Depression Scale (HADS) is a frequently used 14-item questionnaire for screening clinically significant anxiety and depression (Zigmond & Snaith, 1983). The questionnaire consists of two subscales, *anxiety* and *depression*, with seven items each, rated on a four-point Likert scale. The scores of each subscale range from 0 to 21, with higher scores reflecting more severe symptoms.
- Fatigue. The Multidimensional Fatigue Inventory (MFI-20) is an instrument for the assessment of several dimensions of fatigue (Smets, Garssen, Bonke, & de Haes, 1995). It consists of 5 subscales that cover general, physical and mental fatigue as well as reduced motivation and reduced activity. Each subscale consists of four items on a five-point Likert scale. Higher scores reflect a higher level of fatigue.
- Quality of life. The European Organisation for Research and Treatment of Cancer Quality of Life questionnaire (EORTC QLQ-C30) is comprised of 30 items and incorporates five functioning scales (physical, role, emotional, social and cognitive), three symptom scales (fatigue, pain and nausea/vomiting), a global health status/QoL scale, and six single items (dyspnea, appetite loss, insomnia, constipation, diarrhea and financial difficulties) (Fayers et al., 1999). Higher functioning scores represent better functioning/QOL, whereas higher symptom scores represent more severe symptoms.
- A further short screening instrument for measuring quality of life is the SF-8 (Ware, Kosinski, Dewey, & Gandek, 2001). It consists of eight items, each of which represents one of the eight subscales of the SF-36. A physical component summary (PCS) and a mental component summary (MCS) can be calculated. Higher scores represent better quality of life.
- Mental health. The General Health Questionnaire (GHQ-12) is an instrument measuring nonspecific psychological distress and common mental state (Goldberg & Williams, 1988). Twelve items on a four-point Likert scale cover several aspects of anxiety, depression, and social functioning. Higher sum scores represent higher distress.
- Hopelessness. The Beck Hopelessness Scale (BHS) was also used (Beck, Weissman, Lester, & Trexler, 1974). The 20 dichotomized questions of the instrument measure positive and negative attitudes about the future; higher scores indicate higher levels of hopelessness.
- Self-efficacy. The General Self-Efficacy Scale (GSES), developed by Schwarzer and Jerusalem (1995), was used in this study to assess participants' subjective evaluation of their own ability to cope with and solve prospective demands and challenges. Ten items have to be answered on a four-point scale, with higher sum scores indicating higher self-efficacy.

Procedure

Study participants aged 18 and above were randomly selected for this cross-sectional survey. The study design was approved by the Ethics Committee at the Universidad de los Andes. The research market company "Brandstrat Inc." conducted the interviews in eight main cities of the country (Bogotá, Cali, Medellín, Barranquilla, Bucaramanga, Pereira, Cartagena, and Manizales). Each city in Colombia is divided into neighborhoods (barrios), and each barrio is assigned a mean socioeconomic stratum of the inhabitants (ranging from 1 = *very low* to 6 = *very high*). The sampling procedure (called "neighborhood sweep technique") assured that each stratum was representatively included in the sample, and that participants in each barrio were randomly selected. Therefore, the sample can be assumed to be fairly representative of the Colombian population. All participants gave informed consent. A brochure with information about healthy lifestyles was given to the participants as an incentive.

Data analysis

The factorial structure of the LOT-R was tested using confirmatory factor analysis (CFA), computed with the statistical program AMOS 18. All models were tested using covariance matrices, and each model was estimated with the maximum likelihood method approach. CFAs were calculated for the one-factor model and the two-factor model with two related factors and compared to each other on the basis of the following model fit indices: the minimum discrepancy, divided by its degrees of freedom (CMIN/DF); the goodness-of-fit-index (GFI); the normed-fit-index (NFI); the comparative-fit-index (CFI); the Tucker-Lewis-Index (TLI); the root mean square error of approximation (RMSEA); and the Akaike Information Criterion (AIC). For a good model fit, the ratio CMIN/DF should be as small as possible (Arbuckle, 2009; Schermelleh-Engel, Moosbrugger, & Müller, 2003), GFI should range between .97 and 1, and NFI should be higher than .95. Furthermore, CFI and TLI values close to .95 or higher are indicative of a good model fit. The value of RMSEA should be .05 or smaller. The AIC is a descriptive indicator of the badness of fit and allows comparisons between two models; the model with the lower AIC should be preferred (Arbuckle, 2009; Schermelleh-Engel et al., 2003).

Additional analyses were conducted to test the invariance of the model across gender and age using multi-group CFA. Measurement invariance was tested in three steps using first the configural model (no constraints), followed by a metric invariant model (with item loadings constraint to be equal across groups), and a scalar invariant model (with item loadings and item intercepts simultaneously constrained to be equal across groups) (Byrne, 2010). Based on the hierarchy of these nested and increasingly restrictive models, the models were then compared to each other. Since the χ^2 statistic has often been criticized for its sensitivity to sample size, we focused mainly on the differences ΔCFI and $\Delta RMSEA$. Values smaller than .01 indicate invariance of the models.

The remaining statistical analyses were conducted using SPSS version 20. The calculation and the presentation of

Table 2 Summary of fit indices of the one-factor model compared to the two-factor model.

	Chi ² (df)	CMIN/DF	GFI	NFI	CFI	TLI	RMSEA	AIC
One-factor model	417.808 (9)	46.423	.909	.697	.700	.501	.174	441.808
Two-factor model	30.878 (8)	3.860	.993	.978	.983	.969	.044	56.878

Note. df = degrees of freedom; CMIN/DF = minimum discrepancy, divided by its degrees of freedom; GFI = goodness-of-fit-index; NFI = normed-fit-index; CFI = comparative-fit-index; TLI = Tucker-Lewis-index; RMSEA = root mean square error of approximation; AIC = Akaike Information criterion.

Table 3 Standardized regression coefficients and factor correlations of the two-factor model.

	Pessimism	Optimism	Item 9	Item 7	Item 3	Item 10	Item 4
Pessimism	1.000						
Optimism	-.26	1.000					
Item 9 (pess)	.76	-.19	1.000				
Item 7 (pess)	.56	-.14	.43	1.000			
Item 3 (pess)	.34	-.08	.26	.19	1.000		
Item 10 (opt)	-.17	.65	-.13	-.09	-.05	1.000	
Item 4 (opt)	-.18	.71	-.14	-.10	-.06	.47	1.000
Item 1 (opt)	-.17	.66	-.13	-.09	-.05	.43	.47

Note. pess = pessimism subscale; opt = optimism subscale.

the results mainly follow the paper of Glaesmer et al. (2012) in order to facilitate the comparison with the results of the German version of the LOT-R.

Results

Factorial structure of the Life Orientation Test

The fit indices given in Table 2 indicate that the two-factor model fits the data very well and supports the bi-dimensional structure of the LOT-R, whereas the assumption of a uni-dimensional factor structure leads to a poorer model fit. Only the CMIN/DF indicates a relevant deviation between the data and the bi-dimensional model. It should be close to 1 for appropriate models. This coefficient is sensitive to sample size. Thus, when there is a large sample size, even a small misspecification leads to rejection of the model. Utilizing the findings of Joereskog and Soerbom (1993), we focused on the model fit indices described above, which are generally independent of sample size.

Regarding the two-factor model, the correlation coefficient of both postulated latent variables (optimism and pessimism) was $-.26$. Standardized regression coefficients of optimism and pessimism on the related items varied between $.34$ and $.77$ (Table 3).

The two-factor model was also tested for invariance across gender and age. As shown in Table 4, the multi-group analyses revealed invariance across sex and age, because the differences of CFI and RMSEA between the hierarchical nested models are smaller than $.01$. The Chi² test was insignificant for the test of scalar invariance across gender and age, but was significant for the test of metric invariance across men and women. As

mentioned above, this test is sensitive to sample size and thus, the scalar invariance across age and sex can be confirmed with regard to other fit indices.

Additionally, differential item functioning (DIF) was tested across sex using the program PARSCALE. The optimism and pessimism items were calibrated and evaluated separately with the partial credit model. No evidences of DIF were verified.

Reliability and correlation of the subscales

Cronbach's alpha coefficients were $.72$ for *optimism*, $.57$ for *pessimism*, and $.58$ for the total score. The correlations between the subscales and the total score were $r = .71$ (*Optimism*) and $r = .79$ (*Pessimism*). Regarding the correlation between both subscales, we found *optimism* and *pessimism* to be correlated with $r = -.12$ in the total sample, $r = -.12$ in males, and $r = -.13$ in females (all p values $< .001$). Stratified by age groups, the coefficients were as follows: $r = -.12$ (18-30 years), $r = -.12$ (31-40 years), $r = -.17$ (41-50 years), $r = -.09$ (51-60 years), $r = -.09$ (61-70 years), and $r = -.21$ (≥ 71 years). Among the subgroups with different levels of education the coefficients were $r = -.07$ (≤ 5 years), $r = -.10$ (6-9 years), $r = -.21$ (10-13 years), and $r = -.12$ (≥ 14 years).

Correlations with other health-related constructs

Several correlations between the LOT-R scales and other health-related scales were calculated regarding various aspects of the LOT-R's convergent validity, cf. Table 5.

The optimism subscale was more strongly correlated to all other constructs than the pessimism subscale was,

Table 4 Test for invariance across gender and age.

	N	Chi ² (df)	Δ Chi ²	Δ df	Δ p	CMIN/DF	CFI	Δ CFI	RMSEA	Δ RMSEA
<i>Gender</i>										
Men	724	17.591 (8)				2.199	.986		.041	
Women	776	22.107 (8)				2.763	.979		.048	
<i>Multigroup analysis</i>										
Dimensional/configural		39.697 (16)				2.481	.983		.031	
Metric		53.659 (20)	13.961	4	.007	2.683	.975	.008	.034	.003
Scalar		59.257 (26)	5.598	6	.470	2.279	.976	.001	.029	.005
<i>Age groups</i>										
18-30 years	459	15.599 (8)				1.950	.979		.046	
31-40 years	309	20.627 (8)				2.578	.961		.072	
41-50 years	278	13.293 (8)				1.662	.982		.049	
51-60 years	237	9.763 (8)				1.220	.991		.031	
>60 years	217	9.187 (8)				1.148	.994		.026	
<i>Multigroup analysis</i>										
Dimensional/configural		68.474 (40)				1.712	.979		.022	
Metric		93.705 (56)	25.231	16	.066	1.673	.973	.006	.021	.001
Scalar		113.828 (80)	20.123	24	.690	1.423	.976	.003	.017	.004

Note. df: degrees of freedom; CMIN/DF: minimum discrepancy, divided by its degrees of freedom; CFI: comparative-Fit Index; GFI: goodness-of-fit-index; RMSEA: root mean square error of approximation.

Table 5 Pearson correlations between Life Orientation Test scales and further psychological scales.

	Optimism	Pessimism	Total score
HADS-Anxiety	-.41***	.18***	-.39***
HADS-Depression	-.44***	.19***	-.41***
MFI-General fatigue	-.38***	.19***	-.37***
MFI-Physical fatigue	-.42***	.22***	-.42***
MFI-Reduced activity	-.40***	.18***	-.38***
MFI-Reduced motivation	-.45***	.24***	-.45***
MFI-Mental fatigue	-.43***	.19***	-.41***
EORTC-Physical functioning	.32***	-.07**	.25***
EORTC-Role functioning	.25***	-.04 n.s.	.18***
EORTC-Emotional functioning	.19***	-.03 n.s.	.14***
EORTC-Cognitive functioning	.25***	-.04 n.s.	.18***
EORTC-Social functioning	.24***	-.05*	.19***
EORTC-Quality of life	.18***	.00 n.s.	.11***
EORTC-Fatigue	-.18***	.01 n.s.	-.12***
EORTC-Nausea/ vomiting	-.25***	.05*	-.19***
EORTC-Pain	-.16***	.02 n.s.	-.11***
EORTC-Dyspnoe	-.24***	.07*	-.20***
EORTC-Insomnia	-.18***	.06*	-.15***
EORTC-Appetite loss	-.23***	.04 n.s.	-.17***
EORTC-Constipation	-.21***	.05*	-.17***
EORTC-Diarrhea	-.26***	.05*	-.20***
EORTC-Financial problems	-.21***	.04 n.s.	-.16***
GHQ-12	-.28***	.09**	-.23***
Beck Hopelessness Scale	-.45***	.27***	-.47***
SF-8 "physical"	.30***	-.06*	.23***
SF-8 "mental"	.38***	-.07**	.28***
General Self-efficacy Scale	.37***	-.09**	.29***

Note. HADS: Hospital Anxiety and Depression Scale; MFI: Multidimensional Fatigue Inventory; EORTC: European Organisation for Research and Treatment of Cancer; GHQ: General Health Questionnaire.

* $p < .05$; ** $p < .01$; *** $p < .001$; n.s. = non-significant.

Table 6 Life Orientation Test-Revised mean scores, stratified by age group and sex.

		Optimism		Pessimism		Total score	
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Males</i>							
18-30 y.	229	9.30	2.60	5.60	3.00	15.70	4.10
31-40 y.	135	9.50	2.60	5.40	3.00	16.10	4.20
41-50 y.	129	9.40	2.50	5.20	2.90	16.20	4.30
51-60 y.	116	9.40	2.30	5.40	3.00	16.00	3.80
61-70 y.	79	9.00	2.70	5.70	3.00	15.40	4.30
≥ 71 y.	36	8.80	2.90	5.50	2.40	15.30	4.20
All age groups	724	9.30	2.60	5.50	3.00	15.80	4.10
<i>Females</i>							
18-30 y.	230	9.40	2.50	5.10	2.80	16.30	3.90
31-40 y.	174	9.40	2.60	4.90	2.90	16.50	4.20
41-50 y.	149	9.50	2.60	5.30	2.80	16.20	4.00
51-60 y.	121	9.30	2.40	5.20	2.70	16.10	3.90
61-70 y.	71	9.60	2.10	5.60	2.90	16.00	3.60
≥ 71 y.	31	9.60	2.10	5.20	2.80	16.50	3.70
All age groups	776	9.40	2.50	5.20	2.80	16.30	4.00
Total sample							
18-30 y.	459	9.40	2.50	5.40	2.90	16.00	4.00
31-40 y.	309	9.40	2.60	5.10	3.00	16.30	4.20
41-50 y.	278	9.50	2.60	5.30	2.90	16.20	4.10
51-60 y.	237	9.40	2.40	5.30	2.90	16.00	3.90
61-70 y.	150	9.30	2.50	5.60	2.90	15.70	4.00
≥ 71 y.	67	9.20	2.60	5.40	2.60	15.90	4.00
All age groups	1500	9.40	2.50	5.30	2.90	16.10	4.10

Note. *SD*: standard deviation.

whereas the LOT-R total score showed slightly lower coefficients than the optimism subscale. Furthermore, all associations were as predicted. The highest associations ($r > .40$) were found for the relationship between optimism and anxiety, depression, fatigue and hopelessness.

Differences with regard to age, gender, and education

A three-factorial ANOVA was conducted to test for differences in optimism and pessimism according to age, gender and educational level. No significant main effect was found for either optimism (gender: $F_{(1, 1500)} = 2.10$, $p = .147$; age: $F_{(5, 1500)} = 0.31$, $p = .907$; education: $F_{(3, 1500)} = 0.60$, $p = .615$) or pessimism (gender: $F_{(1, 1500)} = 2.85$, $p = .092$; age: $F_{(5, 1500)} = 0.14$, $p = .982$; education: $F_{(3, 1500)} = 2.12$, $p = .095$). Despite the non-significant overall effects, the post hoc tests revealed significantly higher scores in the pessimism sub-scale of the least educated subgroup compared to the two most highly educated sub-groups. Furthermore, no significant interaction effect was found (data not shown). Mean scores for both subscales and the total score of the LOT-R, stratified by gender and age, are given in Table 6. We found only marginal gender differences and no linear age trend.

Population-based norms for the Life Orientation Test

The calculation of the percentile rank scores followed the same procedure used by Glaesmer et al. (2012) to enhance the comparability of the findings. Percentile rank scores for every (sub-) scale of the LOT-R are given in Table 7. Taking the marginal differences with regard to gender and age into account, percent rank scores are only presented for the whole population.

Discussion/conclusions

The aim of this study was to examine psychometric properties of the Spanish version of the LOT-R and to provide representative normative values. Regarding the dimensionality of the questionnaire, the two-factor model fits the data very well, and the results are in line with those of a German representative sample (Glaesmer et al., 2012) and other studies (Ferrando et al., 2002; Herzberg et al., 2006; Ribeiro et al., 2012). As such, the constructs of optimism and pessimism measured with the LOT-R can be seen as partially independent variables that are weakly correlated. These results differ from those of other studies that used the Spanish version of the LOT-R (Ferrando et al.,

Table 7 Percentile rank scores of the Life Orientation Test-Revised.

Raw score	Optimism	Pessimism	Total score	Raw score	Percent rank
	Percent rank	Percent rank	Percent rank		
0	0.20	3.20	0.00		
1	0.60	9.30	0.00	13	26.30
2	1.10	15.10	0.10	14	35.80
3	2.20	22.10	0.20	15	44.00
4	4.00	32.60	0.20	16	52.90
5	6.70	45.70	0.30	17	61.00
6	10.90	58.10	0.50	18	67.00
7	17.20	69.90	0.70	19	73.00
8	26.60	81.80	1.30	20	79.70
9	38.20	90.40	2.20	21	86.00
10	51.50	94.60	4.40	22	90.60
11	66.20	97.10	8.60	23	94.30
12	86.80	99.00	16.10	24	98.10

2002; Vera-Villarreal et al., 2009). This might be due to the specific samples they used with regard to age and education. Taking the potential influence of age into account, the correlation between optimism and pessimism became insignificant in older age groups. This confirms to some extent the results of Herzberg et al. (2006), who have shown that the correlation coefficients between both dimensions are close to zero in higher age groups. Additionally, the invariance of the two-factor model across age and gender was confirmed. Therefore, the structure of the model holds for males and females as well as for people in different age groups and thus, the comparison of means between those subgroups is feasible in a statistical manner.

The internal consistency of the optimism subscale ($\alpha = .72$) is acceptable and similar to the results of Glaesmer et al. (2012) and Vera-Villarreal et al. (2009). In contrast to that, the α of the pessimism subscale (.57) is somewhat problematic and clearly lower than that of the German LOT-R (Glaesmer et al., 2012), but higher than the value of the Spanish version derived from a student sample (Vera-Villarreal et al., 2009).

Significant correlations between the LOT-R and other psychological constructs were shown, indicating the convergent validity of the Spanish LOT-R. The optimism score was positively related to positively valued constructs like quality of life and general self-efficacy, and inversely related to deficit-oriented constructs like anxiety, depression, and fatigue. Surprisingly, the optimism score was more strongly related to all other variables included in this study than the pessimism score was, even for negatively defined constructs such as depression, which is in contrast to the results of Kam and Meyer (2012). This result was also found in the study of Glaesmer et al. (2012). Therefore, the optimism subscale of the LOT-R is better suited for screening and predictive purposes than the pessimism subscale, and it is at least as good as the overall sum scale of the LOT-R. This is because the total score (including six items) has mostly shown the same or lower correlation

coefficients than the optimism score alone shows with only three items.

Concerning the potential influence of sociodemographic variables, we found no meaningful ANOVA main effects with regard to gender and age. This result differs partly from those of the German general population, where a significant main effect of age was found. Furthermore, we found no significant main effect with regard to the educational level of the participants. However, as the post hoc tests of the ANOVA revealed, people with the lowest levels of education (≤ 5 years) showed a higher level of pessimism than men and women with the highest levels of education (10 years and more). This might reflect a real learned experience of those individuals with regard to the positive outcomes in their life rather than a personality deficit or self-inflicted circumstance, as people with a low level of education generally are disadvantaged and have fewer possibilities for moving their life in a positive direction.

Regarding the limitations of the study, some points have to be mentioned. The representativeness of the study population is referred to inhabitants living in cities in Colombia. Despite the fact that the greatest part of the population lives in cities, the underrepresentation of rural areas might cause a bias. Furthermore, the generalizability of the results for other Latin American countries needs further empirical evidence, since norm values of different European countries may also differ and are not of unique validity. Another limitation is the relatively low reliability of the pessimism sub-scale. Here, the advantage of having a very short questionnaire is combined with the disadvantage of a lower reliability. Compared to the optimism sub-scale, the items of the pessimism sub-scale are less reliable.

To the best of our knowledge, this is the first study that provides age and gender-specific means and norm values from a representative sample of the general population for the Spanish version of the LOT-R. Thus, individual test results as well as clinical outcomes of specific subgroups can be evaluated and compared to values of the general population. Although we have found many similarities

between the German and the Spanish version of the LOT-R, we have found also meaningful differences in the mean values of the optimism subscale. Therefore, the calculation of (at least) language specific norm values is required. Colombian men and women scored on average almost one scale point higher than those of the German general population, whereas the differences on the pessimism subscale differed only slightly. Ignoring these differences would lead to biased evaluations of test results. While the result of ten points on the optimism scale filled out in Colombia would indicate a percentile rank of 75 using German norm values, it is better evaluated with the norms of the Spanish version indicating a percentile rank of 52.

In summary, the Spanish version of the LOT-R has been approved in a large sample, which can be seen as representative of the general population of Colombia. Despite some limitations with regard to the internal consistency of the pessimism subscale, psychometric properties of the LOT-R were good, and the bi-dimensionality of the questionnaire with two partially independent factors (optimism and pessimism) was confirmed. The LOT-R, and especially the optimism subscale, is well suited for screening purposes and can also be used to evaluate other health related variables as anxiety, depression, self-efficacy, and quality of life. Furthermore, norm values for the Spanish version of the LOT-R were provided and allow for comparisons of different sub-groups or individual test results with the general population.

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