Psychometric properties of the Brazilian version of the Life Orientation Test-Revised

Propriedades psicométricas da versão brasileira do Life Orientation Test-Revised

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Abstract

This study reports the evaluation of psychometric properties of a Brazilian version of the Revised Life Orientation Test (LOT-R) through the validation procedure. The LOT-R was translated and adapted from English to Brazilian Portuguese. We administered the translated version of the instrument to a non-probabilistic sample of 769 adults Brazilians over 18 years old. A model with adequate fit indices was found: [X^2/gl = 1.082; GFI = 0.998; CFI = 1; RMSEA = 0.001]. The study found good psychometric properties for the LOT-R. This is the first study in Brazil that ran Confirmatory Factor Analysis (CFA), , Multigroup Factor Analysis, Composite Reliability (CC) and Averaged Extracted Variance (AVE) to assess the psychometric properties of the LOT-R. We concluded that the use of LOT-R in the Brazilian context is recommended.

Keywords: *Revised Life Orientation Test* (LOT-R), Validation, Confirmatory Factor Analysis (CFA).

Resumo

Este estudo relata a avaliação das propriedades psicométricas de uma versão brasileira do Revised Life Orientation Test (LOT-R) por meio do procedimento de validação. O LOT-R foi traduzido e adaptado do inglês para o português brasileiro. Aplicamos a versão traduzida do instrumento a uma amostra não probabilística de 769 adultos brasileiros maiores de 18 anos. Foi encontrado um modelo com índices de ajuste adequados: [X^2/gl = 1,082; GFI = 0,998; CFI = 1; RMSEA = 0,001]. Este é o primeiro estudo no Brasil que realizou Análise Fatorial Confirmatória (CFA), Análise Fatorial Multigrupo, Confiabilidade Composta (CC) e Variância Extraída Média (AVE) para avaliar as propriedades psicométricas do LOT-R. O estudo encontrou boas propriedades psicométricas para o LOT-R. Concluímos que o uso do LOT-R no contexto brasileiro é recomendado.

Palavras Chave: *Revised Life Orientation Test* (LOT-R), Validação, Análise Fatorial Confirmatória.

Resumen

Este estudio relata la evaluación de las propiedades psicométricas de una versión brasileña del Test de Orientación de Vida Revisado (LOT-R) a través del procedimiento de validación. El LOT-R fue traducido y adaptado del inglés al portugués brasileño. Se administró la versión traducida del instrumento a una muestra no probabilística de 769 adultos brasileños mayores de 18 años. Se encontró un modelo con índices de ajuste adecuados: [X^2/gl = 1.082; GFI = 0,998; CFI = 1; RMSEA = 0,001]. Este es el primer estudio en Brasil que realizó Análisis Factorial Confirmatorio (CFA), Análisis Factorial Multigrupo, Confiabilidad Compuesta (CC) y Varianza Extraída Promediada (AVE) para evaluar las propiedades psicométricas del LOT-R. El estudio encontró buenas propiedades psicométricas para el LOT-R. Concluimos que se recomienda el uso de LOT-R en el contexto brasileño.

Palabras clave: Revised Life Orientation Test (LOT-R), Validacion, análisis factorial confirmatorio.

Introduction

The study of optimism is part of the theoretical body of Positive Psychology, understood as a theoretical aspect that focuses on the study and interventions in the field of human virtues and potential, aiming to investigate factors that corroborate adequate psychological adjustment. It is a construct that has been defined in terms of the

personality's relatively stable disposition to have positive expectations about future events. Put very simply, optimists have expectations that good things will happen in their lives, while pessimists expect bad things to happen in their future (Scheier et al., 1994).

Optimism is divided into two subtypes; explanatory and dispositional. Explanatory optimism is related to the way subjects make sense of events, having as a reference their usual past experiences, thus attributing specific causes for negative events (Scheier & Carver, 2018). Dispositional optimism, on the other hand, is associated with positive expectations related to the future, estimating them as more or less adequate, without taking into account the causes of events (Krafft et al., 2020).

Dispositional optimism takes place in the theory of self-regulation of behavior and in the value model of expectations, from which derives the idea that subjects engage in behaviors when they understand that their *goals* are possible and worthwhile to be achieved. If a goal is worthless, there is no reason to act. On the other hand, the expectation that it is possible to achieve a goal tends to make the person feel good, which in turn will make the person feel motivated to persist and continue acting (Marelich & Piercy, 2020) towards a future event. Continuous efforts will be made to reach a desirable objective, even if there are adversities on the way (Carver & Scheier, 2002) .

Additionally, the way people explain these positive future events in their lives will also determine whether they are optimistic or pessimistic. People who attribute to these events permanent, generalized internal explanations are considered optimists. On the other hand, people who attribute temporary, specific, external explanations, and do not believe that these positive events happened due to their efforts, are considered pessimists (Carver & Scheier, 2002). In this regard, Carver and Scheier (2002) argue that optimism leads to significant differences between people regarding subjective well-being and the way of living life. Optimists define a pattern of behavioral responses that aim to overcome adversity, despite the negative feelings often associated with adverse events.

Based on the theory of dispositional optimism, its authors developed the *Life Orientation Test (LOT)* in 1985. The LOT is an instrument that assumes optimism/pessimism as a one-dimensional construct. Thus, optimism and pessimism are seen as opposite poles, arranged in a continuum of the same construct. This instrument was originally composed of 12 items that measured positive and negative expectations regarding future events. Subsequent studies systematically criticized the instrument.

Specifically, these criticisms highlighted that the LOT-assessed construct coincided, in some aspects, with the constructs of neuroticism, trait anxiety, self-efficacy, and self-esteem. Additionally these studies questioned the one-dimensionality of the construct. Scheier et al. (1994) addressed these issues with a revised version of the instrument. In the revised version the authors removed items that could be measuring other constructs and keept only items that explicitly focused on expectations related to the future. The new version, the *Revised Life Orientation Test* (LOT-R) was published with 10 items.

Regarding the critique of one-dimensionality, several studies found two dimensions in the administration of the first version of the LOT (Räikkönen & Matthews, 2008) instead of just one, as originally proposed. Interestingly, even Scheier et al. (1994) found Confirmatory Factor Analysis (CFA)-elicited evidence for a two-factor structure (optimism and pessimism) for the LOT-R. However, the authors still opted for the unidimensional structure for the construct because the unifactorial structure was also confirmed and due to the parsimony principle. This one-dimensional perspective assumes that a person can be considered either an optimist or a pessimist, but not an optimist and a pessimist at the same time.

Some authors who ran Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFC) to assess the psychometric properties of the LOT-R continued to find a two-dimensional structure in studies conducted in Spain (Ottati & Noronha, 2017), Japan (Nakano, 2004), and Portugal (Ribeiro et al., 2012). Other researchers who used CFA found evidence of a unifactorial structure, as in studies conducted in Hong Kong, China (Lai et al., 1998), Germany (Rauch et al., 2007) Canada, and France (Trottier et al., 2008; Vautier et al., 2003). Given the apparent controversy, further studies seem to be necessary to elucidate the factor structure of the instrument.

Given the scientific relevance of the construct and its instrument for the area of physical and mental health, and considering that in Brazil (Ottati & Noronha, 2017; Bastianello et al.,2014; Bandeira et al., 2002) no studies with an adult sample using CFA procedures have been conducted yet.

Objective

The present research sought to investigate the psychometric properties of the LOT-R by means of Confirmatory Factor Analysis, Multigroup Factor Analysis,

Composite Reliability (CC) and Averaged Extracted Variance (AVE). Additionally, to the best of our knowledge, this will be the first study that assesses the invariance of this instrument according to gender, in addition to CC and AVE.

Method

Participants

The sample was non-probabilistic and intentional and consisted of 769 adults, Brazilians with 18 years old or older. The sample size followed a ratio well above 10:1, that is, ten subjects for each test item.

The inclusion criteria were accepting participation in the research, signing the Consent Form, and being 18 years of age or older and 60 years old or older. Additionally the candidate had to be Brazilian. Exclusion criteria were being underaged candidates (i.e., less than 18 years old),being over 60 years old, or being illiterate.

Instruments

The present research used the LOT-R, which was translated from the original English version (Scheier et al., 1994) to Brazilian Portuguese. The LOT-R consists of ten self-report items that are filled out in *Likert -type ordinal scale*. Responses range from "strongly agree (4)" to "strongly disagree (0)".Four items are distractors (2,5,6,8) and six items assess the subjects' dispositional optimism (item 1,3,4,7,9,10). Three items are scored in reverse order (3,7,9). The final score is obtained with the total sum of the items.

Data collection procedure

Data were collected on-line by means of Google Forms. The links to the form were posted on social networks and in Whatsapp groups. Additionally, the link and the invitation to participate in the research were sent to coordinators of undergraduate and graduate courses at public universities in all regions of Brazil. On the first page of the form, the consent form was presented, and participants were asked questions regarding the inclusion criteria (age and nationality). The present study was approved by the Research Ethics Committee in accordance with CNS/MS resolution n. 466/2012.

Statistical analysis

Initially, the descriptive statistics of the variables were verified through the mean, standard deviation, and minimum and maximum values. To assess the asymmetry of the distribution of the means, the asymmetry (skewness) and flatness (kurtosis) coefficients will be used, being considered acceptable values for those verified in the range of −2 and +2 (George & Mallery, 2010). These analyzes were performed in IBM SPSS Statistics 21.

Confirmatory Factor Analysis (AMOS 23) was used to test the factor validity of the model proposed by Scheier et al. (1994) using the maximum estimation method likelihood and respecting a minimum number of 10 observations per item. After specifying and estimating the model, its suitability was evaluated by a set of fit/fitness indices. The value of χ^2 (Chi -square) indicates adjustment when the value is not significant ($p > 0.05$).

Jöreskog and Sorbom (1989) suggest a ratio of Chi - square to degrees of freedom (df), represented by $\chi^2/$ df, in which Ullman (2002) suggests values below 2.0 as acceptable. Additionally, the following adjustment indices were used: a) CFI (Comparative Fit Index) and GFI (Goodness Fit Index) and their values may vary from 0 to 1, and if the value is above 0.90 the model presents an adjustment adequate, according to Bentler and Bonnet (1980). b) RMSEA (Root Mean Square Error of Approximation), where values lower than 0.08 indicate acceptable adequacy.

For Multigroup Factor Analysis (genders) a comparison was made between the base model (baseline) and the other models (Structural, metric and scalar equivalence). Some indices are acceptable for confirming the invariance, these being : ΔX^2 (gl) = $p > 0.05$, ΔCFI < 0.01: ΔRMSEA< 0.005 (Meade et al., 2008).

Composite Reliability and Averaged Extracted Variance (v were also analyzed, both of which allow for assessing the quality of the instrument. The acceptable reference values for CC and AVE are: greater than 0.7 (Cheung & Rensvold, 2002) and greater than or equal to 0.5 respectively (Hair et al., 2009).

Results

Translation

The translation and back-translation were performed by four independent translators. The quality of the translation and back-translation was analyzed by a

committee formed by two experienced researchers in the areas of Psychology and instrument validation. The instrument's title was: "The Life Oriented Test Revised" (TOV-R).

Table 1

Items from the original version of the LOT-R and the translated version of the TOV-R

Original Version LOT-R	**TOV-R Translated Version**
1. In uncertain times, I usually expect the best	1. Em situações difíceis, geralmente espero o melhor.
2. It's easy for me to relax	2. Consigo relaxar facilmente.
3. If something can go wrong for me, it will.	3. Se algo na minha vida pode dar errado, sem dúvidas vai dar errado.
4. I'm always optimistic about my future	4. Sou sempre otimista sobre meu futuro.
5. I enjoy my friends a lot.	5. Gosto muito dos meus amigos.
6. It's important for me to keep busy.	6. Me manter ocupado é importante pra mim.
7. I hardly ever expect things to go my way	7.Raramente espero que as coisas aconteçam do jeito que quero.
8. I don't get upset too easily	8.Não fico chateado muito facilmente.
9. I rarely count on good thing happening to me.	9.Raramente espero que coisas boas aconteçam comigo.
10. Overral , I expect more good things to happen to me than bad.	10**.** De forma geral, espero que me aconteçam mais coisas boas do que más.

Participant data

The mean response values for the items ranged between 1.27 ± 1.27 (item 9) and 3.34 ± 0.92 (item 10). Univariate normality values tended to be in a range associated with a normal distribution (+ 2/-2). Regarding the Optimism factor, an average value of 2.11±

0.77 was obtained. The sociodemographic information of the participants is presented in Table 2.

Table 2

Participants' Sociodemographic Information

Variable	Category	Frequency	Percentage
Genre	**Female**	**542**	**70.48**
	Male	221	28.74
	Non-Binary	6	0.78
Race / Ethnicity	White	384	49.93
	Black	78	10.14
	Brown	293	38.10
	Indigenous	6	0.78
	Yellow	8	1
Marital status	Single	451	58.7
	Married/Stable Union	276	35.9
	Separate	36	4.7
	Widower	6	0.8
Age	18-28	349	49
	28-38	227	32
	38-48	102	14.4
	48-58	28	3
	58-69	Two	0.2
Education	Doctorate	138	17.8
	Master's degree	122	15.9
	University graduate	204	26.5
	incomplete graduation	236	30.7
	High school	35	4.2

Family Monthly Income	Up to 1 minimum wage	91	11.9
	1 and a half to 3 salaries	203	26.4
	3 and a half to 5 minimum wages	139	18.1
	5 and a half to 7 minimum wages	93	12.1
	7 and a half to 9 minimum wages	82	10.7
	More than 9 and a half minimum wages	160	20.9

Confirmatory Factor Analysis

Nine models were tested, as shown in Table 3. Eight of these models were suggested by the literature. Three models with two factors (Optimism and Pessimism) (M2; M3; M8), a model with two factors and a second-order factor (Quality of life) (M4), four models (M5; M6; M7; M9) with a factor (Optimism) and an additional factor (Method Effects) and a model with only one factor (Optimism).

Table 3

Models tested

	X2/GL	GFI	CFI	RMSEA	AIC
MODEL 1	10,138	0.957	0.907	0.109	115,241
MODEL 2	4,319	0.985	0.970	0.066	60,513
MODEL 3	26,334	0.918	0.742	0.182	261.003
MODEL 4	10,138	0.957	0.907	0.109	115,241
MODEL 5	7,333	0.980	0.957	0.091	74,001
MODEL 6	4.103	0.990	0.979	0.064	54,621
MODEL 7	45,679	0.957	0.899	0.241	135,891
MODEL 8	3,515	0.983	0.964	0.057	75,700

MODEL 9	1.082	0.998	1	0.010	37,411

The models tested had the following definitions: **Model 1**: One-factor (Optimism) original model; **Model 2**: Two-dimensional with covariance between factors (Optimism and Pessimism) (Cano-García et al., 2015; Sanin & Salanova Soria, 2017); **Model 3**: Two-dimensional (Optimism and Pessimism) without covariance between factors (Cano-García et al., 2015); **Model 4**: Two-dimensional (Optimism and Pessimism) with no covariance between factors other than a second-order factor (Quality of life) (Cano-García et al., 2015); **Model 5**: Additional factor (MET = method effects) formed by the items referred to pessimism in model 2: one factor (OPT = optimism) (Cano-García et al., 2015); **Model 6:** Additional factor (MET = method effects) formed by the items referring to optimism in model 2: one factor (OPT = optimism) (Cano-García et al., 2015); **Model 7**: Additional factor (MET = method effects) formed by all the items referred to in model 1: one factor (OPT = optimism) (Cano-García et al., 2015); **Model 8**: Two-dimensional (Optimism and pessimism) with covariance between factors and addition of item 5 to the optimism factor; (Rondón Bernard & Angelucci Bastidas, 2016); **Model 9**: Additional factor (MET = method effects) formed by the items referring to optimism plus item 7 and the factor (OPT = optimism).

The original LOT-R (M1) model with 1 factor and 6 items showed good fit rates [GFI = 0.957, CFI = 0.907, RMSEA = 0.109]. However, the X^2/gl index was much above the reference value (< 2), and this indicates that the model is not yet fully adjusted.

The analysis of the coefficients (standardized and non-standardized) of model 3 (LOT-R) revealed that all items had factor loadings above 0.40, except for item 7 (-0.29). All these parameters significant are p < 0.001.

Among the models referred to in the literature, model 6 presented the best adjustment indexes [GFI = 0.985, CFI = 0.970, RMSEA = 0.064]. However, when it came to X^2/gl, the index 4.103 was obtained, still far from the reference value X<2.

Model 9 was suggested by the program, due to the covariance between item 7 and the additional factor (method effects). This model (M9) was the one that achieved the best adjustment indices, reducing the value of X^2/gl to 1.082, and is shown in Figure 1.

Figure 1

Structural Equation Model (M9)
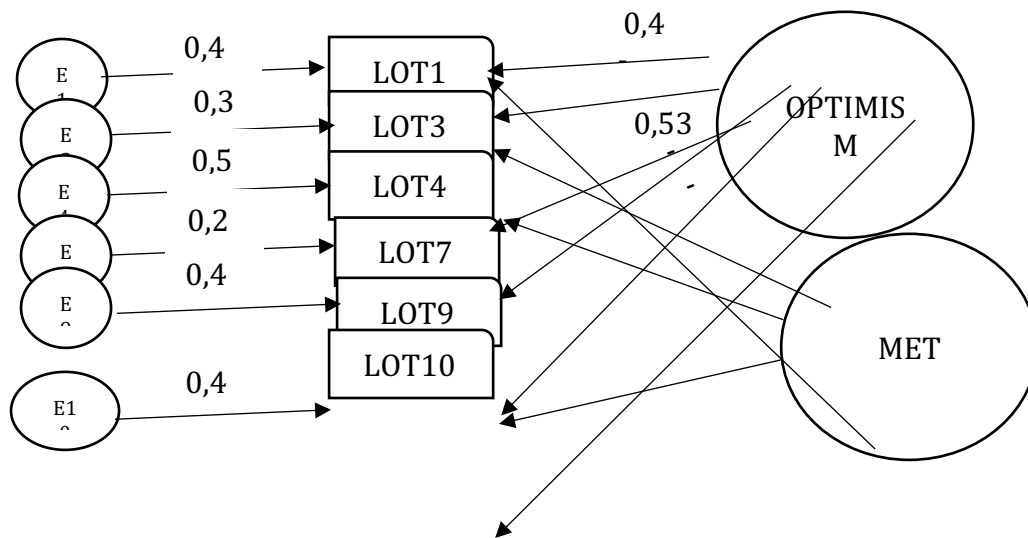
Model M9 (figure 1) was obtained from an adjustment of model M6. A correlation was added between Item 7 and the additional factor, as the statistical program indicated a correlation of 13.774. Model 6, which obtained indices $X^2 / gl = 4.103$, GFI =0.985, CFI = 0.970, and RMSEA = 0.064 and was adjusted with the addition of the correlation, reached the adjustment of X^2/gl:1.082.

Table 4 presents the results obtained through the analysis of Composite Reliability and Average Extracted Variance.

Table 4

Composite Reliability and Average Extracted Variance

Factor	Items	Λ	ε	CC	AVE
	Item 1	0.49	0.46		
	Item 3	0.57	0.33		
Optimism	Item 4	0.53	0.52	0.81	0.43
	Item 7	0.45	0.28		
	Item 9	0.69	0.48		

Item 10	0.56	0.40

The results in Table 4 demonstrate that the instrument has good composite reliability with a value above 0.7. Regarding the average extracted variance, a result below the reference value (< 0.5) was obtained.

Multigroup Factor Analysis

Table 5

Multi-group factor analysis Metric Invariance (Gender Group)

	X²	GL	ΔX²	ΔGL	CFI	ΔCFI	RMSEA
Group							
Male (n = 221)	9,500	5			0.979		0.064
Female (n = 542)	0.590	5			1		0.00
metric invariance							
base model	10,090	10			1		0.003
Structural equivalence	11,801	18	1.709*	8	1	0	0.000
Equivalence Metric	12,441	20	2,351*	10	1	0	0.000
scalar equivalence	25,384	26	15,294*	16	1	0	0.000

*p>0.05

The results of the CFA performed separately for each gender revealed adequate adjustment indices for both the male group (CFI = 0.979) and the female group (CFI = 1).

Multi-group analysis of invariance of different factor structures (Table 5) the indices obtained for the analysis of metric invariance according to gender are presented. Subsequently, a multi-group analysis was carried out (with Emulisrel6 correction) to define the adequacy of the base model (baseline), which constitutes the reference model for the following comparisons (Rondón Bernard & Angelucci Bastidas, 2016). This

model revealed adequate indices (CFI = 1 and RMSEA = 0.003). Further analysis of models with additional constrictions showed support for the equivalence (invariance) of the LOT-R at the structural equivalence level [$\Delta\chi^2$ = 1.7, p > 0.05; ΔCFI < 0.01], metric equivalence [$\Delta\chi^2$ = 2.531, p > 0.05; ΔCFI < 0.01] and scalar equivalence [$\Delta\chi^2$ = 15.29, p > 0.05; ΔCFI < 0.01].

Discussion

The present study aimed to asssess the factor structure, invariance, composite reliability (CC) and Average extracted variance (AVE) of the LOT-R. It should be noted that this study is the first to verify the invariance of this instrument according to gender, in addition to CC and AVE.

The LOT-R has been widely used in several countries in clinical and research contexts and has been validated in different cultures, such as Spain (Zenger et al., 2013), China (Shao et al., 2014), and Portugal (Ribeiro et al., 2012). As already mentioned, in Brazil, there are three validation studies available, but two of them used only exploratory factor analysis (EFA), and the other, which used CFA , was based on a sample formed only by children and adolescents (Ottati & Noronha, 2017).

About construct validity, the result of the present study indicates that the original model (M1), unifactorial, obtained adequate indices [GFI: 0.957, CFI: 0.907, RMSEA: 0.109], except X^2/gl . This is corroborated by other studies with CFA, such as the sample with adolescents in Brazil [χ^2 / df = 3.73; CAIC = 108.04; GFI = 0.96; CFI = 0.94; RMSEA = 0.12][43] and a Portuguese study with participants who had multiple sclerosis [$\chi^2(df\ 9)$ = 59.83, p = 0.0001, CFI = 0.88, RMSEA = 0.14] and another study, by the same authors, aged over 18 years :[$\chi^2(df\ 9)$ = 207.16, p = 0.0001, CFI = 0.65, RMSEA = .18](Ribeiro et al., 2012).

The two-factor model (M2) also obtained adequate indices and reduced the value of X^2/gl [X^2/gl:4.319 GFI: 0.957, CFI:0.907, RMSEA: 0.109]. This finding is supported by the literature according to a German study [CFI=.987, TLI=.987, RMSEA=.042] (Rauch et al., 2007) and a Spanish study with fibromyalgia patients [(RMR=.059, RMSEA= .075, CFI=.969) (Ottati & Noronha, 2017). The Brazilian study also tested a 2-factor model and obtained the result [χ^2 / df = 2.59; CAIC = 101.34; ECVI = 0.258; GFI = 0.96; CFI = 0.92; RMSEA = 0.09] (Ottati & Noronha, 2017).

A Spanish study with 906 participants tested a model with two factors and a second-order factor called quality of life (Cano-García et al., 2015). The result obtained was: [CFI = 0.98, GFI =1 RMSEA = 0.038]. The same model (M4) was tested and some indices were adequate, but compared to the previous one, it had lower indices [CFI = 0.907 GFI = 0.957 RMSEA= 0.109].

The Spanish study also tested other models, one of which tested a model with the optimism factor (6 items) and which correlated items 1, 4 and 10 with both the additional factor called method effects (MET) and with the optimism factor itself (Cano-García et al., 2015). This additional factor serves to adjust the variability of the model. The values found by the authors indicated [CFI = 0.40, GFI = 0.93, RMSEA =0.23]. In this study, the results obtained were better (M6) [CFI = 0.979, GFI = 0.99, RMSEA = 0.091)], however in both values X^2/gl were above 2, indicating that there could be a better fit to the model.

The present study found an M9 model that was able to adequately achieve all adjustment indices [X^2/gl = 1.08, CFI = 1, GFI = 0.998, RMSEA = 0.01]. This model was based on the structure used in the Spanish study with the optimism factor and an additional factor (MET) (Cano-García et al., 2015) with the difference of adding a correlation with item 7 both about the optimism factor and the MET factor.

The present study has some limitations: i) the convenience, non-probabilistic, sample, even though it included a large number of participants ii) the sample had a predominance of people with higher education, including graduate studies and iii) the sample women were predominant and, finally, iv) the sociodemographic questionnaire did not identify the region of the country where the participants resided.

Conclusion

Composite reliability and AFC results revealed good psychometric properties for the Brazilian version of the LOT-R, confirming a factor structure with an optimism factor and an additional method effects factor.

Multigroup factor analysis showed LOT-R invariance for the gender group. Based on these results, it is recommended that researchers who aim to assess optimism use the LOT-R, except the limitations highlighted above.

Future studies should evaluate the composite reliability, and the average extracted variance, in addition to testing the invariance by gender and by region of the country so that the groups are more balanced and the invariance of the LOT-R model.

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