Psychometric properties of the Purpose in Life Scale in Brazilian older adults

Propriedades psicométricas da Escala de Propósito de Vida entre idosos brasileiros

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Abstract

Objective: This study investigated the psychometric properties of the Purpose in Life Scale in a sample of Brazilian older adults.

Methods: This cross-sectional study applied the scale to 309 older adults (mean age = 69.33 ± 7.47 years) residing in the city of Maringá, Paraná, Brazil. Data analysis was conducted through confirmatory factor analysis, Cronbach's alpha, composite reliability, and factor invariance (p < 0.05).

Results: Confirmatory factor analysis revealed that items 2, 3, 5, 6, and 9 had a factor loading below 0.50 and should be excluded. The 1-factor model with 5 items showed acceptable reliability. Multigroup analysis revealed that the configurational, metric, and structural invariance of the 1-factor model with 5 items was acceptable for both men and women.

Conclusion: Although the Brazilian version of Purpose in Life Scale presented acceptable psychometric properties in a reduced model with 5 items, there were limitations that should be explored in the future.

Keywords: aging; quality of life; factor analysis; subjective well-being.

Resumo

Objetivo: Este estudo investigou as propriedades psicométricas da Escala de Propósito de Vida em idosos brasileiros.

Metodologia: Estudo transversal realizado com 309 idosos (média de idade = 69,33 ± 7,47 anos) residentes na cidade de Maringá, estado do Paraná, Brasil. Foi utilizada a Escala de Propósito de Vida. A análise dos dados foi realizada por meio de análise fatorial confirmatória (CFA), alfa de Cronbach, confiabilidade composta e invariancia fatorial (p < 0.05).

Resultados: O CFA revelou que os itens 2, 3, 5, 6 e 9 apresentaram carga fatorial abaixo de 0,50 e devem ser excluídos. O modelo de um fator com 5 itens apresentou ajuste aceitável. A análise multigrupo revelou que a invariancia configuracional, métrica e estrutural do modelo de um fator com 5 itens era aceitável para homens e mulheres.

Conclusão: A versão brasileira da Escala de Propósito de Vida apresentou propriedades psicométricas aceitáveis em um modelo reduzido, com cinco itens; no entanto, mostrou limitações que devem ser exploradas no futuro.

Palavras-chave: envelhecimento; qualidade de vida; análise fatorial; bem-estar subjetivo.
INTRODUCTION
Human life expectancy has increased worldwide, which has led to an increasing older adult population. The World Health Organization estimates that by 2050 about 2 billion individuals will be over the age of 60, representing roughly 20% of the world’s population. Thus, it is becoming increasingly important to promote successful aging in older adults, which requires not only good levels of physical health, but of mental health and good social relationships as well. Purpose in life is considered an important element of an individual’s psychological well-being and it is also associated with other aspects of life, such as sedentary behavior, and depression.

According to a systematic review, among older adults purpose in life has been associated with elements of psychological health (e.g., loneliness, anxiety, and depression), cognitive health (e.g., cognition, sleep quality, and risk of Alzheimer’s disease), physical health (e.g., functional status, self-rated health, risk of stroke/myocardial infarction), and even all-cause mortality. Moreover, recent studies of older adults also show that increasing purpose in life can improve self-perception of aging, protect against cognitive decline, and reduce depressive symptoms, as well as help sustain physical function.

To further research about purpose in life and to promote it among aging individuals, survey instruments are necessary to provide information about factors that impact their quality of life. The Purpose in Life subscale of Ryff’s Psychological Well-Being Scale is a widely used instrument for studying elements that affect quality of life. Among current recommendations for measures of well-being, it is highlighted as a key means of assessing purpose in life for scientific studies. In Brazil, this multidimensional scale has been validated in a sample of university students and has been used to specifically assess older adults.

Although Ribeiro et al. produced an instrument that assesses purpose in life among Portuguese-speaking older adults, only initial steps have been taken towards validating this scale, e.g., semantic-cultural validity and internal consistency. Thus, a more thorough validation process is still required to assess its psychometric properties and further substantiate the use of this scale among older adult populations in Brazil.

Additional steps in the validation process might be important not only for achieving higher standards in psychometric assessment but also due to this scale’s inconsistencies across cultures. A variety of different versions of this instrument currently exist. For example, Ryff’s original Psychological Well-Being Scale is available in versions of 20, 14, 9 and 3 items, while the Dutch, Chinese, Swedish, and Spanish versions consist of 6 items, 4 items, 3 items, and 9 items, respectively.

Given the limitations in the instrument currently available for Brazilian older adults, the range of item possibilities for this scale’s best fit across different populations and cultures, and the importance of having a reliable instrument to study purpose in life among older adults, the present study aimed to analyze the psychometric proprieties of the Purpose in Life Scale for Brazilian older adults to provide evidence of construct validity, convergent validity, and internal reliability.

METHODS
Participants
This cross-sectional study was approved by the Human Research Ethics Committee of the University Center of Maringá (opinion 1.172.969). The data were collected at 15 of the 53 Fitness Zones of Maringá, which were divided in five regions (north, south, east, west and downtown) and selected by lot.

The non-probabilistic sample, chosen intentionally and by convenience, consisted of 309 male (n = 136) and female (n = 173) older adults (mean age = 69.33 ± 7.47 years) residing in Maringá. The inclusion criteria for participants of either sex were age 60 years or older and intact speech and hearing (determined by the researcher), which allowed application of the questionnaires.

The Mini-Mental State Examination (MMSE) was used to exclude older adults with significant cognitive deficits. The MMSE consists of questions grouped into the following categories: orientation (temporal and spatial), registration, attention and calculation, recall, and language. The MMSE cut-off scores for exclusion were: 17 for illiterate individuals, 22 for individuals with 1-4 years of education, 24 for individuals with 5-8 years of education, and 26 for those with 9 or more years of education. Older adults classified below the cut-off point for their education level were excluded. According to MMSE results, 31 older adults were excluded.

Instruments
The Purpose in Life scale is a 10-item self-report measure that uses the following Likert-type expressions:

1. I strongly disagree;
2. I disagree;
3. I neither agree nor disagree;
4. I agree;
5. I strongly agree (Table 1).
To calculate the final score, items 2, 3, 5, 6 and 10 were scored negatively. The final score is the mean of the answers to the ten questions (sum/10), which can range from 1 to 5.

Procedures
Before the beginning of the data collection, a team of 10 researchers was properly trained, and a pilot test was conducted with 30 older people. These results were later discarded.

The volunteers were approached by the lead researcher or the research team. They were informed about the justification, objectives, and procedures to be carried out according to the guidelines for research with human beings in National Health Council Resolution 196/96. After these procedures, those who agreed to participate in the study granted written informed consent. Data collection was performed on different days and at different times according to researcher availability.

The questionnaires were applied through direct interview due to possible reading, visual, or comprehension difficulties.

Data analysis
First, descriptive statistics and bivariate correlations were calculated for all variables using SPSS v. 22.0 (IBM, Armonk, NY, USA). Further, confirmatory factor analysis (CFA) was performed to test the factor structure of the Brazilian version of the Purpose in Life Scale. The sample size for CFA was based on recommendations for at least 10 participants by model estimated parameters. To guarantee the adequacy of the sample, the Monte Carlo bootstrapping technique was applied and the power of the analysis was calculated. In the present study, as has been suggested by several researchers in psychometry, we defined factor loadings > 0.50 as acceptable, since such values explain at least 25% of the variance of an item.

CFA procedures were conducted using AMOS v. 22.0 (IBM, Armonk, NY, USA). The existence of outliers was verified using the Mahalanobis square distance (D²), since the inexistence of these cases is assumed in this analysis. Normality, which is also assumed in CFA, was verified by studying univariate distribution using skewness and kurtosis (ISkI < 3.0 and IKuI < 10), with multivariate distribution determined through Mardia’s coefficient for multivariate kurtosis. The algorithm for maximum likelihood estimation of item parameters maximum was used.

The goodness-of-fit of the structural equation models was evaluated using the following indices: chi-square ($\chi^2$ and p-value), normalized chi-square ($\chi^2$/degrees of freedom), the comparative fit index (CFI), the Tucker–Lewis Index (TLI), and the root mean square error of approximation (RMSEA) with its respective 90% confidence interval (CI = 90%). The following cutoffs were considered indicative of acceptable model fit: CFI and TLI $\geq$ 0.90 and RMSEA $\leq$ 0.08. In addition, convergent validity was analyzed to determine whether the items were related to their respective factors. The average variance extracted was calculated, with values $\geq$ 0.50 considered acceptable. Composite reliability and Cronbach’s alpha ($\alpha$) were calculated to evaluate the internal consistency of the factors, considering scores $\geq$ 0.70 acceptable.

A multigroup analysis was conducted to determine whether the measurement model would be equivalent in groups with different characteristics (i.e., men and women). Byrne’s invariance procedures were followed:

1. The measurement model should provide adequate fit in each sample and
2. Configural, metric, scalar, and residual invariance criteria should be respected.

A change of less than 0.01 in CFI provided evidence for metric invariance and scalar invariance.
RESULTS

A preliminary analysis of the data showed 26 outliers (D² = p₁ < 0.01, p₂ < 0.01). These participants were removed due to the possibility of compromising the internal consistency of the scale and because the absence of outliers is a basic assumption for CFA.²⁰ Descriptive statistics of the items did not indicate deviations from univariate normality, since skewness values varied from -1.59 to -0.24 and kurtosis values varied from -0.90 to 1.98.¹⁹ Nevertheless, the normalized Mardia's coefficient²⁷ for multivariate kurtosis (17.86; p < 0.001) was above 5.00, which Bentler and Wu²⁸ suggest as an indicator of deviation from multivariate normality. Thus, a Bollen–Stine bootstrap with 2000 samples was performed to obtain a corrected value for estimated chi-square coefficients according to the maximum likelihood estimator.²⁹-³¹ Both the variance inflation factor and tolerance test scores conformed to previously reported cutoffs, ensuring the appropriate conditions to test the structural model.

Based on individual reliability assessment of Purpose in Life Scale items and using factor loading (FL), only 6 items were saturated in the latent factor with a magnitude greater than 0.50 (p < 0.001) in the initial model (M1). Items 2 (FL = 0.27), 3 (FL = 0.38), 5 (FL = 0.44), 6 (FL = 0.44) and 9 (FL = 0.36) presented a factor load below 0.50. In addition, M1 did not obtain acceptable adjustment [χ² (35) = 89.38; χ²/df = 2.55; CFI = 0.75; TLI = 0.69; RMSEA = 0.07 (CI 0.05 – 0.09)] (Table 2). Therefore, items 2, 3, 5, and 9 were excluded, and the model was tested again.

As can be seen in Figure 1 (M2), all of the items’ standardized factorial loads (all statistically significant at p < 0.05) showed factor validity, since the 5 items in the model presented FL ≥ 0.50, oscillating between 0.50 to 0.80 and thus explaining at least 25% of the variation of the latent factor. The bootstrap replications (p < 0.001) and the confidence interval (CI = 95%) indicated the stability of the factor estimates and, consequently, acceptable model-data fit. Factor invariance according to sex was investigated in multigroup analysis (Table 3), confirming that sex did not affect the questionnaire’s psychometric properties. Analysis of the configurational invariance of the 5-item model (M2) [χ² (10) = 18.13; χ²/gl = 1.81; CFI = 0.93; TLI = 0.90; RMSEA = 0.051; p (RMSEA < 0.05) = 0.426] revealed adequate fit between men and women, indicating that it remained stable in both groups. When factor weights were applied, the fit was not significantly worse than that of the model with free parameters [χ²diff (4) = 10.17; p = 0.058]. This demonstrates that both model types have a good fit for both groups, with metric

**TABLE 2.** Fit indexes for models of the Brazilian Purpose in Life Scale for older adults.

<table>
<thead>
<tr>
<th>Model</th>
<th>χ²</th>
<th>df</th>
<th>χ²/df</th>
<th>RMSEA</th>
<th>CFI</th>
<th>TLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>89.38*</td>
<td>35</td>
<td>2.55</td>
<td>0.07</td>
<td>0.75</td>
<td>0.69</td>
</tr>
<tr>
<td>M2</td>
<td>13.70</td>
<td>5</td>
<td>2.44</td>
<td>0.07</td>
<td>0.93</td>
<td>0.90</td>
</tr>
</tbody>
</table>

n: 413; χ²: chi-squared; df: degrees of freedom; RMSEA: root mean square error of approximation; CFI: comparative fit index; TLI: Tucker-Lewis index. *p < 0.001.

**FIGURE 1.** Standardized coefficients of bootstrap replications and the correlation between factors and errors associated with each item in the modified model (M2) of the Purpose in Life Scale in a sample of Brazilian older adults.
TABLE 3. Fit indexes for invariance in the modified model (M2) of the Brazilian Purpose in Life Scale across sex.

<table>
<thead>
<tr>
<th>Male-female</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta df$</th>
<th>p</th>
<th>CFI</th>
<th>$\Delta$CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configural invariance</td>
<td>18.13</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.934</td>
<td>-</td>
</tr>
<tr>
<td>Measurement invariance</td>
<td>28.30</td>
<td>14</td>
<td>10.17</td>
<td>4</td>
<td>0.058</td>
<td>0.921</td>
<td>0.013</td>
</tr>
<tr>
<td>Scale invariance</td>
<td>29.00</td>
<td>15</td>
<td>10.86</td>
<td>5</td>
<td>0.054</td>
<td>0.911</td>
<td>0.023</td>
</tr>
<tr>
<td>Residual invariance</td>
<td>40.12</td>
<td>20</td>
<td>21.98</td>
<td>10</td>
<td>0.015</td>
<td>0.838</td>
<td>0.096</td>
</tr>
</tbody>
</table>

$\chi^2$: chi-squared; df: degrees of freedom; $\Delta \chi^2$: difference in chi-square values; $\Delta df$: difference in the degrees of freedom; CFI: comparative fit index; $\Delta$CFI: difference in comparative fit index values.

equivalence between men and women. Assessment of the model’s structural invariance [$\chi^2$diff (5) = 10.86; p = 0.054] indicated that the levels of correlation between the factors were not the same for both groups.

**DISCUSSION**

The present study sought to analyze the psychometric properties of the Purpose in Life Scale for Brazilian older adults. This is the first study to apply robust statistical methods to assess and improve the validity of this instrument for this specific population. It should be recognized that Ribeiro et al. produced a semantic-cultural validation of the scale for the Portuguese language; however, that study involved important limitations, which were addressed in our investigation. Our results suggest that a 5-item version of the Brazilian Purpose in Life Scale can be a reliable tool for studying psychological well-being in older adults.

Contrasting our results with the available literature is somewhat challenging since most studies have assessed the properties of the complete Ryff multidimensional measure of well-being. That scale comprises six dimensions of well-being that have not yet been validated as independent measures of each of the six constructs (self-acceptance, environmental mastery, positive relations, personal growth, autonomy, and purpose in life). Thus, most of the psychometric evidence for each dimension was found in simultaneous testing of all six subscales, which is controversial and limits our understanding of the separate dimensions.

Inconsistencies have been prevalent in the international literature. Throughout the development of Ryff’s Psychological Well-Being Scales, versions ranging from 3 to 20 items per subscale have been produced. However, the criteria for item selection seems to have been based on correlations with other measures, item-to-scale correlations, and Cronbach's Alpha values, without a more in-depth psychometric assessment through confirmatory factor analysis.

Many studies have found low internal consistency values for the Purpose in Life subscale ($\alpha < 0.50$) and factor analysis has only been applied to the instrument’s 3-item version. For instance, a U.K. study also recognized the controversy surrounding the Ryff scales and aimed to examine its structure. Interestingly, these authors formulated a 7-item version of the scale based on personal communication with Ryff. Moreover, a unique and complex model consisting of a second-order factor, two distinct first-order factors, and two method factors were the preferred solution, which indicates the complexity of assessing psychological well-being.

Despite the limitations in attempting to validate and contextualize our results within the international literature, the preference for shorter versions of the original scales seems to emerge as a common factor. Similar to our results, short versions developed in other languages have presented the best psychometric evidence of validity when tested with confirmatory factor analysis. For instance, the Dutch version consisted of 6 items assessing the purpose in life dimension, while the Chinese and Swedish versions included 4 and 3 items, respectively. However, the Spanish version included 9 items for each dimension but its authors considered it far from ideal.

Despite some methodological differences, the overall evidence of the international literature, as well as our results in a sample of Brazilian older adults, align with findings in a sample of Brazilian university students. Machado et al. tested the scale’s original 6-dimension 14-item version and found the best fit was for a short-version of 6 items for each subscale. However, our results came from a 10-item version, assessing only the Purpose in Life dimension of well-being, which also resulted in a shorter instrument of 5 items.

Nevertheless, in this sample of Brazilian older adults, there was strong evidence for the construct validity, internal reliability, and measurement invariance of a short 5-item version of the Brazilian Portuguese Purpose in Life Scale. These results indicate the validity and applicability of the 5-item Purpose in Life Scale in Brazilian older adults, which suggests that it is reliable and measures its construct in a similar manner for both men and women. The complexity in assessing an individual’s purpose in life, as seen by the inconsistencies found.
throughout the well-being literature, could be one reason for the less-than-ideal variance found with this instrument (average variance extracted < 0.50).

This study has some limitations that should be considered. First, given that residents of only one city were included, future research should sample a higher number of older people from other regions of Brazil. Another limitation is that we only tested certain elements of construct validity. Building on our positive findings, future studies should look to assess additional aspects of construct validity. For instance, the consequential aspect of validity could be assessed by examining evidence based on external measures and whether the scale can be used as a ‘basis for action’. Addressing the above points would also provide further evidence for the generalizability aspect of the scale’s construct validity. Assessing additional aspects of construct validity is important, since determining aspects of validity should be viewed as an ongoing process. Furthermore, future studies should replicate our construct validity findings in other large samples of older people. These studies could consider including new items in the scale to capture a greater amount of variance regarding purpose in life, either by returning to Ryff’s 20 original items or by using qualitative methods to assess other aspects of purpose in life among older Brazilians. We encourage authors to further test this version of the Purpose in Life Scale to confirm our evidence in a broader range of older adults in Brazil, as well as to test all 10 items from Ribeiro et al. if necessary.

CONCLUSION

The Brazilian version of the Purpose in Life Scale presented acceptable psychometric properties in a reduced model with 5 items; however, it showed limitations that should be explored in the future. As a practical application, this new Purpose in Life scale is now available as a tool for researchers and health professionals seeking to study the domain of psychological well-being in older adults. This may further strengthen our understanding of this concept and enhance the design and evaluation of proper interventions to improve the quality of life of older adults.

Conflict of interests

The authors declare no conflicts of interest.

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Author contributions

DVO: Conceptualization, data curation, funding acquisition, investigation, project administration, resources, supervision, validation, visualization, writing – original draft, writing – review & editing. RC: Formal analysis, methodology. GLMF: Data curation, methodology. JRA, Freire GLM, et al.: Data curation, formal analysis, methodology. MAN: Software, writing – original draft, writing – review & editing. SMMGB: Data curation, methodology. LF: Data curation, methodology, project administration.

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