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Validity of the de Jong Gierveld loneliness scale in Portugal population: psychometrics studies

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ABSTRACT

Ageing is a life-span complex process. In current cohorts, the final years of life are often marked by increased cognitive, functional, and relational decline due to a range of socioeconomic, biological, and personal factors. As a result, individuals are more susceptible to social isolation and loneliness. The emergence of the COVID-19 pandemic has further intensified the need to assess feelings of loneliness and to develop appropriate interventions. Given the strong association between loneliness and both physical and psychological health and well-being, this area has become a research priority. The aim of this study is to adapt the De Jong Gierveld Loneliness Scale for the Portuguese population and to gather evidence of its validity and reliability. A study was conducted with 191 participants aged between 54 and 99 years old. Results from the exploratory factor analysis revealed a two-factor structure (social and emotional), with Cronbach's alpha values ranging from 0.719 to 0.734. Confirmatory factor analysis indicated good model fit (CFI = 0.996, GFI = 0.931, RMSEA = 0.093) and satisfactory reliability (0.73–0.76). In conclusion, the instrument demonstrates sound psychometric properties and represents a suitable tool for researchers and practitioners. However, further studies with more representative samples of the Portuguese population are recommended.

1. Introduction

1.1. Loneliness

Loneliness has been characterised as a significant social problem (Gierveld & Van Tilburg, 2010) and also as a major challenge for public health (Holt-Lunstad et al., 2015). Although it can affect individuals at any stage of life, it is more common in adolescence and among elderly people who live alone (Gierveld et al., 2018; Pocinho & Macedo, 2017). It is a subjective experience that varies from person to person and often arises from the discrepancy between the level of intimacy that the individual has and that which they consider ideal (Asher et al., 2013; Perlman & Peplau, 1981).

Often described as the psychological expression of social isolation, loneliness represents an individual's dissatisfaction with the frequency

or closeness of their social interactions, or the perceived difference between the bonds they have and those they would like to have. People who experience loneliness tend to perceive negative social cues more intensely and show greater sensitivity to facial expressions associated with pain (Cacioppo & Hawkley, 2009; Edwards et al., 2010; Yamada & Decety, 2009).

According to De Jong Gierveld and Van Tilburg (De Jong-Gierveld and Kamphuls, 1985), loneliness occurs when an individual identifies an unpleasant or unacceptable discrepancy between the quantity and quality of the social relationships they have and those they desire. From this perspective, Cacioppo and Hawkley (Cacioppo & Hawkley, 2009) highlight that individuals with low self-esteem and feelings of social inadequacy are more vulnerable to loneliness. These individuals often interpret their interactions negatively, which promotes emotional distancing and contributes to the formation of a persistent cycle of

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loneliness.

1.2. History of assessment of loneliness

Regardless of the theoretical approach considered, loneliness — understood as an experience of relational deprivation or deprivation — has a significant impact on an individual's health. This phenomenon has multiple dimensions: it includes feelings of emptiness or abandonment associated with the absence of bonds or intimacy; it involves a temporal component, in which loneliness develops and intensifies over time, influencing how individuals perceive their own condition; it incorporates a range of emotions, such as sadness, melancholy, frustration, shame and despair; and it depends on each person's subjective assessment of the quality and quantity of their social relationships. This assessment results from the dynamic interaction between various factors, such as identity, personality, expectations, life events, patterns of social interaction, socio-economic conditions and characteristics of the environment. Despite growing recognition of the need for effective interventions, these remain limited (Yanguas et al., 2018).

People who report feelings of loneliness tend to experience a marked sense of emptiness and abandonment, as well as cognitive changes, depressive symptoms, poorer quality of life, and sleep disturbances (Koğar & Yılmaz, 2023a; Pocinho & Macedo, 2017). Together, these factors contribute to loneliness being an important risk to an individual's mental health.

The literature distinguishes two main types of loneliness: social loneliness, characterised by dissatisfaction resulting from the absence of an adequate social network composed of friends and acquaintances, and emotional loneliness, which stems from the lack of an intimate bond or a meaningful personal relationship (Neto, 1989, 1992). According to the same author, emotional loneliness is the most painful form of isolation.

Social loneliness manifests itself when an individual has reduced involvement with their social environment, which may arise from unfavourable social conditions or rejection by groups with which they wish to establish a connection (Chen, 2015). Emotional loneliness, in turn, is associated with the need to have someone who offers emotional support and security. This type of loneliness often emerges following the loss of family members or close friends, or in contexts of divorce or widowhood.

It is essential to distinguish loneliness from voluntary isolation, since being alone does not necessarily imply feeling lonely. In voluntary isolation, the individual chooses to withdraw for personal preference, productivity or well-being, without this causing emotional suffering. Loneliness, on the other hand, arises when the person is emotionally alone and unable to fully understand the origin of this feeling (Goll et al., 2015).

1.3. Established measures and advantages of current scale

Accurate assessment of loneliness requires reliable and consistent psychometric instruments capable of generating comparable results in different clinical and epidemiological contexts. Several scales have been developed for this purpose, varying in number of items and scope (Chen, 2015), and incorporating direct or indirect approaches (Giraldo et al., 2023). Direct measures usually consist of a single, explicit question about loneliness, while indirect measures seek to capture multiple dimensions of this phenomenon. Among the most widely recognised scales are the UCLA Loneliness Scale (Version 3) (Buz, Urchaga, & Polo, 2014) and the De Jong Gierveld Loneliness Scale (DJGLS) (Wilson et al., 1992). Since its creation in 1987, the DJGLS has been extensively used (Chen, 2015; Goll et al., 2015; Neto, 1989; Yanguas et al., 2018) in the assessment of different manifestations of loneliness, ranging from more intense forms to less severe experiences (Weiss, 1973).

De Jong-Gierveld proposed a multidimensional scale designed to assess how individuals perceive, experience, and interpret their isolation and lack of meaningful communication with others (Grygiel, Humenny,

et al., 2013). This scale covers three main dimensions: intensity — referring to the degree and nature of social isolation; temporal perspective — reflecting the variation in loneliness over time; and emotional characteristics — related to the absence of positive affect. The structure of the instrument includes five subscales: severe deprivation, feeling of abandonment, lack of companionship, lack of sociability, and scarcity of meaningful relationships. From these subscales, it is possible to obtain an overall measure of loneliness composed of 11 items.

Loneliness has been described as a relatively stable characteristic of the individual, often understood as a unidimensional variable subject to variations depending on the context in which the person finds themselves. Its assessment has traditionally been carried out using self-report questionnaires, among which the UCLA Loneliness Scale stands out. However, Penning et al. (2014) indicate that the 11-Item Social and Emotional Loneliness Scale (11-ISEL) is the most appropriate tool for assessing loneliness in the elderly population, and is also one of the most widely used in Europe (Buz, Urchaga, & Polo, 2014).

Subsequent research has challenged the one-dimensional conception of loneliness, suggesting multifactorial structures composed of two (Wilson et al., 1992), three (Pikea et al., 2016) or even four factors (Borges et al., 2008). In the Portuguese context, however, the one-dimensional structure was confirmed by Pocinho, Farrate and Dias (2010), using the UCLA Loneliness Scale (Pocinho et al., 2010).

Considering this evidence, it makes sense to view loneliness as a multifaceted phenomenon. In the typology proposed by Weiss (1973), widely adopted in the literature, two main dimensions are distinguished: social loneliness and emotional loneliness (Weiss, 1973). The validation of the Polish version of the 11-ISEL carried out by Grygiel et al. (2013) corroborated the existence of a two-factor structure, combining a general dimension of loneliness — capable of explaining part of the variance — with two specific dimensions, emotional and social, independent of each other, but both contributing additionally to the observed variability (Grygiel, Humenny, et al., 2013). Thus, there is no consensus on the unidimensionality of loneliness, although there is consistent evidence that strictly bifactorial models never fit satisfactorily (Russell, 1996).

By 2023, fourteen validations of the De Jong Gierveld Loneliness Scale had been carried out, six of which corresponded to the 11-item version. In four of these studies, it was possible to confirm the cross-cultural validity of the DJGLS, demonstrating its applicability in different sociocultural contexts.

In general, loneliness is a multifactorial experience that goes beyond the simple absence of company. It results from the dynamic interaction between psychological, social, cultural, and technological variables, which together determine the unique way in which each individual experiences loneliness. Understanding this phenomenon from a multidimensional perspective is essential for the development of effective interventions that reduce its impacts and promote psychological well-being.

In this context, the main objective of the present study was to adapt the 11-ISEL to the Portuguese population, assessing its psychometric adequacy.

2. Materials and methods

We conducted an observational study and described it following the guidelines proposed by the STROBE statement for studies of this kind. (Haro et al., 2016).

2.1. Participants and data collection

The present study involved individuals aged 54 years and older, without cognitive impairment as assessed by the 6-CIT scale. Data were collected through interviews conducted during 2022, based on a sample of 191 participants from the Portuguese population. This sample size is considered adequate for validation purposes, following methodological

recommendations (Polit et al., 2007), which suggest a minimum ratio of 5–10 participants per item and at least 100 cases to ensure the robustness of factor analyses and statistical reliability.

The final sample consisted of 191 participants, aged between 55 and 99 years old, with a higher prevalence in females 60.7 %. Among the participants, 49.7 % were married. In terms of education, 33.5 % had 1–4 years of schooling, 23.6 % had 5–9 years, 15.7 % had 10–12 years, 21.5 % held a higher education degree, and 5.8 % were only able to read and write. Finally, it is important to mention that 86.4 % of the participants were living in their own homes, not being inserted in any social response, and 83.8 % were taking some type of medication.

The study followed all guidelines applicable to medical research involving human subjects (Pestana & Gageiro, 2014), approved by Ethics and Deontology Committee for Research of the Faculty of Psychology and Educational Sciences, University of Coimbra with the approval number: CEDI/FPCEUC:73/R_8, dated March 22, 2023 and Health Sciences Research Unit: Nursing, Nursing School of Coimbra with the approval number: P623/10–2019, dated November 13, 2019.

After obtaining informed and signed consent forms, a dropout rate of approximately 10 % was observed, attributed to the fact that some elderly participants discontinued their participation during the evaluation process.

2.2. Measurement and missing values

The following instruments were used in the validation process: sociodemographic data, the UCLA Loneliness Scale, and the De Jong Gierveld Loneliness Scale.

The sociodemographic data included information such as age, gender (female, male), marital status (single, married, divorced, or widowed), level of education (illiterate; literate; 1–4 years of schooling; 5–6 years of schooling; 7–9 years of schooling; 10–12 years of schooling; bachelor's, master's or doctoral degree) and profession.

The De Jong Gierveld Loneliness Scale assesses feelings of loneliness through 11 items distributed across two domains: social loneliness, consisting of 5 items with positive semantic content that seek to gauge the sense of belonging; and emotional loneliness, consisting of 6 items with negative semantic content, aimed at identifying feelings of loss or social disappointment. The responses follow a 5-point Likert format (0 – Never, 1 – Rarely, 2 – Sometimes, 3 – Often, 4 – Always).

Thus, for emotional loneliness, the responses “sometimes”, “often” and “always” are scored in items 2, 3, 5, 6, 9 and 10; while for social loneliness, the responses “never”, “rarely” and “sometimes” in items 1, 4, 7, 8 and 11 are considered.

For the convergent validity analysis, the UCLA Loneliness Scale (Polit et al., 2007) was used, an instrument designed to assess loneliness and associated feelings, based on the assumption that loneliness is a psychological state that can be measured in a unidimensional way (Neto, 1989, 1992). This scale consists of 18 items that directly address feelings of loneliness, such as “I feel excluded” or, conversely, “I have no one to turn to.” Responses are given on a 4-point Likert scale (0 – Never, 1 – Rarely, 2 – Sometimes, 3 – Often). In the present study, the scale showed good internal consistency, with a Cronbach's alpha of 0.709, as well as adequate evidence of validity. The UCLA Loneliness Scale was chosen for convergent validity due to its widespread use and strong psychometric properties. Although the DJGLS has a bifactor structure, the UCLA provides a reliable overall estimate of loneliness and allows comparison with prior research. Several international DJGLS validations have also used the UCLA for convergent validity, including studies in Peru, Spain, Korea, and Turkey (Buz et al., 2014b; Caycho-Rodríguez et al., 2021; Koçar & Yılmaz, 2023b; Russell, 1996; Tomás et al., 2017).

2.3. Stages of cultural validation of the jong Gierveld loneliness scale

2.3.1. Translation and back-translation

At an early stage, written consent was requested and obtained from

Professor De Jong Gierveld, author of the original scale, to proceed with its translation and subsequent validation. The scale was then translated independently by two translators. The two resulting versions were analysed by a group of experts, which allowed a new proposal to be constructed. This was again submitted for review by a panel of experts, responsible for examining the back-translated versions. After the necessary adjustments were made, the final version in Portuguese was obtained. The differences found mainly concerned semantic equivalence, as it was essential to ensure that the questions produced comparable effects on participants from different cultural contexts. Thus, it was essential to understand how the items were perceived by the target audience in order to ensure the reliability of the responses.

2.3.2. Face and content validity

The items developed and their respective response options were submitted to a pilot study conducted with six professionals considered experts in the field of health and the construction of measurement instruments. The questionnaire took an average of 5 min to complete. The participation of these experts allowed for the verification of face and content validity, enabling adjustments that improved the instrument.

To assess content validity, the Content Validity Index (CVI) was calculated for each item (I-CVI) and for the scale as a whole (S-CVI). The experts' assessment was based on a 4-point scale (1 = not relevant; 2 = slightly relevant; 3 = relevant; 4 = very relevant), with higher scores indicating greater suitability of the items.

The I-CVI was calculated by dividing the number of experts who gave a rating of three or four by the total number of evaluators.

Regarding relevance, I-CVI ranged from 0.80 to 1 for all items, and overall S-CVI for the 10-item scale was 0.94. Some authors advised that I-CVI should be between 90 % and 100 % when there were five or fewer experts and not less than 78 % when there were six or more. Bearing in mind the opinion of these authors, we can consider the I-CVI values to be good. Scale developers often use a rule-of-thumb score of 80 % as the lower limit of acceptability for an S-CVI (Muthén & Muthén, 2015; Yusoff, 2019).

2.3.3. Psychometric analysis

The purpose of this stage was to perform psychometric analyses, including assessing the internal consistency and reliability of the instrument.

Another objective was to examine convergent and discriminant validity. For discriminant validity, the strength of the correlation between the two factors—social loneliness and emotional loneliness—was analysed, considering a weak to moderate relationship between them to be adequate.

With regard to convergent validity, symptoms associated with loneliness, namely depressive symptoms and quality of life indicators, were selected for comparison.

2.4. Data analyses

The scale validation stage was conducted using JASP software, developed by the University of Amsterdam, for data processing and statistical analysis.

The sample was characterised using descriptive statistics, employing frequencies, percentages, mean \pm standard deviation (SD) and range, in order to describe the sociodemographic and academic profile of the participants.

The validation of the Portuguese version of the 11-Item for Social and Emotional Loneliness Scale (11-ISEL) was based on reliability and validity procedures (Streiner et al., 2015). To this end, the following methodological criteria were observed: (i) determination of Pearson's correlation coefficient between each item and the total scale (item--total), excluding items with values below 0.200; and (ii) calculation of Cronbach's alpha coefficient for each item and for the overall scale.

Cronbach's alpha, an indicator of the internal consistency of the

instrument, has possible values between 0 and 1, with higher scores reflecting greater reliability. In this study, only values above 0.800 were considered acceptable, in accordance with recommendations that point to this threshold as robust evidence of internal consistency (Cohen et al., 2021; Marôco, 2018).

To assess the validity of the scale, an exploratory factor analysis (EFA) was first conducted, followed by a confirmatory factor analysis (CFA). The CFA was performed in JASP, and the fit indices were estimated using Mplus (Cohen et al., 2021). The global fit of the factorial model was evaluated using the chi-square ratio (χ^2/df), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Root Mean Square Residual (RMR), and Standardized Root Mean Square Residual (SRMR). A good overall model fit was considered when $\chi^2/df < 5$, GFI and CFI > 0.90 , and RMSEA, RMR, and SRMR < 0.05 , with values up to 0.10 considered acceptable (Cohen et al., 2021). We acknowledge that conducting both EFA and CFA on the same sample is a non-standard approach; however, this procedure was adopted to ensure comparability with the methodology used in the original validation of the De Jong Gierveld Loneliness Scale (De Jong-et al., 1985) and subsequent replications. In the EFA, a Principal Component Analysis (PCA) extraction method was applied, as it is commonly used in initial validations of the DJGLS to explore factor structure and maintain consistency across studies. This sequential combination of EFA and CFA allows a more comprehensive assessment of factorial validity and model adequacy, following established psychometric recommendations (Brown, 2015; De Jong-Gierveld and Kamphuis, 1985; Kline, 2016; Lloret-Segura et al., 2014; Worthington & Whittaker, 2006). A CFA figure and additional fit indices were also included to visually illustrate the adequacy of the final model.

In the present study, a Varimax rotation was applied in the exploratory factor analysis (EFA) to ensure that each item loaded primarily on a single factor, avoiding cross-loadings. This orthogonal rotation was chosen based on the recommendation of Pestana and Gageiro (Pestana & Gageiro, 2014), who emphasize that Varimax is appropriate when the objective is to obtain factors that are clearly defined and independent, with items contributing strongly to only one factor. By using Varimax, the factorial structure of the De Jong Gierveld Loneliness Scale (DJGLS) could be interpreted more clearly, enhancing the scale's construct validity and ensuring that each item represents a distinct dimension of loneliness.

The convergent validity was also analysed through the analysis of the Person correlation and the cut-off point for the scale was established through ROC curves (Cohen et al., 2021). An independent-sample *t*-test was used to determine whether there were statistically significant differences between male and female participants in the 11-ISEL subscale. The relationship between scale scores and age was calculated using Pearson correlation coefficients.

3. Results

3.1. Internal consistency

The psychometric study began with the determination of the statistics of each of the 11 items. To evaluate the fidelity of the scale, the Cronbach's alpha coefficient of all the items that make up the instrument was calculated, as well as the scale after the exclusion of each of the items individually.

All items remained on the scale because they had a reasonable Cronbach's alpha and a Pearson's correlation value greater than 0.200, with statistical significance (Adamczyk & DiTommaso, 2016; Cohen et al., 2021).

In the data presented in Table 1, it is observed that the 11-item scale has a Cronbach's alpha that varies between 0.719 and 0.734 for the items and 0.802 for the total, demonstrating a satisfactory internal consistency (Cohen et al., 2021) (see Table 2).

Table 1

Descriptive statistics, Pearson correlation and Cronbach's alpha by item-11-ISEL.

Item description	M	DP	r corrected	Cronbach's Alpha
1... about their day-to-day problems.	0.43	0.50	0.62	0.719
2... have a close friend.	0.36	0.48	0.55	0.724
3... overall of emptiness.	0.37	0.49	0.57	0.722
4 when I have a problem.	0.46	0.50	0.60	0.720
5 warm and comforting.	0.31	0.46	0.65	0.719
6 friends are limited.	0.50	0.50	0.43	0.730
7 I can fully trust.	0.57	0.50	0.37	0.734
8 feel intimately connected.	0.47	0.50	0.45	0.729
9. ... companionship.	0.38	0.49	0.50	0.726
10. ... abandoned.	0.16	0.37	0.50	0.731
11. friends whenever I need them.	0.28	0.45	0.55	0.725
11-ISEL				0.802

I – inverted item; M – average; DP – standard deviation; r – corrected total item correlation.

Table 2

Exploratory factor analysis of 11-ISEL.

Item description	λ^2	Factor 1	Factor 2
1... about their day-to-day problems.	0.550	0.0359	.649
2... have a close friend.	0.417	.607	0.219
3... overall of emptiness.	0.498	.687	0.159
4.when I have a problem.	0.544	0.304	.672
5. warm and comforting.	0.548	.694	0.258
6. friends are limited.	0.348	.590	0.001
7. I can fully trust.	0.540	–0.081	.731
8. feel intimately connected.	0.594	0.015	.771
9. ... companionship.	0.386	.609	0.120
10. ... abandoned.	0.577	.759	–0.038
11. friends whenever I need them.	0.387	0.445	0.435
Variance Explained ($\Sigma = 48.98\%$)		27.67	21.31
Number of items		6	5
Cronbach's alpha		0.761	0.732
KMO = 0.821			

Bartlett sphericity test = 525.614 (g. l = 55; $p < 0.001$).

3.2. Exploratory and confirmatory factor analysis

An Exploratory Factor Analysis (EFA) was then performed. The suitability of the correlation matrix for factor analysis was verified using the Kaiser-Meyer-Olkin (KMO) test, considering values between 0.50 and 1.00 to be acceptable. The coefficient obtained was 0.821, indicating satisfactory correlation quality and justifying the continuation of the analysis.

The hypothesis of no correlations between the variables was evaluated by Bartlett's sphericity test ($\chi^2 = 525.614$; $p < 0.001$), the result of which allowed the null hypothesis to be rejected, confirming that the correlation matrix differs from an identity matrix and that there are statistically significant relationships between the items.

With the 11 items on the scale, an EFA was performed using the principal component method, with Varimax orthogonal rotation and forced extraction of two factors, in accordance with the structure proposed by the authors of the original scale. The two extracted factors together explain 48.98 % of the total variability. The factor solution obtained reproduces the original structure both in terms of the number of factors and the distribution of items.

Factor 1 corresponded to the emotional subscale, comprising six items (items 2, 3, 5, 6, 9, and 10) and explaining 27.67 % of the variance. Factor 2 corresponded to the social subscale, consisting of five items (items 1, 4, 7, 8, and 11), with 21.31 % of the variance explained.

Regarding the internal reliability of the factors, adequate Cronbach's alpha values were observed, ranging from 0.761 for factor 1 to 0.732 for

factor 2, consistent with the number of items comprising each dimension.

The factorial solution was then tested using Confirmatory Factor Analysis (AFC) and the initial model was refined based on the modification indices proposed by JASP.

An adjustment was achieved that, as a whole, became adequate for the model with modification indices, revealing values considered acceptable (Table 3 and Fig. 1).

The confirmatory factor analysis (CFA) indicated an overall satisfactory fit of the proposed model. The chi-square ratio ($\chi^2/df = 2.636$) suggests a reasonable model fit, as values below 3 are generally considered indicative of good fit. The Goodness of Fit Index (GFI = 0.996) and the Comparative Fit Index (CFI = 0.931) both exceed the conventional threshold of 0.90, reflecting a strong correspondence between the observed and estimated covariance matrices. The Standardized Root Mean Square Residual (SRMR = 0.041) is below the recommended cutoff of 0.05, further supporting an adequate fit. Although the Root Mean Square Error of Approximation (RMSEA = 0.093) is slightly above the commonly accepted threshold of 0.08, and the Tucker-Lewis Index (TLI = 0.868) is marginally below 0.90, the overall pattern of fit indices indicates that the factorial structure is largely satisfactory. These results suggest that the model adequately represents the data, while minor refinements could further improve model fit in future research.

3.3. Convergent validity

In order to determine the discriminant and convergent validity, a Pearson correlation was performed between 11 ISEL and UCLA, and a significance level of 0.05 was also adopted. In this sense, it was possible to find a moderate and statistically significant magnitude correlation between the totals obtained by UCLA and the totals of 11 ISEL ($r = .634$; $p < 0.001$) demonstrating that they measure the same construct.

3.4. Determination of the cut-off point of the 11 item loneliness scale

In this sense, and using the ROC curve and based on the UCLA Loneliness scale, it was possible to establish the cut-off point for the present scale.

The ROC showed good performance of the 11 item loneliness to classify patients with loneliness based on $UCLA > 31$ (AUC = 0.871; SE = 0.025; 95 % CI 0.821–0.920; $p < 0.001$) with a sensitivity of 85 % and a specificity of 70 %. In this sample, the optimal 11 item threshold was ≥ 3 .

After determining the validity of the instrument, 11-ISEL maintained the 11 items of the original version, with a maximum score of 11, with higher scores translating into higher loneliness indices.

Based on the results obtained in the present study, it is concluded that 129 participants scored values that are indicative of loneliness, this being the highest percentage in females with 61.2 % of respondents.

It should be noted that there are statistically significant differences between men and women in 5 of the 11 items (Table 4).

We also found that despite the wide range of age of the participants, we did not find statistically significant differences between the loneliness index and age ($r = 0.085$; $p > 0.05$).

Table 3
Overall adjustment index.

Model	χ^2/df	GFI	CFI	RMSEA	SRMR	TLI
11-ISEL Final model	2.636	0.996	0.931	0.093	0.041	0.868

χ^2/df – chi-square ratio per Degrees of Freedom; GFI – Goodness Fit Index; CFI – Comparative Fit Index; RMSEA – Root Mean Square Error of Approximation; SRMR – Standardized Root Mean Square Residual; TLI – Tucker Lewis Index.

4. Discussion

The aim of this study was to adapt the Social and Emotional Loneliness Scale (SELSA – 11 ISEL) for the Portuguese population, while simultaneously assessing its psychometric adequacy. To this end, internal consistency and convergent validity were analysed, and exploratory and confirmatory factor analyses were performed. Through these procedures, it was possible to characterise the psychometric properties of the scale in the Portuguese sample.

The exploratory factor analysis provided evidence of factorial validity and accuracy, revealing a two-factor structure consistent with the theoretical proposal and the results of the original study. The fit indices were satisfactory (CFI > 0.95 ; RMSEA < 0.08) (Adamczyk & DiTommaso, 2016). Internal reliability, assessed by Cronbach's alpha, was 0.802, which is considered adequate (Jowkar, 2012; Leung et al., 2008), in line with the three-factor structure found in validations carried out in Poland, Turkey, and Iran (Cheung et al., 2022; Grygiel, Świtaj, et al., 2013; Lecovich, 2013).

Several international studies show that this scale has good psychometric qualities and tend to confirm the existence of two core dimensions — social loneliness and emotional loneliness — as in the original version. In the six-item Chinese version of the De Jong Gierveld Loneliness Scale, applied to 103 elderly people, it was also possible to confirm this two-dimensional organisation, obtaining an alpha of 0.76 (Dahlberg & McKee, 2014a). Similarly, in the study by Pawel Grygiel et al. (2013), conducted in Poland, a two-factor structure was also identified, which together reflect a general factor of loneliness (Cheung et al., 2022), a result also observed by Cheung et al. (Lecovich, 2013).

In the Hebrew version of the scale, applied to 2010 elderly people, exploratory analysis led to the extraction of three factors, since the emotional dimension was subdivided into two distinct scales. Unlike this version, in the present study the items were distributed across the dimensions in a manner fully consistent with the original scale (Dahlberg & McKee, 2014a).

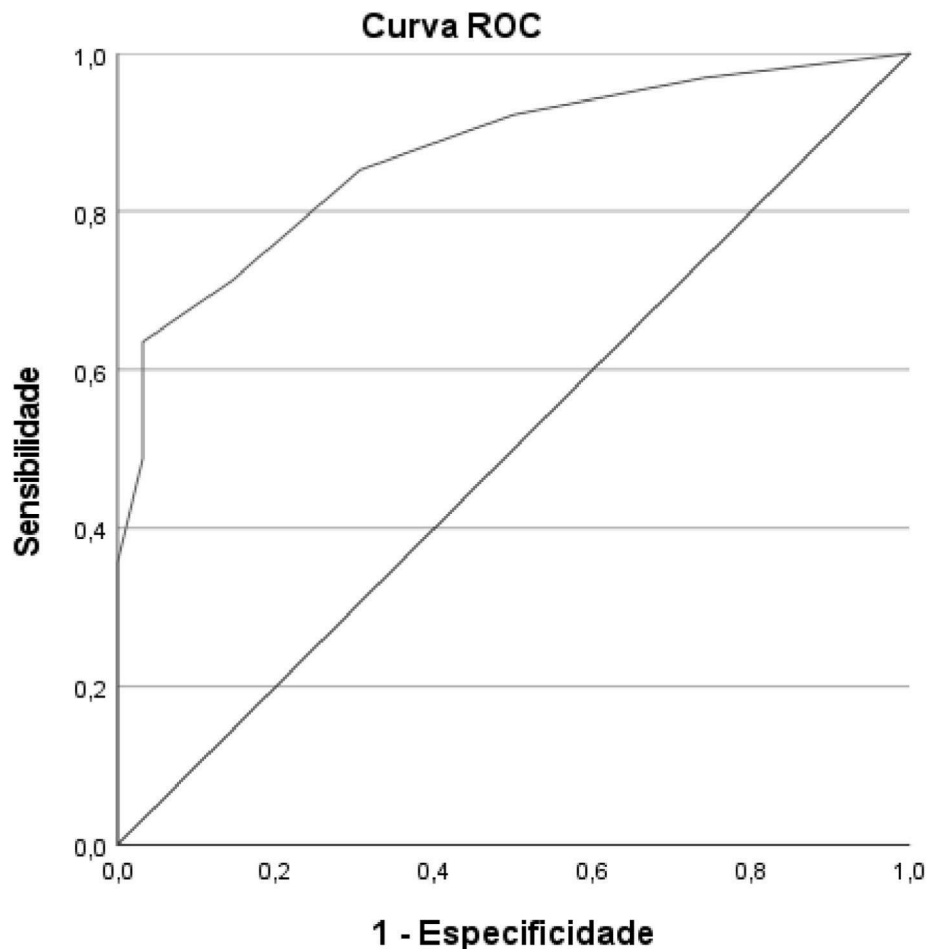
The factor structure observed in the Portuguese population confirms previous findings (Gierveld & Van Tilburg, 2010; Lecovich, 2013) and highlights the importance of distinguishing social loneliness from emotional loneliness. This differentiation separates aspects related to the number of social contacts from aspects related to the perception of the quality and depth of these relationships. This reinforces the multidimensional nature of loneliness (Salo et al., 2020), which is influenced by elements such as personal history, identity, psychological characteristics, and socioeconomic conditions, which give it specific and stable patterns over time (Giraldo et al., 2023b).

The literature analysed also shows an association between marital status and the experience of loneliness, which is more prevalent among widowed, divorced or single people. In the study by Dahlberg & McKee (2014), conducted in the United Kingdom with 1255 elderly people (≥ 65 years), 7.7 % reported high levels of loneliness and 38.3 % reported moderate levels. The authors identified widowhood, low self-esteem and fragile social networks as direct predictors of loneliness. The results obtained in the present study also suggest that marital status is a possible predictor of the phenomenon (Dahlberg & McKee, 2014b).

Although there are other validated instruments for assessing loneliness in Portugal, this study has relevant advantages, namely the validation of a shorter, easy-to-apply and widely used instrument at an international level, which allows clinical and epidemiological comparisons between different populations.

In addition, the results obtained show that the scale assesses loneliness from a multidimensional perspective, enabling interventions specifically targeted at social or emotional loneliness, depending on the most predominant dimension. Social loneliness focuses on the number of interactions, while emotional loneliness relates to the depth and quality of relationships, implying different approaches.

Despite the favourable results, it is important to recognise some limitations. Although the sample includes participants from various age



Os segmentos diagonais são produzidos por empates.

Fig. 1. ROC curves for the 11 item loneliness scale cut-off.

Table 4
T student between scale and 11 item loneliness items and participant's sex.

	Women		Men		T	P
	M	SD	M	SD		
11-Item_1	0.40	0.492	0.47	0.502	0.905	0.183
11-Item_2	0.42	0.496	0.27	0.445	-2.205	0.014
11-Item_3	0.43	0.497	0.28	0.452	-2.123	0.018
11-Item_4	0.47	0.501	0.45	0.501	-0.164	0.435
11-Item_5	0.35	0.480	0.24	0.430	-1.660	0.049
11-Item_6	0.48	0.502	0.53	0.502	0.680	0.249
11-Item_7	0.56	0.498	0.57	0.498	0.176	0.430
11-Item_8	0.44	0.498	0.51	0.503	0.904	0.184
11-Item_9	0.44	0.498	0.28	0.452	-2.241	0.013
11-Item_10	0.20	0.400	0.11	0.311	-1.680	0.047
11-Item_11	0.32	0.468	0.21	0.412	-1.594	0.056
TOTAL_11_item	4.50	3.36	3.92	2.40	-1.314	0.095

groups, it represents only one region of the country, suggesting the need for future studies with greater geographical diversity.

Finally, given that the scale assesses loneliness mainly through a cognitive approach, and being a brief and simple tool to use, it is considered to have significant clinical and epidemiological utility. The existence of measures with good discriminatory power may support the development of preventive policies targeting loneliness and its associated factors. The maintenance of the two-factor structure — allowing for the distinction between number of interactions and quality of relationships — stands out as a feature that deserves further investigation in

future research.

5. Conclusions

Based on this study, we conclude that the Portuguese version of the loneliness scale with 11 items can present two distinct dimensions of loneliness (emotional and social). This study provides an appropriate scale for researchers and health professionals that aim to understand, prevent and intervene in loneliness in older adults.

From a practical perspective, validating instruments with a multifaceted nature of a construct allows researchers to gain a broader understanding of its concept and understand the effect of its multiple dimensions.

The De Jong Gierveld Loneliness Scale (DJGLS) demonstrates several strengths that support its use in research and clinical settings. First, its factorial structure has proven to be robust and replicable across diverse populations. Second, the DJGLS shows strong convergent validity, correlating significantly with other measures of loneliness, such as the UCLA Loneliness Scale, as well as with related constructs like depressive symptoms, social support, and psychological resilience. Additionally, measurement invariance studies indicate that the scale can be reliably used for comparisons across groups such as gender. The DJGLS has also been validated in multiple languages and cultural contexts, including Spanish, Turkish, French, Arabic, and Korean, highlighting its versatility and applicability in cross-cultural research.

The primary limitations of this study relate to the sample size, its non-probabilistic nature, and the uneven distribution of

sociodemographic and educational characteristics, which may have affected participants' responses. A larger and more representative sample reflecting the diversity of the Portuguese population could have provided a deeper understanding of the factors contributing to loneliness. Moreover, both EFA and CFA were conducted on the same sample—a non-standard procedure—which may limit the generalizability of the factorial findings. Additionally, the data were self-reported, which may introduce response biases such as social desirability. Finally, participants with limited educational attainment may have experienced difficulty understanding more complex items, potentially affecting the accuracy of their responses. Although marital status was previously mentioned as a potential predictor in the discussion, no specific analysis was performed; future studies should include such analyses or adjust the interpretation regarding marital status accordingly.

When working with individuals who experience loneliness, recognizing that loneliness has multiple dimensions opens the possibility of designing distinct support groups, each focused on addressing a particular type of loneliness.

These bullet-point highlights summarize the key features of the instrument: it is brief and allows for a quick assessment of the construct; it demonstrates strong internal consistency and is suitable for use with older adults; and it enables the observation of two distinct dimensions of loneliness, providing a more comprehensive understanding of this phenomenon.

CRedit authorship contribution statement

Timóteo Areosa: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Margarida Pedrosa Lima:** Writing – review & editing, Supervision, Conceptualization. **Susana Custódio:** Writing – review & editing, Methodology, Conceptualization. **Tânia Caetano:** Writing – original draft, Methodology, Investigation, Data curation. **J. De Jong Gierveld:** Writing – review & editing. **Maria dos Anjos Dixe:** Writing – review & editing, Methodology, Conceptualization.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author.

Ethical approval

This study was reviewed and approved by Ethics and Deontology Committee for Research of the Faculty of Psychology and Educational Sciences, University of Coimbra with the approval number: CEDI/FPCEUC:73/R_8, dated March 22, 2023 and Health Sciences Research Unit: Nursing, Nursing School of Coimbra with the approval number: P623/10–2019, dated November 13, 2019. Participation was voluntary, and written informed consent was obtained from all individual participants included in this study.

Declaration of the use of AI assisted technologies

The authors declare that no AI assisted technologies were used during any stage in the preparation of this article.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Adameczyk, K., & DiTommaso, E. (2016). *Social and emotional loneliness Scale for adults – Short version; Polish version [Internet]*. <https://doi.org/10.1037/t55306-000> [cited 2024 Feb 21]. Available from: <https://doi.apa.org/doi/10.1037/t55306-000>. doi.
- Asher, S. R., & Weeks, M. S. (2013). Loneliness and belongingness in the college years. In R. J. Coplan, & J. C. Bowker (Eds.), *The handbook of solitude [Internet]* (1st ed., pp. 283–301). Wiley. <https://doi.org/10.1002/9781118427378.ch16> [cited 2024 Feb 20] Available from: <https://onlinelibrary.wiley.com/doi/10.1002/9781118427378.ch16>.
- Borges, A., Prieto, P., Ricchetti, G., Hernández-Jorge, C., & Rodríguez-Naveiras, E. (2008). [Cross validity of the UCLA Loneliness Scale factorization]. *Psicothema*, 20(4), 924–927.
- Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). New York: Guilford Press. <https://doi.org/10.4324/9781315757421>
- Buz, J., & Pérez-Arrechaederra, D. (2014b). Psychometric properties and measurement invariance of the Spanish version of the 11-item De Jong Gierveld Loneliness Scale. *International Psychogeriatrics*, 26(9), 1553–1564. <https://doi.org/10.1017/S104161021400122X>
- Buz, J., Urchaga, D., & Polo, M. E. (2014). Análisis factorial confirmatorio de la escala de soledad de De Jong Gierveld en personas mayores españolas. *Anales de Psicología*, 30(2), 588–596. <https://doi.org/10.6018/analesps.30.2.145051>
- Cacioppo, J. T., & Hawkley, L. C. (2009). Perceived social isolation and cognition. *Trends in Cognitive Sciences*, 13(10), 447–454. <https://doi.org/10.1016/j.tics.2009.06.005>
- Caycho-Rodríguez, T., Tomás, J. M., Hontangas, P. M., Ventura-León, J., Burga-León, A., Barboza-Palomino, M., et al. (2021). Validation of the De Jong Gierveld Loneliness Scale in Peruvian old adults: SEM and IRT multidimensional models. *The Journal of General Psychology*, 150(1), 1–25. <https://doi.org/10.1080/00221309.2021.1870194>
- Chen, I. C. (2015). The scale for the loneliness of college students in Taiwan. *J Educ Psychol*, 5(1), 27. <https://doi.org/10.5539/jep.v5n1p27>
- Cheung, S. L., Hobbelen, H. J. S. M., Van Der Schans, C. P., & Krijnen, W. P. (2022). Cross-cultural equivalence of De Jong Gierveld Loneliness Scale among older native and diasporic Chinese adults. *The Gerontologist*, 62(2), e62–e72. <https://doi.org/10.1093/geront/gnab125>
- Cohen, J., Sturman, E., & Swerdlik, M. (2021). *Testagem e avaliação psicológicas: introdução a testes e medidas*. Amgh. <https://doi.org/10.4324/9781003195560>
- Dahlberg, L., & McKee, K. J. (2014a). Correlates of social and emotional loneliness in older people: Evidence from an English community study. *Aging & Mental Health*, 18(4), 504–514. <https://doi.org/10.1080/13607863.2013.856863>
- Dahlberg, L., & McKee, K. J. (2014b). Correlates of social and emotional loneliness in older people: Evidence from an English community study. *Aging & Mental Health*, 18(4), 504–514. <https://doi.org/10.1080/13607863.2013.856863>
- De Jong-Gierveld, J., & Kamphuis, F. (1985). The development of a Rasch-type loneliness scale. *Applied Psychological Measurement*, 9(3), 289–299. <https://doi.org/10.1177/014662168500900307>
- Edwards, K. M., Bosch, J. A., Engeland, C. G., Cacioppo, J. T., & Marucha, P. T. (2010). Elevated macrophage migration inhibitory factor (MIF) is associated with depressive symptoms, blunted cortisol reactivity to acute stress, and lowered morning cortisol. *Brain, Behavior, and Immunity*, 24(7), 1202–1208. <https://doi.org/10.1016/j.bbi.2010.04.003>
- Gierveld, J. D. J., Tilburg, T. G., & Dykstra, P. A. (2018). New ways of theorizing and conducting research in the field of loneliness and social isolation. In A. L. Vangelisti, & D. Perlman (Eds.), *The Cambridge handbook of personal relationships [Internet]* (2nd ed., pp. 391–404). Cambridge University Press. <https://doi.org/10.1017/9781316417867.026> [cited 2024 Feb 21] Available from: https://www.cambridge.org/core/product/identifier/9781316417867%23CN-bp-29/type/book_part
- Gierveld, J. D., & Van Tilburg, T. G. (2010). The De Jong Gierveld short scales for emotional and social loneliness: tested on data from 7 countries in the UN generations and gender surveys. *European Journal of Ageing*, 7(2), 121–130. <https://doi.org/10.1007/s10433-010-0161-6>
- Giraldo-Rodríguez, L., Álvarez-Cisneros, T., & Agudelo-Botero, M. (2023a). Psychometric properties of the 11-item De Jong Gierveld Loneliness Scale in a representative sample of Mexican older adults. *Healthcare*, 11(4), 489. <https://doi.org/10.3390/healthcare11040489>
- Giraldo-Rodríguez, L., Álvarez-Cisneros, T., & Agudelo-Botero, M. (2023b). Psychometric properties of the 11-item De Jong Gierveld Loneliness Scale in a representative sample of Mexican older adults. *Healthcare*, 11(4), 489. <https://doi.org/10.3390/healthcare11040489>
- Goll, J. C., Charlesworth, G., Scior, K., & Stott, J. (2015). Barriers to social participation among lonely older adults: The influence of social fears and identity. *PLoS One*, 10(2), Article e0116664. <https://doi.org/10.1371/journal.pone.0116664>
- Grygiel, P., Humenny, G., Rebisz, S., Świtaj, P., & Sikorska, J. (2013). Validating the Polish adaptation of the 11-item De Jong Gierveld Loneliness Scale. *European Journal of Psychological Assessment*, 29(2), 129–139. <https://doi.org/10.1027/1015-5759/a000144>
- Grygiel, P., Humenny, G., Rebisz, S., Świtaj, P., & Sikorska, J. (2013). Validating the Polish adaptation of the 11-item De Jong Gierveld Loneliness Scale. *Euro. J. Psychol. Assessment*, 29(2), 129–139. <https://doi.org/10.1027/1015-5759/a000130>
- Grygiel, P., Świtaj, P., Anczewska, M., Sikorska, J., Humenny, G., & Sławomir, R. (2013). *Loneliness and depression among Polish university students: Preliminary findings from a longitudinal study*. Sofia, Bulgaria: BCES Books. <https://doi.org/10.13140/RG.2.1.4507.0803>
- Haro, F., Serafim, J., Cobra, J., Faria, L., Roque, M. I., Ramos, M., & Costa, R. (2016). *Investigação em Ciências Sociais. Guia Prático do Estudante*. Lisboa: PACTOR.

- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science*, 10(2), 227–237. <https://doi.org/10.1177/1745691614568352>
- Jowkar, B. (2012). Psychometric properties of the short form of the social and emotional loneliness scale for adults (SELSA-S). *Int J Behav Sci*, 5(4), 311–317. <https://doi.org/10.1016/j.ijbs.2012.10.004>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). New York: Guilford Press. <https://doi.org/10.4324/9781315757421>
- Koçar, H., & Yılmaz, E. (2023a). Factor structure of the De Jong Gierveld Loneliness Scale: an ESEM approach. *Behav Psychol*, 31(2), 359–378. <https://doi.org/10.51668/bp.8323207n>
- Koçar, H., & Yılmaz, E. (2023b). Factor structure of the De Jong Gierveld Loneliness Scale: an ESEM approach. *Behav Psychol*, 31(2), 359–378. <https://doi.org/10.51668/bp.8323207n>
- Lecovich, E. P. (2013). Psychometric properties of the Hebrew version of the De Jong Gierveld Loneliness Scale. *Educational Gerontology*, 39(1), 12–27. <https://doi.org/10.1080/03601277.2012.660860>
- Leung, G. T., de Jong Gierveld, J., & Lam, L. C. (2008). Validation of the Chinese translation of the 6-item De Jong Gierveld Loneliness Scale in elderly Chinese. *International Psychogeriatrics*, 20(6), 1262–1272. <https://doi.org/10.1017/S1041610208007552>
- Lloret-Segura, S., Ferreres-Traver, A., Hernández-Baeza, A., & Tomás-Marco, I. (2014). Exploratory item factor analysis: A practical guide revised and updated. *An Psicol*, 30(3), 1151–1169. <https://doi.org/10.6018/analesps.30.3.199711>
- Marôco, J. (2018). *Análise estatística com o SPSS Statistics* (7th ed.). Lisboa: ReportNumber. <https://doi.org/10.13140/RG.2.2.30019.37925>
- Muthén, L., & Muthén, B. (2015). *Mplus statistical analysis with latent variables: User's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén. <https://doi.org/10.1007/978-3-319-10867-4>
- Neto, F. (1989). Concept de soi et anxiété sociale. *Cahiers d'Anthropologie et Biometrie Humaine*, 7(3–4), 173–179.
- Neto, F. (1992). Loneliness among Portuguese adolescents. *Social Behavior & Personality*, 20(1), 15–22. <https://doi.org/10.2224/sbp.1992.20.1.15>
- Perlman, D., & Peplau, L. A. (1981). Toward a social psychology of loneliness. *Personal Relationships*, 3, 31–56. <https://doi.org/10.1111/j.1475-6811.1981.tb00016.x>
- Pestana, M., & Gageiro, J. (2014). *Análise de Dados para Ciências Sociais* (6th ed.). Lisboa: Edições Sílabo.
- Pikea, P., Parpa, E., Tsilika, E., Galanos, A., & Mystakidou, K. (2016). Psychometric properties of the Greek-UCLA Loneliness Scale-Version 3 in people with HIV. *WJA*, 6(4), 157–168. <https://doi.org/10.4236/wja.2016.64018>
- Pocinho, M., Farate, C., & Dias, C. A. (2010). Validação psicométrica da escala UCLA-Loneliness para idosos portugueses. *Interações [Internet]*, (18)<https://doi.org/10.1590/S0104-530X2010000100003> [cited 2024 Feb 21] Available from: <https://interacoes-ismt.com/index.php/revista/article/view/304>.
- Pocinho, M., & Macedo, E. (2017). Solidão: um construto complexo. *INTERC [Internet]* [cited 2024 Feb 20] Available from:(32) <https://www.interacoes-ismt.com/index.php/revista/article/view/399>.
- Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health*, 30(4), 459–467. <https://doi.org/10.1002/nur.20296>
- Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, 66(1), 20–40. https://doi.org/10.1207/s15327752jpa6601_2
- Salo, A., Junttila, N., & Vauras, M. (2020). Social and emotional loneliness: Longitudinal stability, interdependence, and intergenerational transmission among boys and girls. *Family Relations*, 69(1), 151–165. <https://doi.org/10.1111/fare.12417>
- Streiner, D. L., Norman, G. R., & Cairney, J. (2015). *Health measurement scales* (5th ed.). Oxford, UK: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199668366.001.0001>
- Tomás, J. M., Pinazo-Hernandis, S., Donio-Bellegarde, M., & Hontangas, P. M. (2017). Validity of the de Jong Gierveld Loneliness Scale in Spanish older population: competitive structural models and IRT. *European Journal of Ageing*, 14(4), 429–437. <https://doi.org/10.1007/s10433-017-0432-2>
- Weiss, R. S. (1973). *Loneliness: The experience of emotional and social isolation*. Cambridge, MA: MIT Press.
- Wilson, D., Cutts, J., Lees, I., Mapungwana, S., & Maunganidze, L. (1992). Psychometric properties of the revised UCLA Loneliness Scale and two short-form measures of loneliness in Zimbabwe. *Journal of Personality Assessment*, 59(1), 72–81. https://doi.org/10.1207/s15327752jpa5901_6
- Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist*, 34(6), 806–838. <https://doi.org/10.1177/0011000006288127>
- Yamada, M., & Decety, J. (2009). Unconscious affective processing and empathy: An investigation of subliminal priming on the detection of painful facial expressions. *Pain*, 143(1), 71–75. <https://doi.org/10.1016/j.pain.2009.02.027>
- Yanguas, J., Pinazo-Henandis, S., & Tarazona-Santabalbina, F. J. (2018). The complexity of loneliness. *Acta Bio Medica Atenei Parmensis*, 89(2), 302–314. <https://doi.org/10.23750/abm.v89i2.7262>
- Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *EIMJ*, 11(2), 49–54. <https://doi.org/10.33552/eimj.2019.11.000559>