

**Title: Confirmatory factor analysis of the Revised UCLA Loneliness Scale (UCLA LS-R) in individuals over 65**

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**Abstract:**

**Goals.** The UCLA LS-R is the most extensively used scale to assess loneliness. However, few studies examine the scale's use on older individuals. The goal of the study is to analyse the suitability of the scale's structure for assessing older individuals.

**Method.** The UCLA LS-R scale was administered to a random sample of 409 community-dwelling residents of Madrid (53% women) aged 65 to 84 years (obtained from the MentDis\_ICF65+ study). Confirmatory factor analysis was used to assess the factor structure of the UCLA LS-R.

**Results.** The internal consistency of the scale obtained a Cronbach's alpha of .85. All the analysed models of factor structure of the UCLA LS-R achieved a fairly good fit and RMSEA values over .80. The models that best fit the empirical data are those of Hojat (1982) and Borges et al. (2008).

**Conclusion.** The data suggest an equivalent effectiveness of UCLA LS-R in adults under 65 and over 65, which may indicate a similar structure of the loneliness construct in both populations. This outcome is consistent with the idea that loneliness has two dimensions: emotional loneliness and social loneliness. The use of short measures that are easy to apply and interpret should help primary care professionals identify loneliness problems in older individuals sooner and more accurately.

**Keywords:** loneliness, older individuals, UCLA LS-R, factor structure

## **Introduction**

Loneliness is a universal experience that occurs in all life stages and is directly related to health. Several studies have shown that feelings of loneliness cause discomfort in the affected individuals (Peplau & Perlman, 1982) and predict depressive symptoms (Cacioppo, Hawkley & Thisted, 2010), symptoms of anxiety and stress (Cacioppo, Hawkley, & Berntson, 2003), personality disorders and psychosis (DeNiro, 1995; Richman & Sokolove, 1992), suicide (Goldsmith, Pellmar, Kleinman, & Bunney, 2002), cognitive impairment (Gow, Pattie, Whiteman, Whalley, & Deary, 2007; Memari, et al., 2013; Wilson et al., 2007) and reductions in physical activity, quality of sleep (Cacioppo et al., 2002) and cardiovascular health (Hawkley, Burleson, Berntson, & Cacioppo, 2003; Hawkley, Thisted, & Cacioppo, 2009). Loneliness has been identified as a risk factor for mortality and morbidity (Patterson & Veenstra, 2010; Shiovitz-Ezra & Ayalon, 2010). Loneliness can occur in 20% to 45% of the population over 65 years of age (Cohen-Mansfield, Hazan, Lerman, & Shalom, 2016; Dahlberg & McKee, 2014; Instituto Nacional de Estadística [INE], 2011; Savikko, Routasalo, Tilvis, Strandberg, & Pitkälä, 2015; Velarde-Mayol, Fragua-Gil & García-de-Cecilia, 2016; Victor & Bowling, 2012). Various factors may underlie the high levels of loneliness experienced by such individuals, including a change of role (e.g., in connection with family, employment or change of residence), loss of income, loss of the partner or friends by death, possible limiting illnesses and difficulties accessing transport among numerous other factors (Pagán-Rodríguez & Sánchez-Sánchez, 2011; Phillipson, Bernard, Phillips, & Ogg, 2001; Wrzus, Hänel, Wagner, & Neyer, 2013). These factors tend to increase their impact over time (Sutin, Stephan, Carretta & Terraciano, 2015).

Various instruments have been proposed to assess loneliness: the NYU Loneliness Scale (Rubenstein & Shaver, 1982), the Differential Loneliness Scale (Schmidt & Sermat, 1983), the Loneliness Rating Scale (Scalise, Ginter, & Gerstein, 1984), the Social and Emotional Loneliness Scale for Adults (DiTommaso & Spinner, 1993). However, probably because of its conceptual framework, ease of application and good psychometric properties, the UCLA Loneliness Scale (Russell, Peplau & Fergusson, 1978; Russell, Peplau, & Cutrona, 1980; Russell, 1996) has become the scale of reference for the measurement of loneliness in adults. It has been adapted in various countries: Germany (Döring & Bortz, 1993), Russia (Ruchkin, Eisemann, & Hägglöf, 1999), South Africa (Pretorius, 1993), Zimbabwe (Wilson, Cutts, Lees,

Mapungwana, & Maunganidze, 1992), Argentina (Sacchi & Richaud de Minzi, 1997), Iran (Hojat, 1982; Zarei, Memari, Moshayedi, & Shayestehfar, 2016), Portugal (Neto, 1992), and Spain (Vázquez & Jiménez, 1994).

Russell et al. (1978) proposed an initial scale (i.e., the UCLA Loneliness Scale) in which all the items were worded negatively. This approach resulted in methodological and readability problems (Russell et al., 1978; Russell, 1996). To address these problems, the same researchers proposed a second version (i.e., the Revised UCLA Loneliness Scale; UCLA LS-R). The revised version has 10 positively worded items and 10 negatively worded items and simplified wording (Russell et al., 1980). Although Russell has proposed a third version (UCLA LS-3; Russell, 1996), in this study, we analyse UCLA LS-R because it is the most extensively used and only such scale adapted for use in Spanish samples (Vázquez & Jiménez, 1994). The UCLA LS-R consists of 20 items that are scored from 1 to 4, resulting in a total score that ranges between 20 and 80, with higher scores indicating severe loneliness. Although it was conceived by its authors as a one-dimensional scale, heterogeneous results were found to be related to the scale's factorial structure. These results are discussed below.

To learn more regarding the psychometric properties of the UCLA LS-R and the assessed populations, we first reviewed several studies that examined the factor structure of the scale (studies that used other versions of the scale were not considered). Table 1 lists the 12 reviewed studies.

Insert Table 1 about here

Although the initial hypotheses formulated by Russell et al. (1978) suggested a one-dimensional or two-dimensional model, the results of the studies in table 1 show greater diversity. Hartshorne (1993) and Pretorius (1993) found a single factor in a confirmatory analysis of the scale. Dodeen (2015) tested different models to determine which model best fit the scale's factor structure. Of the eight models tested, only two had an adequate fit. Both of these models were one-dimensional. The first model had one factor that consisted of all the items and the correlations between the positively worded items. The second model also had a single factor, with all the items and two unrelated sub-factors corresponding to the positive and negative items. Borges, Prieto, Ricchetti, Hernández-Jorge, and Rodríguez-Naveiras (2008) found a bivariate solution that consisted of the factors "Emotional loneliness" and "Subjective evaluation of the

social network". Knight, Crisholm, Marsh, and Godfrey (1988) also obtained a two-factor solution (Factor 1 consisted of the negatively worded items and Factor 2 of the positively worded items). Similarly, Wilson et al. (1992) found a two-factor solution: "Intimate other" and "Social other". Dussault, Fernet, Austin, and Leroux (2009) tested three different models. The model that received the most support consisted of three factors: "Isolation," "Relational connectedness," and "Collective connectedness." McWhirter (1990) found similar results: a structure that consisted of the three factors "Isolation," "Relational connectedness," and "Collective connectedness." For their part, Hawkey, Browne, and Cacioppo (2005) performed two studies to determine the factor structure of the UCLA LS-R, and both supported a three-factor model: "Isolation," "Relational connectedness," and "Collective connectedness."

Penning, Lui, and Chou (2014) found four factors. Hojat (1982) also obtained a four-factor solution: "Isolation and withdrawal," "People", "Sharing with others," and "Absence of an intimate person," and in a second study, a five-factor solution, i.e., the four previous factors plus "Sociability." Neto (1992) also found 5 factors: "Isolation and withdrawal," "Social others," "Sharing with others," "Absence of affiliation," and "Absence of an intimate person."

As shown in Table 1, most studies (10) were performed on populations of young individuals or adolescents. Only 4 studies were performed on samples of the general population, including a small proportion on individuals over 65. The only exception is Penning et al. (2014), which examines a sample of individuals between 45 and 84 years, approximately 50% of whom were over 65. Considering the negative consequences of loneliness in older individuals, it is relevant to understand how the scale functions in this population group. Specifically, knowing whether the scale's structure resembles those used with young individuals and adults under 65 or, on the contrary, displays significant characteristics that could affect the UCLA LS-R's use and interpretation when employed with older individuals. However, the reviewed literature provides no information on the structure of the scale used for older populations. Nevertheless, in Spain, Velarde-Mayol et al. (2016) found that the UCLA LS-R is a useful and sensitive tool to measure the feeling of loneliness in older individuals. Thus, the goal of this study is to analyse the structure of the UCLA LS-R with respect to its applicability to older individuals through confirmatory factor analysis of the scale in a sample of individuals over 65. To compare the resulting structure with that of the scales used on general

populations in previous studies, we performed confirmatory analysis on each of the reviewed models.

## **Methods**

### **Sample and procedure**

The sample was obtained from the longitudinal study MentDis\_ICF65+ (Health and Well-being of People aged 65 to 84 in Europe) (Andreas et al., 2013, 2016; Ausín, Muñoz, Santos-Olmo, Pérez-Santos, & Castellanos, 2017). That study included community-dwelling residents of Madrid, both in urban and rural areas. As a result of ethical regulations, for certain countries that participated in the Mentdis\_ICF65+ study, the response rate was defined as the total percentage of participants who completed interviews compared with the number of individuals contacted by letter requesting their participation. The overall response rate was 20%, which is comparable to previous studies with similar recruitment methods (Andreas et al., 2016). Participants were selected at random and requested to provide their informed consent to participate in the study. The final sample consisted of 409 individuals (53% women) aged 65 to 84 years, with a mean age of 73.32 and a standard deviation of 6.03. The sociodemographic characteristics of the sample are shown in Table 2.

Insert Table 2 about here

### **Instrument**

Perceived loneliness was evaluated with the UCLA LS-R (Russell et al., 1980; Spanish adaptation of Vázquez & Jiménez, 1994). The instrument consists of 20 items, 11 of which are negative (e.g., *I lack companionship*) and nine positive (e.g., *I feel in tune with the people around me*). All the items are scored from 1 (*never*) to 4 (*frequently*).

### **Statistical analysis**

Confirmatory factor analysis was performed to test the factor structure of the UCLA LS-R scale. Based on the sample used for this study, we tested the twelve models proposed by the previously mentioned authors. Analyses were performed with the R program (R Core Team, 2013), version 3.1.3, of the lavaan package (Rosseel, 2012). As the items are ordinal, we chose a weighted-least squares estimator with robust

estimation of means and variances (*WLSMV*). In the results, for each model, a chi-square test and the following fit indicators are shown: comparative fit index (CFI), Tucker Lewis index (TLI), standardized root mean square residual (SRMR), goodness of fit index (GFI), and the root mean square error of approximation (RMSEA) with its 90% confidence interval, and the respective significance of the contrast. As the models were non-nested, we did not perform contrasts.

## Results

Table 3 presents the **descriptive statistics** (mean, standard deviation, skewness and kurtosis) for each of the 20 items and the total score on the UCLA LS-R scale. The mean score obtained on the UCLA LS-R scale among women was 30.31, with a standard deviation of 8.47, whereas among men, it was 30.77, with a standard deviation of 8.33. The mean total score, regardless of sex, was 30.53, with a standard deviation of 8.40, a positive skewness of 1.14 and a kurtosis of 1.30.

Insert Table 3 about here

The **internal consistency** obtained by the scale was Cronbach's  $\alpha = .85$ , which indicates a good homogeneity of the scale.

Table 4 shows the results of the **confirmatory factor analysis** according to each model. Taking into account all the indices presented, generally, all the models had a fairly good fit and met the RMSEA criterion with higher than .80 significance. The models that best fit the empirical data were Models 10 and 11 (Table 1) of Hojat (1982) and Model 2 (Table 1) of Borges et al. (2008), followed by Models 7 and 8 (Hawkley et al., 2005) and subsequently Model 3 (Knight et al., 1988) and Model 12 (Neto, 1992).

Insert Table 4 about here

Hojat (1982) presented two models (one with four factors and the other with five). Both models achieved fairly similar scores in all indices, which indicates that they adequately fit the present sample. In the four-factor solution, the first factor, termed "Isolation and withdrawal", refers to the presence or absence of a social network and a person's feeling that he or she can count on this network if necessary. This factor corresponds to Items

12, 14, 17, and 18. The second factor, “People”, includes Items 1 and 6 and refers to the person's relationship with the individuals around him or her. The third factor, “Sharing with others”, consists of Items 10, 16, and 19 and alludes to the other individuals around the respondent with whom he or she can share interests. The fourth and last factor, “Absence of an intimate person”, corresponds to Items 2, 3, 7, and 8 and refers to a close and trusted figure. The five-factor model includes in addition to the previous factors a fifth factor, “Sociability”, which consists of Items 9 and 15. This factor refers to a person's willingness and ability to interact with the environment.

Model 2 of Borges et al. (2008) consists of two factors (“Emotional loneliness” and “Subjective evaluation of the social network”) and includes 13 of the original 20 items of the UCLA LS-R scale. The “Emotional loneliness” factor consists of Items 2, 3, 4, 11, 14, 17, and 18, and the “Subjective evaluation of the social network” factor consists of Items 5, 10, 15, 16, 19, and 20. Factor 1 (“Emotional loneliness”) explains 43.17% of the variance, whereas Factor 2 (“Subjective assessment of the social network”) explains 12.64% of the variance (Borges et al., 2008).

## **Discussion**

The review of the factor models of the UCLA LS-R scale reveals that despite being the most extensively used instrument to assess loneliness, the scale has no definitive factor structure. Confirmatory factor analysis of each model shows that all the models fit the empirical data, such that the structures of all the models described for samples of older people are acceptable. That is, the data seem to indicate an equivalent behaviour of UCLA LS-R scale when used on adults under 65 and individuals over 65, which could indicate a similar structure of the loneliness construct in both populations. In the case of older persons, the best results are obtained by the models of Hojat (1982), Borges et al. (2008), Hawkley et al. (2005), Knight et al. (1988), and Neto (1992), all of which use multiple factors. We cautiously note that the univariate solution presents the worst fit in our sample (even though it meets all the fit criteria). Of all the reviewed models, the ones that best fit the empirical data are the four- and five-factor models of Hojat and the two-factor model of Borges et al., which represent a multidimensional and/or two-dimensional approach to the UCLA LS-R and would support the four-, five-, and two-factor solutions as those with the best fit.

In the original study of Hojat (1982), a total of five items of the UCLA LS-R are not included in any of the 5 empirical factors. These items are the following: “I feel alone,” “I feel part of a group of friends,” “I feel left out, forgotten by others,” “No one really knows me well,” and “There are people I can turn to.” With respect to the semantic content of the items, it seems that the items “I feel alone” and “I feel left out” could both match the definition of the factor “Isolation and withdrawal”. The item “I feel part of a group of friends” could be categorized under the factor “People”, and the other two items, “No one really knows me well” and “There are people I can turn to”, could be included in “Sharing with others”. This solution could justify the use of the full scale. One strength that supports the use of the 5-factor structure stems from the relationships found between certain factors and variables related to psychopathology, such as depression and anxiety (Hojat, 1982). From this perspective, certain factors could have a greater clinical utility in helping detect such problems. However, it should be noted that the relationships between UCLA LS and variables such as depression and negative effects have been noted since the first studies that applied the scale (Rusell, 1980) and can also be found for the scores scale or other wider item configurations. From our viewpoint, although its empirical support and clinical utility could represent an advantage, a four- or five-factor model for a 20-item (15-item) scale may be too disaggregating and complex to interpret, particularly in daily clinical or social practice. However, the scores of the clusters of items with psychopathological predictive value can be used without necessarily implying an underlying structure of the solitude.

Borges et al. (2008) found a two-factor solution (“Emotional loneliness” and “Subjective evaluation of the social network”) that removed 7 of the 20 items of the UCLA LS-R scale. Factor 1, “Emotional loneliness”, includes aspects such as feeling isolated from others, lack of companionship, feeling left out and forgotten by others, feeling all alone, not having anyone to count on, feeling unhappy for being so withdrawn, and feeling that people are around one but not with one. Abellán et al. (2007) observe that aspects such as retirement, the death of loved ones, children leaving home, or the perception of hostility of the environment may constitute major risk factors for the emergence of loneliness at this life stage. In fact, the social exclusion process that could affect individuals over 65 (Pagán-Rodríguez & Sánchez-Sánchez, 2011; Phillipson et al., 2001; Sutin et al., 2015; Wrzus et al., 2013) could contribute to the increase in the subjective sense of loneliness reflected by these items. Therefore, when examining the factor structure of UCLA LS-R for a population over 65 years, it makes

sense that one finds a factor such as “Emotional loneliness” for items that largely represent the subjective impact of social exclusion. The second factor found by Borges et al. (2008) is the “Subjective assessment of the social network”, which includes aspects such as having people to communicate with, feeling that there are people who really understand one and on whom one can count, feeling close to people, feeling part of a group of friends, and being able to find company when needed. This factor refers to the social aspects of loneliness, particularly the older person's social network, which is at risk of deteriorating with age (Pagán-Rodríguez & Sánchez-Sánchez, 2011).

Despite the added value of structures of 4-5 factors related to the predictive capacity of psychopathological problems, from our viewpoint, the two-factor structure (Borges et al., 2008), which was obtained in a sample that includes Spaniards and that is culturally and sociologically closer to the current study, seems to be the most appropriate to support the use of the UCLA LS-R in individuals over 65 in Spain. This conclusion is consistent with the idea that the UCLA LS-R has two dimensions: Emotional loneliness (first factor, linked to the subjectivity of loneliness) and Social loneliness (second factor, related to the social network) (Dahlberg & McKee, 2014; DiTommaso & Spinner, 1997; Weiss, 1989). According to Weiss (1973), social loneliness refers to a deficit in social relations, in the social network and social support, whereas emotional loneliness indicates a lack of closeness or intimacy with others. In addition, we note that it would be appropriate to minimize the number of items to facilitate the applicability of the scale to the older population, a population that can have difficulties responding to complex evaluation instruments and may require special adaptations of the measuring instruments to simplify and shorten them (Wittchen et al., 2015). Reduction of the theoretical dimensions to two may facilitate the scale's interpretation in this population by professionals in clinical and social contexts by approximating the scale to a reference model of loneliness that is well known and already used in this field (Dahlberg & McKee, 2014; Weiss, 1973). As noted by Velarde-Mayol et al. (2016), primary care professionals should pay special attention to older persons who live alone (who have more feelings of loneliness), administer the UCLA LS-R to detect those who experience a higher level of loneliness, and propose interventions.

The use of measures that are easy to apply and interpret should help identify the loneliness problems of older individuals sooner and more accurately, even by professionals not specialized in mental health, and should facilitate the treatment of older persons when they are still in a risk phase (for example, in primary care, in

residential centres). This strategy would no doubt support earlier, more effective detection of loneliness, which could help reduce its unwanted effects on older individuals.

Since the study presents a number of limitations, the generalization of the results to other contexts and populations must be performed with caution. First, the used version is a version adapted to Spanish that includes slight changes to the original that could affect how the scale functions in other populations. Second, the sample consists of Spaniards, who have specific cultural characteristics, similar to members of Mediterranean cultures (Borges et al., 2008). Finally, three of the reviewed factorial studies include individuals over 65 years (Dussault et al., 2009; Knight, et al., 1988; Penning, et al., 2014). This overlapping makes it difficult to interpret certain results.

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Table 1. Review of the studies on factor analysis of the UCLA LS-R.

Model Nr.	Author/s	Sample	Nr. of factors	Scale items
1	Hartshorne (1993)	N=220 College students Ages*	1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
1	Pretorius (1993)	N=657 College students Ages*	1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
1	Dodeen (2014)	N=1226 College students Ages*	1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
2	Borges, Prieto, Ricchetti, Hernández-Jorge, & Rodríguez-Naveiras (2008)	N=522 College students Ages: 17-56	2	Emotional loneliness: 2, 3, 4, 11, 14, 17, 18 Subjective evaluation of social network: 5, 10, 15, 16, 19, 20
3	Knight, Crisholm, Marsh & Godfrey (1988)	N=978 General population Ages: 15-89	2	Negative aspects: 2, 3, 4, 7, 8, 11, 12, 13, 14, 17, 18 Positive aspects: 1, 5, 6, 9, 10, 15, 16, 19, 20
4	Wilson, Cutts, Lees, Mapungwana, & Maunganidze (1992)	N=1354 Teenagers Mean Age: 25, 70 Ages*	2	Intimate other: 2, 3, 4, 7, 8, 11, 12, 13, 14, 16, 17, 18 Social other: 1, 5, 6, 9, 10, 15, 19, 20
5	Dussault, Fernet, Austin, & Leroux (2009)	N=1157 Teachers Ages: 23-72	3	Isolation: 2, 3, 7, 8, 11, 12, 13, 14, 17, 18 Relational connectedness: 10, 15, 16, 19, 20 Collective connectedness: 1, 4, 5, 6, 9
6	McWhirter (1990)	N=598 College students Ages*	3	Intimate others: 2, 3, 7, 8, 11, 12, 13, 14, 17, 18 Social others: 10, 16, 19, 20 Affiliative environment: 1, 4, 5, 6, 9, 15
7	Hawkey, Browne, & Cacioppo (2005)	N=2531 College students Ages:	3	2, 3, 4, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18 10, 15, 16, 19, 20 1, 5, 6, 8, 9
8		N=299 Adults Ages*	3	Isolation: 2, 3, 4, 7, 8, 11, 12, 13, 14, 17, 18 Relational connectedness: 10, 15, 16, 19, 20 Collective connectedness: 1, 5, 6, 9
9	Penning, Lui, & Chou (2014)	N=243 Adults Ages: 45-84	4	2, 3, 11, 14, 17 4, 10, 19, 20 7, 8, 12, 13, 16, 18 1, 5, 6, 9, 15
10	Hojat (1982)	N=232 College students Ages*	4	Isolation and withdrawal: 12, 14, 17, 18 People: 10, 16, 19 Sharing with others: 1, 6 Absence of an intimate person: 2, 3, 7, 8
11		N=305 College students Ages*	5	Isolation and withdrawal: 12, 14, 17, 18 Sharing with others: 1, 6 People: 10, 16, 19 Absence of an intimate person: 2, 3, 7, 8 Sociability: 9, 15

12	Neto (1992)	N=217 Teenagers Ages: 14-17	5	<u>Isolation and withdrawal: 2, 5, 11, 14, 17, 18</u> <u>Social others: 10, 15, 16, 19, 20</u> <u>Sharing with others: 1, 6</u> <u>Absence of affiliation: 7, 9, 13</u> <u>Absence of an intimate person: 3, 8</u>
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\* Data unavailable.

Table 2. Descriptive data of the sample (N=409).

Variable	%
<b>Sex</b>	
Male	53
Female	47
<b>Age</b>	
65-74 years	54.9
75-84 years	45.1
<b>Marital status</b>	
Married	60.14
Widowed	26.97
Divorced	5.25
Never married	4.77
Separated	2.63
Other	0.24
<b>Do you live alone?</b>	
No	74.30
Yes	24.70
<b>Economic situation</b>	
Very poor	2.4
Poor	15
Sufficient	50.1
Good	29.6
Very good	2.9

Table 3. Descriptive statistics of the UCLA LS-R.

	Item	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
1	I feel in tune with the people around me.	1.10	.32	3.31	10.95
2	I lack companionship.	1.77	.97	.86	-0.60
3	There is no one I can turn to.	1.57	.98	1.54	0.94
4	I feel alone.	1.61	.94	1.29	0.38
5	I feel part of a group of friends.	1.92	1.05	0.84	-0.56
6	I have a lot in common with the people around me.	1.73	.87	0.96	0.04
7	I am no longer close to anyone.	1.58	.90	1.38	0.75
8	My interests and ideas are not shared by those around me.	1.98	.99	0.57	-0.89
9	I am an outgoing person.	1.46	.78	1.81	2.72
10	There are people I feel close to	1.29	.64	2.47	6.16
11	I feel left out.	1.40	.81	1.95	2.65
12	My social relationships are superficial.	1.87	.99	0.72	-0.74
13	No one really knows me well.	1.89	.99	0.68	-0.83
14	I feel isolated from others.	1.38	.75	2.10	3.75
15	I can find companionship when I want it	1.34	.65	2.12	4.48
16	There are people who really understand me.	1.35	.64	1.95	3.58
17	I am unhappy being so withdrawn.	1.30	.69	2.33	4.63
18	People are around me but not with me.	1.57	.87	1.35	0.72
19	There are people I can talk to.	1.21	.54	2.99	9.55
20	There are people I can turn to.	1.24	.55	2.61	7.51
	Total score	30.53	8.40	1.14	1.30

Table 4. Results of the confirmatory factor analyses by model.

Model	Author/s	Structure (factors)	Chi-square			Fit indices				RMSEA		
			Value	df	p	CFI	TLI	SRMR	GFI	Value	90% CI	p
1	Dodeen (2014); Hartshorne (1993); Pretorius (1993)	1	310.62	170	0.000	0.95	0.95	0.08	0.99	0.045	[0.037, 0.053]	0.847
2	Borges, et al. (2008)	2	62.09	62	0.473	1.00	1.00	0.05	1.00	0.002	[0.000, 0.030]	1.000
3	Knight, et al. (1988)	2	215.56	169	0.009	0.98	0.98	0.06	1.00	0.026	[0.014, 0.036]	1.000
4	Wilson, et al.(1992)	2	247.28	169	0.000	0.97	0.97	0.07	0.99	0.034	[0.024, 0.042]	0.999
5	Dussault, et al. (2009)	3	248.00	167	0.000	0.97	0.97	0.06	0.99	0.034	[0.025, 0.043]	0.999
6	McWhirter (1990)	3	254.00	167	0.000	0.97	0.97	0.07	0.99	0.036	[0.027, 0.044]	0.998
7	Hawkley, et al. (2005)	3	194.93	164	0.050	0.99	0.99	0.06	1.00	0.021	[0.001, 0.032]	1.000
8	Hawkley, et al. (2005)	3	202.69	167	0.031	0.99	0.99	0.06	1.00	0.023	[0.008, 0.033]	1.000
9	Penning, et al. (2014)	4	260.05	164	0.000	0.97	0.96	0.07	0.99	0.038	[0.029, 0.046]	0.992
10	Hojat (1982)	4	43.45	59	0.936	1.00	1.00	0.04	1.00	0.000	[0.000, 0.008]	1.000
11	Hojat (1982)	5	69.09	80	0.803	1.00	1.00	0.04	1.00	0.000	[0.000, 0.019]	1.000
12	Neto (1992)	5	159.60	125	0.020	0.99	0.98	0.06	1.00	0.026	[0.011, 0.037]	1.000

Note: comparative fit index (CFI), Tucker Lewis index (TLI), root square mean residual (SRMR), goodness of fit index (GFI), root mean square error of approximation (RMSEA), and CI confidence interval.