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ORIGINAL INVESTIGATION

Psychometric analysis of the short-form UCLA Loneliness Scale (ULS-6) in older adults

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Abstract The aim of this investigation was to present new empirical evidence regarding the psychometric properties of the short-form UCLA Loneliness Scale (ULS-6) among Portuguese older people. The study included 1,154 persons (60 % women and 40 % men), aged 60–90 ($M = 71.26$; $SD = 6.66$). The psychometric properties of the ULS-6 were analysed by means of confirmatory factor analysis, internal consistency, and criterion-related validity methods. Confirmatory factor analysis supported a unidimensional structure of the measure with adequate values of various fit indices. The ULS-6 presented satisfactory psychometric properties, with a high level of internal consistency. Furthermore, the ULS-6 showed a negative relationship with self-esteem, satisfaction with life, and positive affect; and a positive one with negative affect. The results confirm that the ULS-6 provides a brief, psychometrically sound measure of loneliness that is appropriate for use among older adults.

Keywords Reliability · UCLA Loneliness Scale · ULS-6 · Validity

Introduction

Existing research directs our attention to the pervasive and baneful effects of loneliness (Rokach and Neto 2005). Most definitions of the phenomenon emphasize the perceived deficits that may prevail in relationships. For example, (Ascher and Paquette 2003, p. 75) define loneliness as "the cognitive awareness of a deficiency in one's social and personal relationships, and ensuring affective reactions of sadness, emptiness, or longing".

Loneliness is a serious problem among older persons, in particular due to widowhood, poor health, low social contact and institutionalisation (Andersson 1985; Pinquart and Sörensen 2001; Savikko et al. 2005; Theeke 2009). A comparative study conducted in 12 countries among older persons aged 65 and over showed that loneliness varied by country ranging from 25 % in Denmark to 60 % in Greece, with higher prevalence in the Mediterranean countries than in Northern Europe (Sundström et al. 2009). Canadian older adults scored significantly higher than Portuguese older adults on unfulfilled intimate relationships, developmental deficits, and social marginality (Rokach and Neto 2005). Such comparative research provides support for the hypothesis that different cultural backgrounds significantly affect the perceptions of loneliness antecedents in older adults.

Loneliness has been associated with low levels of physical activity (Hawkley et al. 2009), physical illness and negative psychological outcomes (Cornwell and Waite 2009; Thurston and Kubzansky 2009). For example, a relationship between loneliness and self-esteem (Cacioppo et al. 2006) and subjective well-being (Goodwin et al. 2001; Neto 1995) has been reported. Moreover, the experience of loneliness can be severe enough to lead to death by suicide (Heinrich and Gullone 2006).

Therefore empirical research about loneliness requires that this feeling be adequately understood and measured (Marangoni and Ickes 1989). Reliable and valid measures of loneliness assume either a unidimensional or a multidimensional conceptualization. For the unidimensional conceptualization loneliness implies "some core sense of

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being lonely which is undifferentiated in nature, and is experienced and understood in the same way by all lonely people" (Allen and Oshagan 1995, p. 185). For the multidimensional conceptualization loneliness implies different experiences or types (e.g., Rokach 1988; Russell et al. 1984; Weiss 1973). Since its presentation over three decades ago, the Revised UCLA Loneliness Scale (R-UCLA; Russell et al. 1980) has become the most widely utilized measure of feelings of loneliness in a variety of populations. The scale has good concurrent and discriminant validity, internal consistency and stability (Russell 1982). It adopts the former conceptualization, reflecting that loneliness is a single phenomenon apprehended by a single global measure (Russell 1982).

A recent development in the measurement field is the changing of constructs that have many items to shorter instruments based upon a few items only (Schweizer 2011). In fact, it has been demonstrated that short scales can be just valid as long and sophisticated scales (Burisch 1997). Among the useful candidates for the applications of such short measures, according to (Gosling et al. 2003, p. 505) are "large-scale surveys, pre-screening packets, longitudinal studies, and experience-sampling studies". As a case in point, short forms of the revised UCLA Loneliness Scale have been developed, given the need for measures of loneliness that can be completed quickly and easily by respondents of certain populations, especially in research designs in which time to complete the scales is limited.

Russell et al. (1980), Hays and DiMatteo (1987), and Neto (1992) have all developed short-forms of the revised UCLA Loneliness Scale. The Russell et al. (1980) short-form scale has 4 items (ULS-4) selected on the basis of regression analysis. These items were those of the longer version which best predicted scores of a self-labeling loneliness index. Correlations between the ULS-4 and the ULS-20 of 0.61 for men and 0.70 for women were found among college students (Franzoi and Davis 1985). Hays and DiMatteo's (1987) short-form scale has 8 items (ULS-8) which were selected according to exploratory factor analysis, in which 8 items loaded substantially on the first factor. The internal reliability (Cronbach's α) of the ULS-8 was 0.84 and the measure correlated 0.91 with the UCLA-20.

Neto's (1992) short-form scale has 6 items (ULS-6). The items were selected on the basis of an exploratory factor analysis, in which 6 items had a substantial load on the first factor. These items seemed to contain the core of loneliness as defined by the difference between desired and actual social contact. That is, the greater the discrepancy between what one wants in terms of social contact and what one has, the greater the loneliness subjectively experienced. Loneliness exists in situations where the number of relationships is smaller than desired. The ULS-6 works well because its items are predominantly indicators of perceived social isolation. The correlation between the longer scale and the ULS-6 was 0.87. The internal reliability (α) of the ULS-6 was 0.77. Moreover, correlations between the ULS-6 and other psychological measures were very similar to those of the longer scale (e.g., loneliness self-rating, public self-conscientiousness, self-concept, attractiveness, shyness, and happiness). As evidence of its discriminant validity, the correlation between the ULS-6 and private self-conscientiousness was not significant. Thus, this efficient short measure of loneliness showed satisfactory reliability and similar validity as the longer scale.

Subsequently, two other shortened versions were proposed. Russell (1996) introduced a shortened version of the UCLA Loneliness Scale (Version 3) composed of 10 items. These items were selected on the basis of "the corrected-item total correlations from previous studies" (Russell 1996, p. 26). This particular shortened version has been used with a teacher sample. Hughes et al. (2004) developed another short loneliness scale for use on a telephone survey. Their Three-Item Loneliness Scale presented satisfactory reliability and both concurrent and discriminant validity. The three items in that measure ("I feel left out", "I feel isolated from others", and "I lack companionship") are all included in the ULS-6.

The ULS-6 has been used mostly with adolescents (Neto 1992, 2002) and college students (Neto 2006). It has also been used with migrants, showing satisfactory psychometric characteristics in all cases. Furthermore, significant correlations were found between ULS-6 scores and acculturative stress, satisfaction with life, and social anxiety among Portuguese youngsters living in Paris (Neto 2001). The strongest predictors of loneliness among adolescents from immigrant families living in Portugal were self-esteem, duration of sojourn, and perceived discrimination (Neto 2002). Among college students loneliness was positively related with social cynicism (Neto 2006). In sum, in the studies reported above, this brief measure of loneliness presented acceptable reliability and validity. The present study therefore served to obtain new empirical evidence of the psychometric properties of the ULS-6 in an older population, testing the factorial structure, the internal consistency, and the criterion-related validity of the scale. To determine the criterion-related validity, correlations between ULS-6 and self-esteem and subjective well-being were examined. These constructs were selected given that they are conceptually related to loneliness in the existing literature.

Method

Participants

The sample comprised 1,154 participants living in the community, 698 females (60.5 %) and 456 males (39.5 %).

The ages ranged from 60 to 90 with a mean age of 71.26 years (SD = 6.66). Concerning the level of education, 66.2 % had not completed secondary education, 12.5 % had completed secondary education, and 21.3 % had a tertiary education. Respondents never married made up 8.9 % of the sample, married or cohabiting 60.4 %, and divorced or widowed 30.7 %.

Measures

The participants were assessed using five scales, previously adapted for a Portuguese population, described below, and socio-demographic questions pertaining to age, gender, education and marital status.

(a) *UCLA Loneliness Scale* A validated Portuguese version (Neto 1989) of the revised UCLA Loneliness Scale (Russell et al. 1980) was used to assess loneliness. This validated Portuguese scale is composed of 18 items, of which 9 are worded positively (e.g., "I am an outgoing person") and 9 negatively (e.g., "I am no longer close to anyone"). The items describe subjective feelings of loneliness. However, none of them refer specifically (literally) to loneliness. All items were scored on a 4-point scale ranging from 1 (*never*) to 4 (*often*). Higher scores indicate greater loneliness. The Cronbach coefficient alpha for this sample was 0.90.

(b) *Satisfaction with Life Scale* This scale was first developed by Diener et al. (1985) to measure satisfaction with people's lives as a whole. It consists of five items. Participants were asked to state how much they agreed or disagreed with each statement on a 7-point Likert scale, with 1 as *strongly disagree* and 7 as *strongly agree*. The reliability and the validity of this scale have previously been demonstrated for a Portuguese population (Neto 1993). The Cronbach standardized alpha on this measure for the current study was 0.88.

(c) *Positive and negative affect* were assessed through the Portuguese version of the Positive and Negative Affect Schedule (Watson et al. 1988). This is a measure of positive and negative affect that includes 22 emotion oriented adjectives. Respondents used a 5-point scale to indicate how often they generally experience each emotion. The scale has been extensively used and was adapted to a Portuguese population (Simões, 1993). In this sample, the coefficient alphas were 0.90 for positive affect and 0.84 for negative affect.

(d) *Self-esteem scale* Self-esteem was assessed using Rosenberg's (1965) 10-item self-esteem inventory. Participants responded on a 4-point scale (1 = *strongly disagree*, 4 = *strongly agree*). The psychometric properties of this scale have been previously demonstrated for a Portuguese population (Neto 1996). In the current study, the scale had a Cronbach standardized alpha of 0.84.

(e) *Self-labelling item of loneliness* In addition, a direct general question on how frequently the participants felt loneliness was asked "Do you ever feel lonely?" The answers ranged from 1 (never) to 5 (always).

Procedure

The recruitment and testing of the participants was performed by trained psychology researchers in the Porto area of Portugal. The sample was recruited at a range of venues, including shopping centres and community groups. The participation rate was high (65 %). Twenty-nine participants were dropped from the analysis due to incomplete data. Completion of the questionnaire usually required less than 20 min. The survey was conducted in accordance with the current legal and ethical norms in the country. All participants were unpaid volunteers.

Data analyses

The data were analysed using confirmatory factor analysis. The results of the confirmatory models were evaluated on the basis of several goodness-of-fit statistics, including goodness of fit index (GFI), normed fit index (NFI), comparative fit index (CFI), incremental fit index (IFI), and adjusted goodness of fit index (AGFI). Values greater than 0.90 on these measures are considered to be indicative of adequate model fit, although values approaching 0.95 are preferable (Bentler 1990). Root mean square error of approximation (RMSEA) was also performed. Values smaller than 0.08 for the RMSEA support acceptable model fit (Browne and Cudeck 1993). We used three measures to assess internal consistency, reliability and homogeneity: inter-item correlation, Cronbach's α, and intraclass correlation coefficients. Ranges, frequencies, percentages, means, and standard deviations were performed to describe the data. Analyses of variance were used to reveal potential socio-demographic effects. Concurrent validity was tested using the Pearson product-moment correlation coefficient between the ULS-6 and external scales. The statistical analyses were conducted with IBM SPSS Statistics version 19 and IBM SPSS Amos version 19.

Results

Structure validity

A confirmatory factor analysis was run on the raw data of the ULS-6. The model tested was the one-factor model

proposed by Neto (1992). The estimates of model fit were based on a maximum likelihood solution. No correlation between error terms was allowed. The χ^2 statistic was 38.73 (df = 9) with the χ^2/df ratio having a value of 4.30, less than 5 which indicates an acceptable fit (Kline, 2005). All path coefficients were significant, and the values of the fit indexes were GFI = 0.99, NFI = 0.98, CFI = 0.99, IFI = 0.99, AGFI = 0.97, RMSEA = 0.05. So, it was concluded that the data fit the hypothesized one-factor model reasonably well.

Internal consistency reliability

Based on the research of the confirmatory factor analysis to establish the internal consistency of the ULS-6 scores, we examined Cronbach's α and used item-total correlations. Cronbach standardized α was 0.82, and corrected item-total correlations ranged from 0.45 to 0.60. The mean interitem correlation coefficient had a value of 0.42. Intraclass coefficient also demonstrated a sufficient level of homogeneity (0.43). These values confirm the internal consistency of the ULS-6 scores.

Descriptive analyses and differences according to socio-demographic factors

Descriptive statistics of the ULS-6 items are indicated in Table 1. The mean score for the ULS-6 was 11.54 with standard deviation of 3.83. As expected, most participants reported low levels of loneliness. Table 2 exhibits the scores of loneliness by the socio-demographic factors: age, gender, marital status, and level of education.

Two age groups were generated: old adults (60–74 years old), and very old adults (75–90 years old). The effect of age on loneliness was significant, $F(1,1153) = 13.76$, $p < 0.000$. The old adults ($M = 11.25$; SD = 3.66) scored lower on loneliness than the very old adults ($M = 12.14$; SD = 4.10).

Table 1 Means (*M*), standard deviations (SD), and corrected item-total correlations of the ULS-6

	M	SD	Corrected item-total correlations
1. I lack companionship	2.25	0.91	0.56
2. I feel part of a group of friends[a]	1.77	0.82	0.45
3. I feel left out	1.68	0.85	0.63
4. I feel isolated from others	1.89	0.95	0.69
5. I am unhappy being so withdrawn	2.20	0.85	0.62
6. People are around me but not with me	2.20	0.85	0.54

[a] Item should be reversed before scoring

The effect of gender was not significant, $F(1,1153) = 2.73$, $p = 0.12$. Men ($M = 11.33$, SD = 3.79) and women ($M = 11.68$, SD = 3.86) showed similar levels of loneliness.

The level of education was evaluated by grade school education: less than secondary school, secondary school and above secondary school. The effect of the level of education was significant, $F(1,1153) = 3.86$, $p = 0.02$. Scheffe post hoc comparisons indicated that participants who completed the secondary level ($M = 10.72$, SD = 3.45) showed lower loneliness scores than both those who had not completed the secondary level ($M = 11.57$, SD = 4.08) and those who attended college ($M = 11.62$, SD = 3.13).

Finally, we examined the effect of marital status. The category "married" includes both legal marriage and partnership. "Divorced" describes a general situation of separation from the spouse, including both legal divorce and separation from the partner; similarly "widowed" refers to the death of either a legal spouse or a partner. As may be seen there was a significant effect of marital status on loneliness, $F(1,1153) = 47.57$, $p < 0.000$. Scheffe post hoc comparisons of the three groups indicated that divorced and widowed participants ($M = 12.95$, SD = 4.22), and single respondents ($M = 12.54$, SD = 4.15), revealed a higher level of loneliness than married or partnership participants ($M = 10.69$, SD = 3.30). The two-way interaction of gender × marital status, $F(2,1153) = 2.31$, $p > 0.05$, and the three-way interaction of gender × marital status × education, $F(4,1153) = 1.37$, $p > 0.05$, were not significant.

Table 2 Loneliness according to socio-demographic factors ($N = 1,154$)

	N	%	*M*	SD
Age				
60–74 years	779	67.5	11.25[a]	3.66
75–90 years	375	32.5	12.14[b]	4.10
Gender				
Men	456	39.5	11.33	3.79
Women	698	60.5	11.68	3.86
Marital status				
Single	103	8.9	12.45[b]	4.15
Married/partnership	697	60.4	10.69[a]	3.30
Divorced/widowed	354	30.7	12.95[b]	4.22
Level of education				
Less than secondary	764	66.2	11.67[b]	4.08
Secondary	144	12.5	10.72[a]	3.45
Tertiary	246	21.3	11.62[b]	3.13

Means could vary from 6.0 to 24.0. The greater the mean, the greater was the loneliness score. Within each column, for each variable, means with no superscripts in common (a, b) differed at the 0.05 level, either by *F* test directly for a pair of means or by Scheffe test for three means

Criterion-related validity

On the basis of previous studies (Pinquart and Sörensen 2001; Heinrich and Gullone 2006) we predicted that loneliness would be negatively correlated with self-esteem, satisfaction with life and positive affect and positively correlated with negative affect (DiTommaso et al. 2004; Goodwin et al. 2001; Neto 1995). The results presented in Table 3 show that the ULS-6 correlated significantly with all the scales analysed. The correlation between ULS-6 and self-esteem was -0.66 ($p < 0.001$), between ULS-6 and satisfaction with life it was -0.43 ($p < 0.001$), and between ULS-6 and positive affect was -0.56 ($p < 0.001$). The correlation between ULS-6 and negative affect was positive 0.47 ($p < 0.001$). The direction of all associations was consistent with the assumptions presented above. The relationship between ULS-6 and the longer scale (the revised Portuguese 18-item UCLA Loneliness Scale) was also examined and the correlation between these two measures was 0.92 ($p < 0.001$). These results show that the ULS-6 meets criterion validity standards.

Finally, single self-report has been used in the validation of the original UCLA instrument (Russell et al. 1978) and continues to be used to establish the validity of measures (Hughes et al. 2004). The self-labelling item of loneliness was answered in the present study by only a part of the sample ($N = 350$) and it correlated significantly with the ULS-6 scores ($r = 0.74$, $p < 0.001$).

Discussion

The aim of this study was to obtain new empirical evidence regarding the psychometric properties of the ULS-6 in a large sample of older people. The factor structure, the reliability, and the criterion-related validity of the ULS-6 were studied.

Table 3 Psychometric properties of the ULS-6 ($N = 1,154$)

Revised UCLA Loneliness Scale (R-UCLA) α	0.90
ULS 6 α	0.82
Pearson correlation between R-UCLA and ULS-6	0.92
Pearson correlation between ULS-6 and	
Self-esteem	−0.66***
Satisfaction with life	−0.43***
Positive affect	−0.56***
Negative affect	0.47***
ULS-6	
M	11.54
SD	3.83

α Cronbach standardized alpha

*** $p < 0.001$

To answer the question as to whether ULS-6 measures a single construct, the factor structure was explored. This analysis allowed evaluating the construct validity of the measure (Briggs and Cheek 1986). Confirmatory factor analysis was run to verify the one factor structure of the ULS-6 that has been evidenced in previous research. The results of the confirmatory factor analysis of the ULS-6 supported the one-factor model, which is consistent with previous findings among both adolescents (Neto 1992) and young adults (Neto 2006).

The scale also showed adequate internal consistency and appropriate item-total correlations. In addition to factorial structure and internal consistency, the external criterion-related validity of ULS-6 was tested by exploring its association with other instruments that measure constructs that are theoretically related to loneliness (self-esteem, satisfaction with life, positive affect, and negative affect). The pattern of correlations found was consonant with the theoretical assumptions, indicating that the ULS-6 meets the validity criterion.

Issues of discriminant validity can be raised due to the high correlations between loneliness and scores on measures of related constructs, such as self-esteem and subjective well-being. However, ULS-6 scores correlated more highly with the single self-report of loneliness than with any of the other measures, supporting the discriminant validity of the measure.

The relation between loneliness and socio-demographic variables was also documented. Results showed that in the older age-groups, loneliness was higher. Some authors argue that loneliness increases among very old adults (Dykstra 2009; Luanaigh and Lawlor 2008). Our data confirm this expectation as significant differences in loneliness between the two age-groups (60–74 years and 75–90 years) were found. Gender did not significantly impact on loneliness in the current investigation. Borys and Perlman (1985) argued that when loneliness is assessed indirectly, gender differences are generally not found. In this vein, it was expected that we would not find gender differences in the current study insofar as we assessed loneliness indirectly. As indeed, as noted, no such association emerged.

Previous research is not consistent concerning the association between loneliness and education. Victor and Yang (2012) found that tertiary education was a protective factor against loneliness (i.e., it linked with decreased levels of loneliness). Similarly, other investigations reported that the loneliness score was higher among those with lower education (Savikko et al. 2005). However, this association is not perfect and many exceptions do occur (Sundström et al. 2009). Our findings point to a lower level of loneliness among those who completed secondary education. Future investigation is needed to clarify these

findings and to examine the possible explanation that older adults with secondary education have broader social networks. In any event, past research has demonstrated a stronger relation between income and loneliness than between education and loneliness (Pinquart and Sörensen 2001).

Divorced or widowed individuals and never married persons reported higher loneliness than married participants in the present investigation. This is consonant with previous research which has reported that being married is a protective factor of loneliness (Savikko et al. 2005; Theeke 2009; Victor and Yang 2012). Some research has shown that the benefits of marriage may be greater for men than for women among older adults. For example, widowed men showed higher loneliness than widowed women (Perlman et al. 1978; Pinquart 2003). In the current study the interaction of gender * marital status was not statistically significant, so the premise that the benefits of marriage are greater for older men than for older women was not supported.

Past research has shown that the R-UCLA Loneliness Scale is preponderantly a measure of social loneliness (Cramer and Barry 1999; DiTommaso and Spinner 1993; DiTommaso et al. 2004; Fernandes and Neto 2009). Similarly, the content of the items from the ULS-6 mainly reflect social loneliness, that is, a perception of the lack of a supportive social network. Consequently, although the ULS-6 might represent a useful global index of loneliness, it seems to emphasize social loneliness, involving dissatisfaction with social networks, such as intimate friends, faithful neighbours, people who are available to talk when necessary, and so on. Researchers interested in other facets of loneliness, such as family loneliness or romantic loneliness might be advised to use other instruments (Shaver and Brennan 1991).

An issue of the ULS-6 is that it is constituted by five items that are worded in a negative direction and just one item worded in a positive direction. When all items of a scale are worded in the same direction, biases in responding—such as an acquiescent response set—may occur (Russell 1996). However, even if the ULS-6 includes just one item worded in a positive direction, it nevertheless introduces a control against same direction biases in responding, albeit a limited one. Furthermore, in order to reduce response bias, the word "lonely" does not ever appear in the instrument. Some authors have observed that the R-UCLA contained items with double negatives (e.g., responding "never" to the already negative statement "I do not feel alone") which were difficult for older people to understand (Cutrona et al. 1986). The ULS-6 alleviates this difficulty.

The current study had some typical research based limitations. First, Russell et al. (1980, p. 479) have observed that "the validity of a measure is never proven"; so it is necessary to learn more about the validity and reliability of the ULS-6, in particular, by future exploration of test–retest reliability and discriminant validity. Second, there was also method invariance due to reliance on self-report, and it would be desirable to have some observer or behavioural ratings. Third, it would be useful also to evaluate the short scale's psychometric properties by means of more diverse samples including older people living in nursing homes who, for example, might have a significant risk of loneliness. Despite these limitations, the present study has extended the knowledge base by examining the shortened loneliness scale in a sample other than adolescents and college students. The results of the current analysis confirm that the ULS-6 expands the possibilities for loneliness research in older population.

In conclusion, the ULS-6 is a simple and brief scale that is very easy to apply among older people. This study has provided new empirical evidence regarding the adequate psychometric characteristics of the short scale: it shows a unidimensional structure, with satisfactory levels of internal consistency, and validity. These results should encourage its inclusion within research contexts exploring predictors and outcomes of loneliness, and its implementation within programs to minimize loneliness in society. The psychometric characteristics displayed also support the use of the measure outside of Portugal. The ULS-6 should be used in cross-cultural research, given that contextual variables such as culture and ethnicity can have an effect on loneliness (Rokach and Neto 2005; Yang and Victor 2011). A final advantage of the ULS-6 is its availability in the Portuguese language. Portuguese is the official language in ten countries, spoken by about 250 million people.

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