



Research article



Measuring loneliness: Psychometric properties of the three-item loneliness scale among community-dwelling adults

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ABSTRACT

Loneliness is a prevalent set of negative feelings associated with unsatisfactory and reduced social interactions, inadequate social support, poor satisfaction with life and health, negative emotions, and economic burden. Thus, its measurement is of foremost importance. Therefore, this study aimed (i) to devise the Portuguese version of the three-Item Loneliness Scale (T-ILS), which is ideal for epidemiological studies, and (ii) to evaluate its psychometric properties.

Three hundred forty-five community-dwelling Portuguese adults with a mean age of 54.6 ± 19.5 years, 61.7% women, recruited door-to-door, were assessed with the Portuguese versions of T-ILS, Satisfaction With Life Scale-SWLS, Lubben Social Network Scale 6-items-LSNS-6, a question regarding Happiness/Unhappiness, and a sociodemographic questionnaire.

The T-ILS showed good psychometric properties and correlated moderately with SWLS and LSNS-6, and happiness, and weakly with the number of people in the household.

The Portuguese version of the T-ILS proved to be a valid and reliable instrument, easy and quick to administer. It proved to be a valuable tool in screening loneliness in Portugal, being potentially useful to the identification of lonelier people in need of intervention.

1. Introduction

Social relationships and integration are vital for emotional well-being, behavioral adjustment, and cognitive functioning across developmental ages [1], and the need to belong is a fundamental human motivation [2]. A consequence of the failure to meet this basic need is loneliness, a complex ensemble of feelings [2]. The concept, most widely used in research, derives from the cognitive discrepancy theory, which posits that loneliness results from the mismatch between an individual's desired and actual level of social connections [3]. Although interconnected, loneliness differs from seclusion, living alone, and social isolation [1,4].

Loneliness has multiple meanings that mirror social, personal, and situational factors [5,6]. Still, since the 1980s, most researchers have recognized the complexity and subjectivity of the concept and agreed with the cognitive discrepancy theory in the sense that loneliness is a set of negative feelings related to losses and disappointment in interpersonal relationships [6]. These feelings result from weighing existing personal relationships against one's desires and expectations regarding interpersonal relationships. Thus, loneliness is felt when the social network is too small, or relationships are of insufficient quality [7,8]. Accordingly, it has been shown that

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loneliness is related to the type and number of social interactions [9], inadequate social support [10–12], and limited living arrangements, including single marital status and living alone [13].

Besides the cognitive discrepancy theory, there are four other main approaches to explain loneliness. The evolutionary approach posits that loneliness evolved as an adaptive mechanism to produce an “aversive state” or “social pain” in social species [14], eliciting unsafeness and threat hypervigilance [15] and re-affiliative behavior [14]. Enlarging this approach, the reaffiliation theory propounds that social disconnectedness may trigger adaptive cognitive processes that elicit reconnecting behaviors or maladaptive ones, including negative information bias, threat sensitivity, continued withdrawal, ongoing loneliness, and negative affect [16]. The skill-deficit theory suggests that lonely people have difficulties attaining social connectedness because of a lack of social skills necessary for constructing and maintaining meaningful relational bonds [17]. Contrarily, proponents of the theory of social monitoring ability suggest that attentional and perceptual social skills remain intact and that there is a heightened focus on the social context that can help the regulation of belonging needs [18].

Loneliness prevalence seems to present a U-shape distribution among adults, with the younger and the older presenting higher levels of these feelings [19–24]. Differently, some found an increase after middle age or after 74 years [25,26], somewhat consistent with those who found a linear relationship in which “the older, the lonelier” [24,27–32]. However, an inverted U-shaped relationship [24,33,34] and a linear decrease [35,36] were also found. The differences could be explained by measurement tools [20] and cultures where the assessment took place [24]. Nevertheless, taken together, the different studies show that loneliness is common, founding values between 10.5 and 76.0% in the adult population [4,37,38]. The prevalence values point to a public health problem with deleterious effects attributable to the effects of loneliness itself [39,40].

The detrimental effects of loneliness include dissatisfaction with life, physical (e.g., cardiovascular problems) and mental health problems (e.g., depression, sleep disturbances, psychiatric conditions), cognitive decline, and even mortality [12,13,27,28,38,41–49]. The COVID-19 pandemic has since made the impact of loneliness and social isolation on mental health more visible [50–52]. Moreover, as we have pointed out above, evolutionary and reaffiliative approaches associate loneliness with negative emotions [14–16], but recent evidence also suggests a relationship with positive affect, with a greater reactivity in the subfacet Interest (in the presence of others), aligned with the social monitoring approach of loneliness [53].

Besides age, which is the leading factor [30,54], several sociodemographic factors are significantly associated with loneliness. Regarding sex, a meta-analysis has shown mixed results [55]. In fact, some researchers found that women feel higher levels of loneliness than men [24,33,36], but others found the opposite [35], and others found no relation [8,22]. Again, differences in measurement tools and cultures could explain these mixed results [55], but the age cohorts analyzed could also be a relevant factor. Other factors include geographical places [13,26,35,56] and the aforementioned household dimension [13], being single-/divorced/widowed [1,57,58], and poor health [12,13,27,28,38,40–48,59,60]. Finally, evidence point to higher scores of loneliness among those with lower income and less educated [61–63].

There is some evidence of the economic burden associated with loneliness. Meisters et al. [64] aimed to understand whether there is a relationship between healthcare expenditure and loneliness, concluding that there is a direct relationship between lonely people and higher costs of primary and mental health care. Other two studies, respectively from 2015 to 2016, performed in the United Kingdom, also analyzed the costs associated with loneliness. Fulton and Jupp [65] compared direct costs, and the results showed that lonely people spent more £11,725 in 15 years than those who do not feel lonely. The study of McDaid et al. [66] included direct and indirect costs, and their results demonstrated that about £6000 per person could be saved, over a time horizon of 10 years, if effective interventions to reduce loneliness were applied. However, the resources allocated to loneliness intervention are usually scarce [67].

It is imperative to properly assess this construct to allocate adequate resources and implement effective interventions to reduce loneliness. However, the complexity of the loneliness construct has made it difficult to assess. Loneliness may be appraised either as a personality *trait* [1] or a *state*, in the sense of a form of reactivity in specific contexts [68], and also both as a personality trait and a state characteristic [68]. Moreover, since the ‘70s, loneliness has mainly been appraised as a multidimensional construct comprising at least two distinct components: social and emotional loneliness. Emotional loneliness concerns feelings of being disconnected, while social loneliness concerns the belief that one’s own social relationship network is insufficient [69]. Other studies point to three dimensions (relational connectedness, social or collective connectedness, and self-perceived isolation or intimate loneliness) [70,71]. However, many studies have analyzed it as a unidimensional concept [20].

Even so, psychosocial research has tried to convert this complexity into measurement instruments to assess this set of negative feelings. Since the 1960s, scales such as Sisenwein’s [72] or Schmidt’s [73] have been identified, revealing extension and reliability problems. Following this, Russell et al. [74] proposed the UCLA Loneliness Scale (UCLA-LS) to measure trait loneliness as a unidimensional scale, a 20-item brief scale validated with students at the University of California Los Angeles. Revised versions have been developed, including the R-UCLA [75] and several shorter ones, such as a three-item version (T-ILS) [1], four-items [75], six-items, eight-items [76,77], eleven-items [78] and 18-item [79] with its factorial structure varying mostly between 1 and 3 factors [55]. Often when the factor numbers are similar among different studies, they do not always include the same set of items [55]. Construct validity of the various short-versions has been ascertained by correlations with R-UCLA scores, depressive symptoms, marital status, structural social relationships [1], perceived social support, social provision, depression, positive affect, negative affect, self-esteem, and satisfaction with life [62,80], interpersonal difficulties [81], and with various health scales [81,82]. The test-retest reliability was evaluated with a maximum time interval of one month between assessments, resulting in correlations varying from 0.46 to 0.91. The median interval between assessments was two weeks, with a range of 1–4 weeks [55].

The T-ILS, addressed in the current study, was derived from the R-UCLA [75], and developed for epidemiological studies or large-scale surveys and inquiries through telephone [1]. Each T-ILS item assesses one of three previously established dimensions (relational, social, and intimate loneliness). Since then, this small scale has been translated and validated in other countries, presenting

good psychometric properties [8,36,77,83–85]. It has also been used in online surveys [86] and large-scale studies [19,25,87–89]. In fact, short questionnaires are necessary for survey screening because they have been shown to have a higher response quality than long questionnaires [90].

As far as we know, prevalence numbers have yet to be uncovered in Portugal, which is needed, so public health policies address loneliness, but for that intent, short and valid instruments are required. No study was found regarding the T-ILS's linguistic and cultural adaptation and validity to the European adult Portuguese population. Thus, this study aimed to create the Portuguese version of the T-ILS, test its validity, and analyze individual differences. For validity, we tested structural validity through exploratory factor analysis; reliability through Cronbach's alpha and test-retest; concurrent validity through correlations with conceptually related constructs — satisfaction with life, social isolation–social integration, and happiness/unhappiness — measured by brief questionnaires.

2. Materials and method

2.1. Translation and adaptation of the instrument of the T-ILS

After obtaining authorization from the main author, we followed a sequential approach according to the principles of good practices [91] and Cosmin's taxonomy [92] to translate and validate the T-ILS for the Portuguese population. Therefore, two independent expert translators translated the scale from English into Portuguese, focusing on the conceptual equivalence of the terms. Then, two researchers compared the two translations and created a reconciled questionnaire version. Next, a third independent translator back-translated this newly translated version without knowing the original version. Finally, the back-translated version and the original were compared by a panel of researchers, and the final Portuguese version of the scale was obtained. This process guaranteed the content validity of the Portuguese version.

2.2. Participants

Participants were recruited door-to-door in five parishes of a small municipality in the Northern region of Portugal. This methodological approach was derived from the geographical proximity of the assessment member of the team and was a way of ensuring that answers from adults who do not have access to digital resources were represented [93]. These convenient recruitment parishes are rural towns where many advanced survey methodologies (e.g., computer-assisted or web-based approaches) are lacking, and the level of education is mostly low. This methodological approach is common for conducting health screenings in rural areas. Knowing the evaluator, who resided within the study area, we guaranteed that the trust was already present, allowing for more accurate screening and higher quality responses from participants [94]. This is also a way of adding evidence and complementing findings to the previous research that used different approaches (e.g., self-administered online, telephone).

The study's objectives were explained, and those who agreed to participate were asked to give written informed consent. For those who expressed difficulties reading and signing the consent, data were collected in person, with the interviewer reading and registering the answers in the questionnaires. The remaining subjects kept the questionnaires, and the researcher collected the protocols on an agreed date. After one month, 30 individuals were questioned again with the same instruments.

The eligibility criteria included people older than 18 who could understand when signing the informed consent. Exclusion criteria encompassed aspects that prevented participation in this study, such as the inability to understand or speak Portuguese and having cognitive or mental problems.

The data collection was performed without identifying the participants, and the Ethics Committee of the Miguel Torga Institute of Higher Education has approved this study.

2.3. Measurement instruments

We applied the T-ILS to measure the loneliness of our sample and, to construct validate the Portuguese version of the T-ILS, we compared the results with the scores also obtained by SWLS, LSNS-6, and H/UHS. As a supplementary file, we present the full questionnaire used in this project.

- The Three-Item Loneliness Scale (T-ILS) was created by Hugges et al. [1] and intends to measure feelings of loneliness. Differently from the original UCLA-LS, items were formulated as questions, adapted to the second person, and each item's score can take one to three points, with the total score resulting from the sum of the three items (3–9 points). The higher the sum, the higher the level of loneliness. The authors validated this scale in a sample of older people, considering the relevance of social adjustment and interaction between objective and subjective isolation in this population [1]. Its original version showed good internal consistency and a strong correlation ($r = 0.82$) with the original scale, expanding the possibilities of its use in epidemiological studies. In fact, it showed satisfactory reliability (Cronbach's $\alpha = 0.72$), convergent validity ($r = 0.49$ with the item "lonely" from the Center for Epidemiologic Studies-Depression Scale and divergent validity ($r = 0.48$ with CES-D; $r = 0.44$ with the 4-Item Perceived Stress Scale; and weak correlations with emotions unrelated to loneliness, including satisfaction, energy, and motivation) [1].
- The Satisfaction with Life Scale (SWLS) was developed by Diener et al. [95], and it is a five-item questionnaire that assesses the respondent's global life satisfaction. The SWLS is a 7-point Likert scale, with total scores ranging from 5 to 35 and higher scores indicating higher satisfaction. The SWLS presented good internal consistency and test-retest reliability in the original study and was correlated with other subjective well-being scales, demonstrating its concurrent validity [95]. The Portuguese version of the SWLS

was validated by Neto et al. [96] in a sample of adult people. This version presented a unidimensional factor, with an adequate internal consistency ($\alpha = 0.78$).

- The Lubben Social Network Scale (LSNS-6) is a questionnaire used to screen social isolation and measure social integration [97]. It was developed with older people and is a short version of the original 10-item LSNS. This instrument comprises two parts: one to assess friendship relations and the other to assess family relations. The total score varies from 0 to 30 (less social isolation and more social integration), and it is obtained by summing the answers to the six items. Lubben et al. [97] demonstrated the high internal consistency, stable structure, and criterion validity of the original LSNS-6. The Portuguese version of the LSNS-6 [98] was validated in a sample of participants aged 65 years or more, and it showed a similar factorial structure to the original study, adequate internal consistency (Cronbach's alpha = .80), and item-total and item-subcales correlations ranging from 0.46 to 0.63.
- The Degree of Happiness/Unhappiness (H/UHS) was measured through a single question ("How do you feel?") and five response options ranging from "very unhappy" (1 point) to "very happy" (5 points).
- At last, a multidimensional questionnaire was used to assess sociodemographic characteristics (sex and age), social resources (marital status, social class, profession, academic qualifications, household size, and perceived need for social support), perceived physical health, and the presence or absence of a diagnosed chronic disease.

2.4. Statistical analysis

The data were processed using SPSS Statistics (Version 26). The a priori sample size calculation with the G*Power software [99] for comparative and correlational analyses showed that the minimum sample size to detect average effects ($d = 0.50$; $f = 0.25$; $r = 0.30$) would be above 305 subjects for a statistical power of 95% and a significance threshold of 0.05. This sample size is also suitable for exploratory factor analysis [100]. We also checked whether the data had normal distribution using the skewness (Sk) and kurtosis (Ku) coefficients [101] and followed Kim's [102] criteria for their interpretation [absolute value below 2 for the Sk and below 7 (proper) for the Ku are indicators of normality for $N > 300$]. The Shapiro-Wilk test was used for the T-ILS scores in the retest since the n was 30. Descriptive statistics were used to characterize the participants and the distribution of T-ILS scores for the first assessment moment.

To test the validity of the Portuguese version of T-ILS, we also approached structural validity. The structural validity was assessed using exploratory factor analysis (EFA) after having inspected the correlation matrix and calculated the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The Kaiser criterion of selecting factors corresponding to eigenvalues larger than one was also used.

We used Cronbach's alpha for internal consistency reliability analysis [103]. Additionally, we used the intraclass correlation coefficient (ICC) for temporal stability [104].

We used correlational analyses of the T-ILS scores with those from the measurement instruments SWLS, LSNS-6, and H/UHS to test the construct validity.

To test the known-group hypotheses, we compared known groups defined by sociodemographic and social variables through Student's t -tests for independent samples or ANOVA, followed by Games-Howell post hoc, depending on the number of groups.

Effect sizes were also analyzed for all statistical tests, including the coefficient of determination (r^2) for correlation coefficients, Hedges' g for t -tests, and eta-squared for ANOVA for difference analysis [105]. The significance level was set at 0.05.

3. Results

3.1. Translation and adaptation of the T-ILS

During the cultural and linguistic adaptation of the T-ILS to the Portuguese population, we did not find any major discrepancies except in one item of the reconciled version, which was solved with the panel discussion. The comparison between the original questionnaire and the back-translated did not show any conceptual differences. So, the conceptual, idiomatic, and semantic equivalences were achieved in the final Portuguese version of the scale.

3.2. Preliminary analyses

As presented in Table 1, parametric assumptions [102] were met for all instruments.

Preliminary analyses showed outliers in all variables, so they were changed to less extreme values [106]. The remaining assumptions of normality, linearity and homoscedasticity were not violated.

Table 1

Descriptive statistical analysis of study variables.

Measures	Mean	SD	Min	Max	Sk	Ku
Three-Item Loneliness Scale (T-ILS)	4.13	0.09	3	9	1.50	1.39
Satisfaction with Life Scale (SWLS)	23.22	6.00	5	35	-0.61	-0.14
Lubben Social Network Scale-6 items (LSNS-6)	22.32	5.92	8	36	0.25	-0.47
Happiness/Unhappiness Scale (H/UHS)	3.61	0.86	1	5	-0.56	0.39

Note. SD = standard deviation; Min = minimum; Max = maximum; Sk = skewness; Ku = kurtosis.

3.3. Sample characteristics

The study included 345 people with a mean age of 54.6 ± 19.5 years between 18 and 92 years, residing in five parishes in Northern Portugal. The sociodemographic characteristics of the sample are presented in Table 2.

This table shows that more than half of the participants were married, illiterate, or had the first education cycle. More than two-thirds had a manual occupation, belonged to the middle or high social class, and had no chronic disease. Almost all participants had more than two persons in their household, most stated that they rarely or never needed emotional support, and some referred to good or very good health conditions.

Adding to the table, the T-ILS score presented a mean of 4.10 ($SD = 1.57$; Min – Max = 3–8).

3.4. Structural validity

Exploratory factor analysis (EFA) assumptions were verified, including an adequate sample size (>150 and case/item ratio >5), matrix correlations with values between 0.68 and 0.86 (>0.3), KMO of 0.704 (>0.6), and statistically significant Bartlett's test of sphericity ($p < .001$). The model obtained revealed the presence of one factor, meeting the Kaiser criterion and explaining 88.7% of the variance.

Table 2
Sample characterization ($N = 345$).

		n	%
Sex	Female	213	61.7
	Male	132	38.3
Age Min – Max = 18–92 Mean \pm SD = 54.6 ± 19.5	Less than 55	162	47.0
	[55–65]	57	16.5
	[65–74]	71	20.6
	75 or more	55	15.9
Marital status	Single	79	22.9
	Married/living with a partner	205	59.4
	Divorced/separated	18	5.2
	Widowed	43	12.5
# of persons in the household	1 person/live alone	22	6.4
	≥ 2 persons/live with other people	323	93.6
Need of emotional support in the last 12 months	Often	26	7.5
	Sometimes	106	30.7
	Rarely	62	18.0
	Never	151	43.8
Years of education	No formal education	52	15.0
	4 years	133	38.6
	5–10 years	78	22.6
	10–12 years	54	15.7
	More than 12 years	28	8.1
Occupation	Manua	249	72.2
	Intellectual	96	27.8
Perceived social class	Lower class	102	29.5
	Lower-middle class	2	0.6
	Middle clas	219	63.5
	Middle-high class	18	5.2
	Upper class	4	1.2
Perceived health status	Very bad	3	0.8
	Bad	53	15.4
	Neither good nor bad	130	37.7
	Good	130	37.7
	Very good	29	8.4
Diagnosed chronic disease	Yes	114	33.0
	No	231	67.0
How often do you feel that you lack companionship? [T-ILS 1] Mean \pm SD = 1.48 ± 0.66	Hardly never [1]	212	61.4
	Sometimes [2]	101	29.3
	Often [3]	32	9.3
	Hardly never [1]	255	73.9
How often do you feel left out? [T-ILS 2] Mean \pm SD = 1.32 ± 0.58	Sometimes [2]	69	20.0
	Often [3]	21	6.1
	Hardly never [1]	251	72.8
How often do you feel isolated from others? [T-ILS 3] Mean \pm SD = 1.36 ± 0.63	Sometimes [2]	65	18.8
	Often [3]	29	8.4

Note. SD = standard deviation; Min = minimum; Max = maximum.

3.5. Reliability

The internal consistency analysis showed a Cronbach's alpha of 0.895, a high value [103]. The corrected item-total correlations were also high [104], ranging between 0.718 and 0.846 (Table 3).

From the same Table 3, we can find evidence that the correlation total score between the two moments of the test-retest was high (ICC = 0.909), ranging from 0.789 to 0.890, and corresponding to a 95% confidence interval from 0.089 to 0.957 ($p < .001$).

3.6. Construct validity

To test the construct validity of the T-ILS, we correlated the total scores with the scores obtained by the measurement instruments SWLS, LSNS-6, H/UHS, and household size. Table 4 presents these correlations.

3.7. Known-group validity

We also compared the total T-ILS scores with subsamples based on sociodemographic, economic, and health variables. The results are presented in Table 5.

We observed statistically higher T-ILS scores among people older than 65 years, without a partner (except single), those living alone, needing often or sometimes emotional support, those without a formal education, with a manual occupation, from lower or lower-middle class, worse perceived health status, and diagnosed with a chronic disease, with effect sizes ranging from medium to large (Table 5). However, on the variable sex, the differences were not statistically significant.

4. Discussion

The findings of our study complement previous research regarding loneliness assessment through brief measures, which have been studied scarcely in the Portuguese context. Previous Portuguese validation studies used 20-item/18-item versions and a 6-item version, and this one with a restricted sample (older adults) [21,107,79,108]. The focus of this study was on the three-item version, which is considered ideal for epidemiological studies and large-scale surveys; thus, our main objective was to validate the T-ILS and investigate individual differences in a sample of the Portuguese adult population.

It is important to clarify the unidimensional construct of the different versions of the UCLA-LS and its ability to reflect loneliness [109]. Factor analysis in the present study showed a one-factor structure consistent with other translated T-ILS versions [8,36,77,83,84]. Another study using CFA found a perfect fit for the T-ILS with a unidimensional model [110]. However, this perfect fit is due to a mathematical limitation (i.e., a 3-item structure in CFA is a saturated model and will always fit perfectly). Nevertheless, the present study and previous ones all indicate a unidimensional structure.

Confirming its adequate psychometric properties, we provide evidence for good reliability of the T-ILS with a Cronbach's alpha higher than in the original study (0.72, [1]) and the Taiwanese version (0.76, [77]) and slightly higher than the other translated versions [8,36,83]. Our results also indicate that the Portuguese T-ILS is a stable measure with a good test-retest similar to other versions [36] and consistent with the conceptualization of loneliness as a stable personality trait, although dependent on circumstances [1]. Given that Cronbach's alpha has a close connection with the item count in a measure [103], the high value of the Portuguese T-ILS is remarkable, which, coupled with good test-retest reliability, suggests its suitability for use as a reliable and valid measuring tool.

In addition to its unidimensionality and reliability, this study adds to the literature by demonstrating comparable construct validity. Concerning concurrent validity, the T-ILS correlated moderately with less life satisfaction or lower subjective well-being, which is consistent with previous literature [12,36,62,80], with Seligman [111]'s consideration that healthy relationships with others are a crucial component of well-being and align with the evolutionary and reaffiliative approaches that associate loneliness with aversive states [14–16]. Somewhat, also aligning with the reaffiliative approach that associates loneliness with dysfunctional attributions and appraisals of others along with a lack of interpersonal trust [14–16], we found correlations with more social isolation (perceived social support received by family and friends) and smaller household size. These results are supported by previous research indicating that people with a poor social network, inadequate social support, and reduced household size tend to suffer from higher levels of subjective loneliness [1,7,9–13,38,62]. Consonant with the social monitoring approach of loneliness [53] and previous research pointing to a negative correlation with happiness [36] and positive affect [62], happiness was inversely related to loneliness in our study. Moreover,

Table 3
T-ILS reliability.

Items	CITC	CAID	Teste-retest	
			ICC	ICC 95% IC
How often do you feel that you lack companionship?	.718	.920	.849	.682–.928
How often do you feel left out?	.828	.827	.890	.769–.948
How often do you feel isolated from others?	.846	.804	.789	.558–.900
T-ILS Total score	–	–	.909	.809–.957

Note. CITC = Corrected item-total correlation; CAID = Cronbach's alpha if item deleted.

Table 4
Correlations between T-ILS and SWLS, LSNS-6, H/UHS, and household size.

	<i>r</i>	sig	<i>r</i> ² (%)
Satisfaction with Life Scale (SWLS)	-.48	<.001	23.4
Lubben Social Network Scale-6 items (LSNS-6)	-.33	<.001	1.6
Happiness/Unhappiness Scale (H/UHS)	-.32	<.001	6.2
Household size	-.25	<.001	11.2

Note. *R* = correlation; *r*² = coefficient of determination; sig = significance. Moderate correlations of the T-ILS were observed with all measures. Thus, greater feelings of loneliness correlated with lower subjective well-being, higher social isolation, less happiness, and living alone.

Table 5
Sample characterization and Individual Differences in T-ILS (N = 345).

Variables	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i> or <i>F</i>	Sig	<i>g</i> or η^2
Sex						
Female	213	4.16	1.57	0.76	.448	0.35
Male	132	4.02	1.57			
Age						
Less than 65	219	3.91	1.40	3.08	<.01	0.34
65 or more	126	4.44	1.78			
Marital status						
Single (S)	79	3.72	1.39	16.92	<.01	0.13
Games-Howell Post-hoc (<i>p</i> < 0.008a): D ≠ S; D ≠ C; W ≠ S, C						
Married (M)	205	3.89	1.36			
Divorced/separated (D)	18	5.33	1.88			
Widowed (W)	43	5.30	1.90			
# of persons in a household						
1 person/live alone	22	5.86	2.01	5.679	<.01	1.24
≥2 persons/don't live alone	323	3.99	1.46			
Need of emotional support						
Often/Sometimes	132	4.78	1.77	6.691	<.01	0.74
Rarely/Never	213	3.69	1.27			
Years of education						
No formal education (N)	52	5.06	1.99	9.687	<.01	0.10
Games-Howell Post-hoc (<i>p</i> < 0.005b): N ≠ II, III, IV; I ≠ III						
4 years (I)	133	4.27	1.60			
5–10 years (II)	78	3.81	1.24			
10–12 years (III)	54	3.54	1.18			
>12 years (IV)	28	3.46	1.00			
Occupation						
Manual	249	4.28	1.64	3.504	<.01	0.42
Intellectual	96	3.63	1.24			
Perceived social class						
Lower/Lower middle class	104	4.64	1.84	4.306	<.01	0.51
Middle/High class	241	3.87	1.37			
Perceived health status						
Very bad/Bad (VBB)	56	4.86	1.90	0.940	<.01	0.11
Games-Howell Post-hoc (<i>p</i> < 0.017c): VBB ≠ GVG; NN ≠ GVG						
Neither good nor bad (NN)	130	4.44	1.68			
Good/Very good (GVG)	159	3.57	1.11			
Chronic disease						
Yes	114	4.49	1.68	3.263	<.01	0.37
No	231	3.91	1.48			

Note. Sig = significance. Two groups: *t* = Student *t*-test; *g* = Hedges' *g* effect size/3+ groups; *F* = ANOVA *F*-test; η^2 = eta-squared effect size.

^a Bonferroni adjustment (*p* = .05/6 comparisons).

^b Bonferroni adjustment (*p* = .05/10 comparisons).

^c Bonferroni adjustment (*p* = .05/3 comparisons).

considering that unhappiness can be expressed through sadness and depressive symptomatology [112], the results from this study are in line with other investigations, with depressive symptomatology associated with higher levels of loneliness [1,13,38,52,62,113].

Regarding other investigated variables, T-ILS scores varied based on several sociodemographic variables with mixed support signaling signal cultural aspects not assessed in this study. Our findings showed that females and males presented similar scores in the T-ILS, per the results of a few studies [8,22], but not others [24,33,35,36].

Older individuals reported more loneliness, a finding supported by previous research indicating an increase with age [24,27–32]. But it is not supported by all the other studies that show different non-linear age-related changes [19–26,33–36].

We found that divorced/separated and widowed individuals and those living in a household of one person reported more loneliness. This is similar to previous findings regarding marital status [1,57,58] and is in line with those indicating that people living alone are more likely to experience loneliness [13,36]. However, our study did not observe higher levels of loneliness in single subjects, despite the findings of the aforementioned researchers. A reason for this is that in Portugal, young adults typically leave home around 30–35, ranking the country second among European countries [114], thus likely reducing vulnerability to loneliness among single Portuguese individuals.

People with more loneliness report needing emotional support more often. Studies also indicate that emotional support effectively reduces loneliness and promotes well-being [115].

Previous research suggests that individuals with lower income and education levels have higher scores of loneliness [61–63], which is in accordance with our findings regarding 'years of education', 'perceived social class', and 'occupation'. People with less education and with manual-type professions usually have a lower income, less social recognition, and less ability to access health care, characteristics usually related to more loneliness [63,116], although some have not found this relationship [58]. Additionally, those with

lower socioeconomic status experience more loneliness [61,63], likely due to a limited social network limited to family and increased social isolation [61,117]. On the other hand, they often have less access to healthcare and more unhealthy behaviors (e.g., smoking, sedentary lifestyle), which may contribute to poorer health and chronic diseases, which are related to more loneliness [61,63]. Indeed, individuals suffering from multiple chronic diseases face a higher risk of physical and cognitive difficulties and the loss of cherished ones, contributing to greater feelings of loneliness [59–61]. Our results regarding perceived health status and the presence/absence of chronic disease align with these considerations.

At last, as we stated above, loneliness affects a significant portion of the adult population, constituting a public health issue [4,37,38,40,70]. Although it was not our objective, we also found that more than 25% of the respondents answered that some of the time or often, they lack companionship, feel left out, or feel isolated from others.

4.1. Limitations and future directions

The sample size of this study was adequate for good statistical power. However, the participants were volunteers, not randomly chosen, and from restricted geographic areas. We, therefore, caution against generalizations of our findings. It is advisable to replicate the study with other samples. Another area for improvement was the survey methodology. The door-to-door recruitment involved geographically neighboring households, which may share key factors (e.g., isolation) that could affect survey findings [118]. Thus future studies using the same methodology should consider doing it randomly [119]. In addition, self-report questionnaires involve the possibility of recall and response bias due to social desirability, although they also convey information not detectable by any other means. To avoid the consequent common method variance, we suggest using behavior rating scales conducted by independent observers or collecting information from multiple informants. Despite these limitations, our study has the advantage of having included a sample with a broad age span, representing the various stages of adult life.

5. Conclusion

In summary, the T-ILS demonstrates good psychometric properties (unidimensionality, high internal consistency, and concurrent validity) for adults aged between 18 and 92. The T-ILS is a self-administered instrument with a short administration time and could be a valuable tool in screening loneliness in Portugal when time is more restricted and the practical settings are busier. The T-ILS is available for future research, and further work is warranted with studies on the predictors, mediators, and consequences of loneliness, including physical health. These are topics that have yet to receive attention in Portugal.

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Author contribution statement

Fernanda Daniel; Pedro Lopes Ferreira: Conceived and designed the study; Analyzed and interpreted the data; Wrote the paper.
Helena Espírito-Santo: Analyzed and interpreted the data; Wrote the manuscript.
Laura Lemos; Sónia Guadalupe: Analyzed and interpreted the data; Wrote the manuscript.
Isabel Barroso: Contributed reagents, materials, analysis tools or data.
Alexandre Gomes da Silva: Analyzed and interpreted the data.

Data availability statement

Data will be made available on request.

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.

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