Study Information

1. Title (required)

Development and Validation of a Modified Version of the UCLA Loneliness Scale: UCLA Loneliness, Distress, and Contentment Scale (UCLA-LDC)

2. Authors (required)

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3. Description (optional)

Loneliness is shown to have negative consequences for physical and mental health across cultures, lifespan, and clinical populations (for a recent review, see Quadt et al., 2020). The World Health Organization has declared loneliness a priority for researchers and care providers, given its potential adverse consequences, including depression (Cacioppo et al., 2010), anxiety (Anderson & Harvey, 1988), psychotic disorders (Lim et al., 2018), cardiovascular disease (Holt-Lunstad et al., 2015), chronic health conditions (Barlow et al., 2015), and immunological/inflammatory changes (Moieni et al., 2015). The surge of the Covid-19 pandemic and associated lockdown measures world-wide have added to the importance of understanding the potential consequences of feelings of loneliness.

The term ‘loneliness’ can be quite elusive, being defined differently in everyday language, and also in academic research. It is often conceptualized as the actual or perceived absence of meaningful social interactions (Cacioppo et al., 2015; Weiss, 1973), although it is acknowledged that there is a qualitative difference between social isolation (number of social contacts) and feelings of loneliness (perceived lack of meaningful social contacts).

Most standard self-report tools in loneliness research on adults ask how often a person feels lonely, or how many social contacts they have. Research has shown that it is the subjective experience of being distressed by loneliness that induces adverse health effects (Cacioppo et al., 2010; Matthews & Tye, 2019). It is therefore important for loneliness measures to explicitly pick up this dimension of loneliness and reliably distinguish feelings of distress associated with loneliness from chosen solitude that may not induce feelings of distress. The most commonly used loneliness measures to date touch on negative affect associated with loneliness through items such as “I have an unmet need for a close romantic relationship” (SELSA; DiTommaso & Spinner, 1993), “I miss having people around” (De Jong Gierveld Loneliness Scale; Gierveld & Tilburg, 2006), or “How often do you feel that your relationships with others are not meaningful?” (UCLA-LS; Russell, 1996). However, while it is assumed that this perceived lack of meaningful relationships will lead to distress, this may not always be the case. Similarly, populations believed to not be motivated for meaningful social interactions, such as autistic individuals (Chevallier et al., 2012), most likely actually feel distress at being lonely (Causton-Theoharis et al., 2009).

Standard questionnaires about loneliness do not pick up these subtleties explicitly. We believe these to be of importance for detecting and distinguishing feeling states associated with

loneliness. Therefore, the aim of this study is to modify the UCLA-LS, and add the question "How do you feel about this?" after each original item, with a unipolar 5 point Likert scale ranging from "Very bad" to "Very good". These additional questions are designed to capture feelings of distress and contentment associated with loneliness (UCLA Loneliness, Distress and Contentment Scale; UCLA-LDC).
In a large-scale survey, the goal is to assess the psychometric properties of a modified loneliness questionnaire, statistically test whether the added questions indeed assess the latent constructs of distress and contentment, and test whether they capture aspects of loneliness that multi-dimensional loneliness questionnaires, like the De Jong Gierveld Loneliness Scale, do not.

4. Hypotheses (required)

1. Automatic item selection will indicate a multidimensional scale of the UCLA-LCD, with loneliness, distress, and contentment as the hypothesized resulting factors
2. Loneliness distress scores will positively correlate with total loneliness score of the original UCLA Loneliness scale, total score and subscales of De Jong Gierveld Loneliness Scale
3. Loneliness contentment will negatively correlate with total loneliness score of the original UCLA Loneliness scale, total score and subscales of De Jong Gierveld Loneliness Scale
4. Participants with a diagnosis/diagnoses of neurodiversity, mental illness, and/or chronic illness will score higher on all scales compared to participants without diagnoses of these conditions

Design Plan

5. Study type (required)

Observational Study

6. Blinding (required)

No blinding is involved in this study.

7. Is there any additional blinding in this study?

N/A

8. Study design (required)

This study is an observational, cross-sectional study. Participants are asked to fill out an online survey which includes demographic information, the modified UCLA-LCD scale, and the De Jong Gierveld Loneliness Scale. The order of questionnaires and questions is not randomized and the same for all participants. Participants can indicate if they are interested in taking part in

a follow-up study, which includes the two loneliness scales, but not demographic information. This repeated measure will be used to assess test-retest reliability if the sample size is sufficient.

9. Randomization (optional)

No randomization

Sampling Plan

10. Existing data (required)

Registration prior to accessing the data: Data collection under way at point of preregistration, but no data has been accessed or analyzed.

11. Explanation of existing data (optional)

N/A

12. Data collection procedures (required)

Volunteer participants will be recruited through social media and university forums. Participants will be individuals from the general public willing to take part and meeting inclusion criteria. These are age over 18, capacity to provide informed consent, and fluency in English. Exclusion criteria are age under 18, diagnosis of neurodegenerative conditions, and severe cognitive/learning disabilities.

13. Sample size (required)

Our target sample size is at least 200 participants.

14. Sample size rationale (optional)

Although little guidance exists on sample size requirements for scale validation studies, best practice recommendations assume that a sample over 200 participants will yield best results (Boateng et al., 2018; Kyriazos, 2018).

15. Stopping rule (optional)

Data collection will stop after 15/07/2021, at which point it has run for 6 weeks, regardless of whether the minimum number of participants (N=200) has been reached before this date.

Variables

16. Manipulated variables (optional)

N/A

17. Measured variables (required)

1. Demographic information about the sample
    a. Age
    b. Sex assigned at birth
    c. Current gender identification
    d. Level of education
    e. Current country
    f. Nationality
    g. Ethnicity
    h. Current relationship status
    i. Current living situation
    j. Ownership of pets
    k. Presence/absence of neurodiversity diagnosis
    l. Presence/absence of mental health diagnosis
    m. Presence/absence of chronic illness
2. Loneliness score as measured by original items of UCLA Loneliness Scale
3. Distress score as measured by added items to UCLA Loneliness Scale
4. Contentment score as measured by added items to UCLA Loneliness Scale
5. Social Loneliness score as measured by De Jong Gierveld Loneliness Scale
6. Emotional Loneliness score as measured by De Jong Gierveld Loneliness Scale
7. Loneliness score as measured by De Jong Gierveld Loneliness Scale

18. Indices (optional)

- Social loneliness (sum of allocated items of De Jong Gierveld Loneliness Scale)
- Emotional loneliness (sum of allocated items of De Jong Gierveld Loneliness Scale)
- Loneliness (sum of original items on UCLA Loneliness Scale; sum of social loneliness and emotional loneliness scores on De Jong Gierveld Loneliness Scale)
- Response scales to added questions (“How do you feel about this”) are 5-item, unipolar Likert scales, ranging from “Very bad” (1) to “Very good” (5)
- Exploratory factor analysis will be used to determine the number of factors present in the modified UCLA-LCD

Analysis Plan

We will follow and adapt the six-step protocol for use in R (R Core Team, 2020) set out by Dima (2018), which allows the integration of both parametric and nonparametric item response theory approaches to scale validation.

Step 1: Descriptive statistics

- Summary statistics for demographic characteristics of the sample will be presented in tables using mean, SD, and range
- Spearman inter-item correlations will be plotted for initial visualization of correlations between items of the same subscales

Step 2: Non-parametric item response theory (NIRT)/Mokken Scale Analysis (MSA)

- MSA will be performed to test homogeneity of items, where coefficients of homogeneity (*H*) for items in each of the (sub)scales will be calculated
- Dimensionality of the UCLA-LCD will be assessed using Automated Item Selection Procedure (*aisp*) as part of MSA (Ark, 2007)
- Item-specific *H* coefficients below threshold (<.30) will be deemed unscalable and considered for exclusion

Step 3: Parametric item response theory (IRT)

- Fit with the Rating Scale model for ordinal data will be assessed using parametric item response theory
- Infit and outfit scores will be used to determine whether items are ordered according to the theory, where each item should fall within the acceptable range of 0.6-1.4.; items outside this range will be considered for exclusion

Step 4: Factor analysis

- Exploratory and confirmatory factor analysis will be used to assess the factor structure of the UCLA-LCD and construct validity
- First, Bartlett's and Kaiser-Meyer-Okin (KMO) tests will be conducted to assess whether data is suitable for factor analysis, with KMO measure of sampling adequacy required to be above 0.6, and Bartlett's test of sphericity required to be significant (p<.05)
- Using parallel analysis, the number of factors will be explored and visualized in a parallel analysis scree plots
- The optimal number of factors will be determined using Very Simple Structure (VSS) analysis and item cluster analysis (ICLUST)
- Confirmatory factor analysis will indicate goodness of fit with fit indices specified as follows: Tucker-Lewis index (TLI) and Comparative Fit Index (CFI) >0.95; root mean square error of approximation (RMSEA) <0.06; $p(\chi^2)$<.05 (Dima, 2018)

Step 5: Classical test theory

- To assess internal consistency, Cronbach's α (<.70 satisfactory threshold) and associated reliability indices (ω, β, and Guttman's lambda 6 [G6]) will be calculated

- Item-total correlations will be calculated to test how items are associated with the total score; correlations <.30 will be considered for exclusion
- Multi-trait multi-method matrices will be used to determine discriminant validity, specifically to assess whether Loneliness Distress is different from Emotional Loneliness (De Jong Gierveld Loneliness Scale)
- To examine whether the novel constructs behave as expected in “known groups”, binary dummy variables with presence/absence of neurodiversity, mental illness, and chronic illness will be computed. T-tests will be used to test whether these groups show higher indices of Loneliness Distress (in line with previous research) and lower indices of Loneliness Contentment than participants without diagnoses of neurodiversity, mental illness, and chronic illness
- Linear regressions determining intraclass correlation coefficients (ICC) will be used to estimate the relationship between existing measures (De Jong Gierveld Loneliness Scale) and UCLA-LCD

Step 6: Total (sub)scale scores

- Total scores of all (sub)scales will be summarized and tested for ceiling and floor effects, where the acceptable threshold of extreme scores is <15% (Dima, 2018)

19. Transformations (optional)

NA

20. Inference criteria (optional)

Inference criteria for each analysis step have been determined in the main analysis section.

21. Data exclusion (optional)

Participants who have completed the survey will be included in the analysis, participants with partial responses will be excluded from analysis. Mahalanobis distance (Reiser, 2001) will be calculated to detect outliers and Q-Q plots will be used to confirm outliers, which will then be excluded.

22. Missing data (optional)

Missing data will be reported but not replaced.

23. Exploratory analysis (optional)

Participants have the option to take part in a follow-up study, in which they are asked to complete the UCLA-LCD and De Jong Gierveld Loneliness Scale two weeks after their initial participation. If this study is sufficiently powered (at least 100 participants), this data will be used to assess test-retest reliability by calculating intra class correlation coefficients.

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