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Analysis of Psychometric Properties of the University of California, Los Angeles Loneliness Scale Version-3 (UCLA LS-V3) in the Indian Context

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ABSTRACT
Background: Loneliness is increasingly recognised as a significant psychological phenomenon among university students in India. This article aims to validate a tool for measuring loneliness among university students, highlighting its implications for academic performance, mental health, and social engagement. **Objective:** This paper aimed to validate the UCLA Loneliness Scale, Version 3 (Russell, 1996), among university students from government and private universities in Punjab, India. **Methods:** The 20-item UCLA LS V3 was used to measure levels of loneliness among males and females aged 18 to 24 years. Firstly, exploratory factor analysis (EFA) was conducted on 340 data samples, followed by confirmatory factor analysis (CFA) using SPSS 23 and AMOS to confirm the psychometrics. **Results:** The results revealed that the UCLA LS V3 has a five-factor structure, making it a valid and reliable tool for assessing loneliness among undergraduate students in India. **Conclusions:** These findings not only affirm the scale's suitability for assessing loneliness among Indian university students but also contribute significantly to the growing body of literature on loneliness.

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1. INTRODUCTION

Loneliness, a pervasive phenomenon, emerges as a multifaceted construct entrenched within the human experience, characterized by profound social isolation and emotional estrangement. It engenders psychological distress among the populace at large. The imperative for a valid and reliable tool to assess loneliness cannot be overstated, as it enables the implementation of targeted interventions to alleviate this distressing state. The UCLA LS-V3[1] stands out as the preeminent and globally utilized scale for evaluating levels of loneliness. Subsequent iterations of the UCLA scale have been developed in various languages and for different cultural contexts, including the UCLA-16 [4], UCLA-11 [5], UCLA-6 [6,7], UCLA-8 [8], and UCLA 3-item scale [9] [10], tailored to streamline questionnaire length and

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bolster response rates in clinical and longitudinal studies. Notably, the UCLA LS V3 [1] holds sway as the favored measure of loneliness among university students and diverse age cohorts across clinical and non-clinical environments. Conceived initially as a 20-item unidimensional instrument comprising nine positive and eleven negative items, with "Cronbach's alpha coefficients "ranging from 0.89 to 0.94 across samples drawn from populations encompassing teachers, nurses, college students, and the elderly, the UCLA LS-V3[1] conceptualizes loneliness as a singular, undifferentiated state universally experienced and understood, varying only in intensity, and stemming from deficits within an array of relationships [1, 3].

Literature Review:

Extensive research underscores the scale's robust feasibility and applicability, with validation efforts spanning diverse nations, including South Africa [11], Denmark [12], Taiwan[13], Canada[14], Turkey [15], Italy [16], Iran [17], Japan [18], Spain [19], and India [20]. While theoretically posited as unidimensional, the UCLA LS V3 [1] has been subject to varied interpretations, with some studies corroborating its singular factor structure [12,1]. In contrast, others advocate for a multidimensional framework [21,14,22], with investigations into two-factor models [23,24], three-factor solutions [15,22], and, notably, a four-factor model informed by "Weiss's relational theory of loneliness" in the Indian context [20]. Despite considerable research into loneliness across different age groups, there remains a paucity of studies addressing loneliness, specifically among Indian university students. A study in India[25] identified loneliness as a significant ailment. At the same time, another focused on loneliness only among postgraduates[20], revealing a gap in research targeting university students. At the same time,[26] validated the UCLA loneliness scale's Hindi version in a recent study. This current paper aims to investigate the psychometric properties of UCLA LS V3 Russell (1996) to enhance the literature on loneliness among the undergraduates considering their mental health a very crucial issue [27] in the country; therefore, the present study endeavors to scrutinize the "psychometric

properties of the UCLA LS-V3" [1] in gauging loneliness among university students, contributing to the burgeoning body of literature in this field.

MATERIALS AND METHODS:

1 Participants:

The sample consisted of students aged 19 to 22 years who were registered for the second semester of the 2022-23 academic year. Fifty-one percent of Participants were from rural areas, 48.2% were from urban areas, 43.26% were from government universities, and 56.09% were from private universities. The sample consisted of 67.13% females and 32.86% males. Across age groups, 40.1% were 19 years old, 14.3% were 20 years old, 15.5% were 21 years old, and 30.1% were 22 years old. Regarding majors, 11.9% were pursuing a BBA, 13.6% a BCA, 31.1% a B.Com., 21.6% a B.Sc., and 22.3% a B.Ed. Programs.

Table 1: Demographic Details of the sample concerning Gender, Area of Residence, University, Age, and Programs

Gender	**N=339**	**%**
Male	223	32.8%
Female	456	67.1%
Area of residence	N	%
Rural	351	51.7%
Urban	328	48.2%
university type	N	%
Government	299	43.9%
Private	380	56 %
Age	N	%
19-Year-olds	272	40.1%
20-Year-olds	97	14.3%
21-Year-olds	105	15.5%
22-Year-olds	204	30.1%
Programs	N	%
BBA	82	11.9%
BCA	89	13.6%
B.Com.	211	31.1%
B.Sc.	146	21.6%
B.Ed.	151	22.3%

2 Instrument:

The UCLA LS-V3 [1] was used to collect data from university students. "The scale comprised 20 items rated on a 4-point scale from 1 to 4 indicating frequency, with scores ranging from 1 to 80 categorizing loneliness levels (1-20) as low, (21-40) mild, (41-60) moderate, and (61-80) high".

3 Statistical Analysis:

The first 340 data samples were used for "Exploratory Factor Analysis (EFA)," and "Confirmatory Factor Analysis (CFA)" was done on the other 339 data samples. The scale's internal consistency was evaluated using "Cronbach's Alpha." "IBM SPSS 23" was used for the analysis's EFA, while "IBM SPSS AMOS 23" was utilized for the analysis's CFA. Data appropriateness was evaluated before factor analysis using the "Kaiser-Meyer-Olkin (KMO)" and "Bartlett's Test of Sphericity." "Principal component analysis" was used to run EFA with a "varimax rotation." Significant factors were those with rotational loadings greater than 0.40[28]. The Root Mean Square Error of Approximation (RMSEA) is less than or equal to 0.06 [29], where lower values indicate a better fit. Indices such as the "Goodness Fit Index (GFI)," "Comparative Fit Index (CFI)," "Tucker Lewis Index (TLI)," "Normed Fit Index (NFI)," "Incremental Fit Index (IFI)," and "Adjusted Goodness of Fit Index (AGFI)" of 0.90

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or higher [30], indicating superior fit. Additionally, the "$\chi 2$/df" ratio was required to be less than 5 [31], [32]. The assessment of the proposed UCLA LS V3's goodness of fit was carried out using the "Maximum Likelihood (ML)" method.

RESULTS:

The study was conducted in two phases: the first for EFA and 2nd phase for CFA.

1 Exploratory Factor Analysis:

In the first phase, an EFA was conducted using varimax rotation on the sample (N = 340). The appropriateness of the data for running factor analysis was assessed using the "Kaiser-Meyer-Olkin's measure (KMO)" and "Bartlett's sphericity test." As per the result, the KMO =0.752, "Bartlett's sphericity test" of homogeneity of variance, $\chi 2$= 2626.526 (df =190, p = 0.000 <0.05), was found to be significant, indicating that the data was adequate for factor analysis. Upon scrutiny of the eigenvalues' scree plot, it became clear that the findings robustly endorsed a five-factor framework for the UCLA LS-V3 [1] within the dataset.

The five distinct factors were "isolation, relational connectedness, social connectedness, social compatibility, and social exclusion." The results of the "EFA" reported 65.94% of the total variance, with "isolation" accounting for 15.52%, followed by "relational connectedness" accounting for 14.92%, "social connectedness" contributing 13.33%, "social compatibility" accounting for 11.66%, and "social exclusion" contributing 10.49%. The items demonstrated "factor loadings ranging from 0.72 to 0.91, all of which were retained owing to their significant factor loading strength. The factor loading threshold was set at 0.40 [33].

Table 2 Factor Loadings of UCLA LS V3

	Isolation	Factor Loading
	How often do you feel that you lackcompanionship?	0.801
	How often do you feel that there is no oneyou can turn to	0.778
	How often do you feel that people are around you, but not with you?	0.778
	How often do you feel alone?	0.802
	How often do you feel isolated from others?	0.746
2.	**2.** Relational Connectedness	
	How often do you feel close to people?	0.859
	How often do you feel that there are peoplewho understand you?	0.846
	How often do you feel that there are peopleyou can turn to	0.841
	How often do you feel that there are people you can talk to?	0.776
3.	3. Social Connectedness	
	How often do you feel that you are "in tune"with the people around you?	0.858
	How often do you feel part of a group offriends?	0.842
	How often do you feel that you have a lot incommon with the people around you	0.825
	How often do you feel outgoing and friendly?	0.739
4.	**3. Social Compatibility**	
	How often do you feel that your interests andideas are not shared by those around you?	0.814
	How often do you feel that no one really knows you well?	0.781
	How often do you feel that your relationshipswith others are not meaningful	0.778
	How often do you feel shy?	0.750
5.	**4. Social Exclusion**	
	How often do you feel that you are no longerclose to anyone?	0.918
	How often do you feel left out?	0.898
	How often do you feel you can findcompanionship when you want it?	0.716

2. Reliability:

Cronbach's alpha coefficients and Composite reliability were calculated and reported in the following table for each dimension: "Isolation" (0.84), "Relational connectedness" (0.85), "Social connectedness"

(0.79), "Social compatibility" (0.83), and "Social exclusion" (0.82). Collectively, these indicate a satisfactory level of reliability.

3. Confirmatory Factor Analysis (CFA):

In the second phase, a confirmatory factor analysis (CFA) was conducted on a sample of N = 339 to confirm the construct validity of the scale. The outcomes of the proposed model exhibited robustness across various fit indices: "$\chi 2$/df=2.03, RMR=0.01, GFI=0.96, TLI=0.96,

CFI=0.97, NFI=0.94, IFI=0.97, AGFI=0.94" and "RMSEA" settled at 0.04. These collective results indicated a notably successful model fit, shown in Table 1. The items demonstrated "factor loadings ranging from 0.46 to 0.92, all of which were retained owing to their significant factor loading strength; the factor loading threshold was set at 0.40 [33]. All major model fit indices, including "RMSEA, GFI, CFI, TLI, NFI, AGFI, and $\chi 2$/df," met the predefined criteria comfortably. Consequently, these findings established the

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construct validity of the UCLA LS-V3 [1] scale. The path diagram of UCLA LS-V3 [1] is shown in Figure 1.

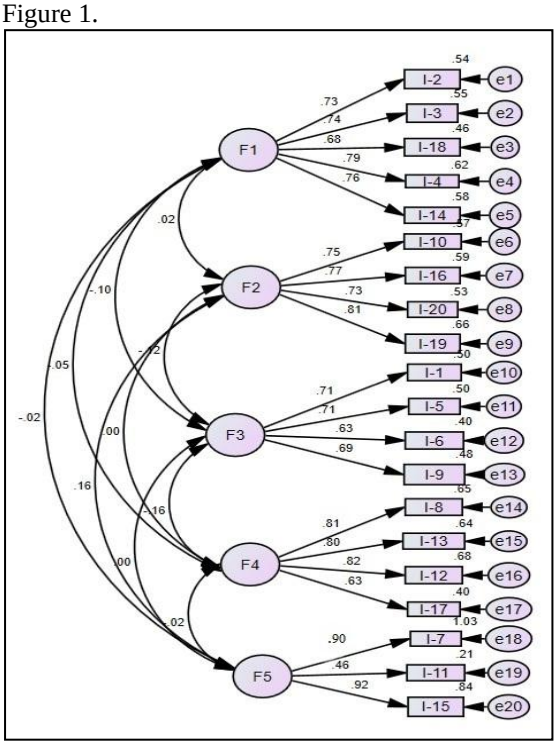

Fig. 1: The Path diagram of UCLA LS-V3 1

In Fig. 1, the findings of CFA are applied to the five components and their underlying variables. Factor 1 is "isolation," Factor 2 is "relational connectedness," Factor 3 is "social connectedness," Factor 4 is "social compatibility," and Factor 5 is "social exclusion."

Table 3: "The Model Fit Estimates"

The model is considered fit when 3-4 indices in a model pass the minimum requirement [33]. If the fit indices in the majority are above the threshold values, the conclusion can be that the theoretical model is supported by data [34]. The chi-square test was the initial evaluative metric. The better the model fit, the lower the discrepancy between actual and anticipated covariance, as seen in the more minor chi-square test results. Given the minimal difference in variances, the result of 1.77 here indicates that the model fits the data well. A score higher than 0.9 indicates a strong model fit, while a value between 0 and 1 is appropriate for the second index, the GFI (Goodness-of-Fit Index). Given that GFI was 0.93, a strong model fit was also implied. NFI (non-normed fit index) and CFI (comparative fit index) are two relative indices. The figures in Table 1 and the model for this aim confirm that these indices should be greater than 0.95 to indicate a successful model fit. Model fit is assessed using the root mean square error of approximation (RMSEA), and a result of less than 0.06 indicates a satisfactory fit, which was the case for this model. The Tucker-Lewis index, or TLI, should be greater than 0.9 for an acceptable model fit, and at the same time, it should never exceed the CFI value. The fact that this model satisfied the prerequisites for TLI and CFI > TLI suggests that it fits the data well. Since the incremental fit index (IFI) is comparable to the squared R-value, a value near one indicates a good model fit. An excellent model fit was demonstrated, as all absolute and relative index values exceeded their respective thresholds. The study reported satisfactory reliability coefficients for each dimension, with Cronbach's alpha values ranging from 0.79 to 0.85. These findings are consistent with previous research[1], which reported high internal consistency for the UCLA Loneliness Scale, with coefficient alpha values ranging from 0.89 to 0.94 across various samples, including college students. The confirmatory factor analysis (CFA) in your study also demonstrated a good model fit, with indices such as the Comparative Fit Index (CFI) (0.97) and the Root Mean Square Error of Approximation (RMSEA) (0.04) indicating strong construct validity. Our research has unveiled a five-factor framework for the UCLA Loneliness Scale Version 3 (UCLA-LS V3) among university students. This framework includes Isolation, Relational Connectedness, Social Connectedness, Social Compatibility, and Social Exclusion. The model demonstrates excellent fit indices (χ^2/df = 2.03, RMR = 0.01, GFI = 0.96, TLI = 0.96, CFI = 0.97, NFI = 0.94, IFI = 0.97, AGFI = 0.94, RMSEA = 0.04), highlighting a robust model fit in the Indian context. This detailed structure surpasses the widely recognized three-factor bifactor model validated by the study [11], which comprises Isolation, Relational Connectedness, and Collective Connectedness in a South African university sample, with fit indices of TLI = 0.92, CFI = 0.94, and RMSEA = 0.07. Similarly, [15] confirmed a three-factor structure amongst Turkish university students, showcasing the scale's cross-cultural reliability. Conversely, the study [20] found a four-factor structure among Indian postgraduate students, indicating possible cultural differences in the experience of loneliness. A meta-analysis by [35] consolidated the study's findings from 52 studies, concluding that the two-factor and second-order three-factor models fit best across various samples, including university students. Together, these studies validate the multidimensional nature of the UCLA-LS V3, which comprises five factors, and confirm its reliability and validity in measuring loneliness among university students worldwide.

4. CONCLUSION:

The necessity of employing a valid and reliable instrument for measuring loneliness is highlighted, with the "UCLA loneliness scale version 3 (UCLA

LS V3)" emerging as a widely accepted tool. While the UCLA LS V3 initially presents as unidimensional, subsequent studies have revealed both unidimensional and multidimensional factor structures, reflecting the nuanced nature of loneliness. This study contributes to the existing research on the five dimensions of the UCLA LS-V3. The findings from both "exploratory factor analysis (EFA)" and "confirmatory factor analysis (CFA)" validated the construct of the scale among the Indian university student population, indicating its suitability for assessing loneliness among university students.

SUGGESTIONS:

Our results identified five distinct factors—Isolation, Relational Connectedness, Social Connectedness, Social Compatibility, and Social Exclusion—that provide a nuanced understanding of loneliness. Future research could investigate cross-cultural studies to determine whether this five-factor model is applicable in diverse cultural contexts. For example, a study in Iran reported an 18% prevalence of loneliness among university students, while studies in Ethiopia and Turkey reported rates of 49.5% and 60.2%, respectively [36]. These studies emphasize the importance of considering cultural and demographic factors when assessing loneliness, as prevalence and associated factors may vary across contexts. Our current study also examined the five-factor model in the undergraduate university student population in the Punjab region of India. Therefore, this study aims to contribute to the growing body of literature on loneliness and to address the research gap by validating the UCLA Loneliness Scale, Version 3, by Russell, in the Indian context.

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CONFLICT OF INTEREST:

The authors declared that there is no conflict of interest.

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