



Dimensional Structure and Psychometric Properties of the Persian Version of the Existential Loneliness Questionnaire (ELQ)

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The recent pandemic of Coronavirus and its associated excess mortality have made the man more prone to feelings of isolation and being alone existentially. Therefore, it is necessary to identify, assess, and reduce such negative feelings. The present study aims to provide a Persian adaptation of the existential loneliness questionnaire (ELQ) and to examine its dimensional structure and psychometric characteristics. The ELQ items were translated into Persian using forward-backward translation method. Participant recruitment is conducted via social media platform and data is collected via online survey. Content validity was evaluated by the expert's judgement, followed by factor analysis, validity, and reliability tests. Two samples of university students were collected. Sample 1 consisted of 305 students aged 18-53 years, completed the Persian adaptation of the ELQ and several other instruments: De Jong Gierveld Loneliness Scale (DJGLS), Existential Anxiety Questionnaire (EAQ), Beck Depression Inventory (BDI-13), Meaning in Life Questionnaire (MLQ), and Satisfaction with Life Scale (SWLS). Sample 2 consisted of 262 students aged 18-50 years, completed only the Persian ELQ to conduct Confirmatory Factor Analysis (CFA) tests. According to Parallel Analysis (PA) and Exploratory Factor Analysis (EFA) results, a unidimensional structure was found for the Persian ELQ, and the results of the CFA test supported this finding. The Multi-group CFA test supported the measurement invariance of the questionnaire across two samples. Evidence of high internal consistency ($\alpha = .91$) and adequate test-retest reliability ($r = .73$) was found as well. The correlational analyses revealed a strong construct validity based on the ELQ score's significant association with other criterion measures. According to the findings of the study, the Persian version of the ELQ is a reliable, valid, and psychometrically suitable instrument for use in Iranian samples of university students.

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Introduction

Loneliness, as a universally accepted concept in psychology literature, is defined as the negative subjective experience, the unpleasant or distressing feeling that results from the absence of satisfying interpersonal relationships; or from the lack of meaningful relationships or social companionship (Perlman & Peplau, 1981; Weiss, 1973). Existential loneliness is an ontological aspect of loneliness that is broadly described in relation to existential issues of being human, such as guilt, death, isolation, meaninglessness, and the like (Sundström et al., 2018). In existential literature, loneliness is described as a basic existential human concern (Breitbart, 2017), a part of being human (Yalom, 1980) or a part of the human predicament (Tillich, 1963). Existential loneliness as an intrinsic feature of human existence stems from the awareness of the painful fact that human is fundamentally alone. Such a sense refers to human unavoidable separateness from the world and others. In other terms, it refers to a primary and fundamental separation from every creature and everything in the world (Yalom, 1980). In this sense, "no matter how close one becomes to another... there is an ultimate unbridgeable gap" (Breitbart, 2017, p. 404). Ettema et al. (2010) have defined existential loneliness as "intolerable emptiness, sadness, and longing, that results from the awareness of one's fundamental separateness as a human being" (p. 142). This type of loneliness is also considered to be everpresent, as it may be experienced by everybody at some point in one's life, specifically in face with conditions threatening life, such as disease and death. It has been asserted that existential loneliness has no permanent remedy, but instead can be momentarily palliated by defensive activities; when encountering such a feeling, people often tend to use psychic defenses and occupy their minds with hobbies, romantic relationships, vacations, and with some tasks, such as living a busy life, actualizing one's potentialities, and expressing oneself creatively, in order to protect themselves from the basic sense of loneliness. The fact is that such defenses temporarily alleviate negative and unpleasant states of isolation, but ultimately may collapse in the face of life-threatening events over which they have no control (Ettema et al., 2010; Mayers & Svartberg, 2001). Thus, existential loneliness is to be characterized as an everpresent feeling of aloneness, against which human defends oneself for much of the time, but for which there is no permanent remedy (Mayers et al., 2005).

There is lots of research about loneliness among older people, but little is known about the existential loneliness in old-age (Edberg & Bolmsjö, 2019). It is normally assumed that existential loneliness can appear

at any time throughout life, but is more often present at the end-of-life when people get older. In fact, existential loneliness is considered as being interrelated with death and often defined in relation to it, as lonely confrontation with one's own death or finitude. As a result, existential loneliness is assumed to be most evident in end-of-life-events (Cherry & Smith, 1993; Moustakas, 1961; Yalom, 1980). Also, studies have shown that people with deadly diseases, like cancer patients, are forced to face existential concerns, for example experience existential isolation (Razban et al., 2022). It is emphasized that people with serious mental and physical diseases are more vulnerable to existential loneliness, such as schizophrenic patients (Nilsson et al., 2008), patients suffering from aphasia (Nyström, 2006), people with advanced cancer (Hlubocky et al., 2019; Mah, 2019), women with breast cancer (Rosedale, 2009), HIV-infected gay men (Cherry & Smith, 1993), and HIV-infected women (Mayers & Svartberg, 2001).

On the whole, existential loneliness is characterized by 3 dimensions —as a condition, as an experience, and as a process of inner growth (Ettema et al., 2010). The first and second are negative aspects and the third is positive aspect. To the extent that awareness and acceptance of existential loneliness may lead to inner growth, it is considered to be a positive force. By giving meaning to life and death one uses its potentialities and develops its capacities as a human being (Ettema et al., 2010; Moustakas, 1961; Yalom, 1980).

The theoretical and research literature support the idea that loneliness in general, existential loneliness in particular, has negative consequences on physical and mental health. Empirical studies have revealed that there is a close relationship between loneliness and depression (Hawkey & Cacioppo, 2010; Oehler, 2017), anxiety (Adamczyk & DiTommaso, 2014), life satisfaction (Salimi, 2011) and meaning in life (Oehler, 2017; Tomšik, 2015). It has also been indicated that existential loneliness is closely associated with negative psychological outcomes, e.g., depressive symptoms and suicidal ideation (Chung et al., 2020; Gökdemir-Bulut & Bozo, 2018), existential anxiety and meaninglessness (Chung et al., 2020; Mayers et al., 2002; Sjöberg et al., 2017). In fact, existential anxiety and meaninglessness are concepts generally overlapping with existential loneliness (Breitbart, 2017; Ettema et al., 2010; Mayers & Svartberg, 2001). Existential loneliness is thought to be primary source of anxiety for human beings (Fromm, 1956; Mayers & Svartberg, 2001). Regarding relationships between existential loneliness and mental health, it is necessary to develop a suitable psychometric instrument that can measure existential loneliness accurately.

Since 1970s, various instruments have been developed to measure loneliness, including the Belcher Extended Loneliness Scale (BELS) (Belcher, 1973), the USLA Loneliness Scale (Russell et al., 1980), the New York University Loneliness Scale (NYULS) (Rubenstein & Shaver 1980), the Differential Loneliness Scale (DLS) (Schmidt & Sermant, 1983), the Loneliness Rating Scale (LRS) (Scalise et al., 1984), the Loneliness and Aloneness Scale for Children and Adolescents (LACA) (Marcoen et al., 1987), the Emotional and Social Loneliness Scale (ESLI) (Vincenzi & Grabosky, 1989), the Social and Emotional Loneliness Scale for Adults (SELSA) (DiTommaso & Spinner, 1992), the Three-Item Loneliness Scale (TILS) (Hughes et al., 2004), the University of Philippines Loneliness Assessment Scale (UPLAS) (Tharayil, 2012), and the Buenos Aires Loneliness Scale (BALS) (Aune et al., 2019), and Iranian Loneliness Inventory for Older Adults (ILIOA) (Bandari et al., 2022). Some of these instruments (e.g., USLA, UPLAS, TILS, and BALS), inspired by global approach, address unidimensional nature of loneliness, while others inspired by multidimensional approach, address and measure multifaceted nature of loneliness and its different forms, such as emotional, social, or general. According to the first, loneliness is a unitary phenomenon varying in experienced frequency or intensity. But second approach views loneliness as a multifaceted phenomenon which cannot be assessed by a single global measure.

The main problem is that only two instruments measure existential loneliness: The BELS (Belcher, 1973) and the Existential Loneliness Questionnaire (ELQ) (Mayers et al., 2002). The BELS consists of 60 items with 8 subscales one of which is existential loneliness (8 items). This factor has been criticized for inadequacy of its subset items (Mayers & Svartberg, 2001; Solano, 1980), and for being lengthy and unwieldy (Scalise et al., 1984). Unlike the BELS, the ELQ (consisting of 22 items) was particularly developed to assess existential loneliness using a small sample included 47 HIV-infected women who are more vulnerable to experience existential concerns. After a decade, Gökdemir-Bulut and Bozo (2018) translated the ELQ into Turkish and studied its psychometric properties. As a result, Turkish version of the ELQ was reported a high internal consistency, an adequate stability reliability, a three-factorial structure. Since in Persian language, there is no psychometric instrument particularly assigned to measure existential loneliness, so the ELQ was chosen to translate into Persian. The purpose of the present study was to examine factorial structure and psychometric properties (e.g. validity and reliability) of the Persian ELQ among

two samples of university students, as Mayers et al. (2002) have recommended the replication of the questionnaire with larger samples by performing factor analysis.

Methods

The study was conducted between March and May 2022. At first, the permission to translate and adapt the ELQ was received from one of the creators via email and then, the questionnaire was translated by two experts who were fluent in Persian and English. The method of translation was forward-backward translation. Three items (6, 8 & 22) designed for HIV population were changed into general statements to be applicable in various populations, especially in university students.

Participants and Procedures

Convenience method of sampling was used due to easy access to university students. All participants were recruited through online advertisements in university-affiliated social media channels, and through sending email. All the (potential) participants were students of Islamic Azad University South Tehran Branch, affiliated to two different complexes. Sample 1 participants were recruited through social media channels or groups affiliated to Valiye asr University Complex, but the Sample 2 participants were recruited through those channels or groups affiliated to Technical and Engineering University Complex. Sample 1 consisted of 305 university students (72.5% female, $n= 221$; 27.5% Male, $n= 84$) with ages ranging between 18 and 53 years ($M= 26.6$, $SD=8.1$). Also, Sample 2 consisted of 262 university students (58.8% female, $n= 154$; 41.2% male, $n= 108$) with ages ranging between 18 and 50 years ($M = 27.23$, $SD = 8.16$). More demographic information is presented in Table 1.

All data were collected via online surveys. The link of questionnaire package was shared in WhatsApp, Telegram, Eitta, and iGap. The study was approved by the Review Board of the Islamic Azad University-Central Tehran Branch. In agreement with the Helsinki Declaration, all participants volunteered and received information about purpose and procedure of the study by first page of package (<https://survey.porsline.ir/s/IAisaex>). They were also informed about data protection and assured of confidentiality and anonymity of their personal information. Informed consent was obtained from participants electronically before they begin to answer questions.

Table 1: samples characteristics

Characteristics	N (%)	
	Sample 1	Sample 2
Gender		
Male	84 (27.5%)	108 (41.2%)
Female	221 (72.5%)	154 (58.8%)
Marital Status		
Never married	222 (72.8%)	179 (68.3%)
Married	71 (23.3%)	65 (24.8%)
Divorced/Separated	12 (3.9%)	18 (6.9%)
Education level		
Bachelor	206 (67.5%)	176 (67.2%)
Master	99 (32.5%)	86 (32.8%)
Occupation		
Unemployed	189 (62%)	101 (38.5%)
Self-employed	39 (12.8%)	56 (21.3%)
Employed	50 (16.4%)	95 (36 %)
Other	27 (8.9%)	10 (4.2%)
Socioeconomic Status		
Low	43 (14.1%)	71 (27.1%)
Middle	238 (78%)	147 (56.1%)
High	24 (7.9%)	44 (16.8%)

Measurements

Existential Loneliness Questionnaire (ELQ)

The ELQ was created by Mayers et al. (2002) to measure existential loneliness among 47 HIV-infected women, consisting of 22 items rated on a 6-point Likert scale. These items met the Rasch model's criteria and were internally highly consistent ($\alpha = .90$). Items 1, 2, 7, 14, and 18 are reverse. Getting high scores on this questionnaire means high level of existential loneliness. Gökdemir-Bulut and Bozo (2018) reported a high internal consistency ($\alpha = .88$) and adequate test-retest reliability ($r = .75$) for the Turkish version of the ELQ. They also reported a three-factor structure for the scale: loneliness in social ties ($\alpha = .84$), loneliness in close relationships ($\alpha = .70$), and finding meaning in life ($\alpha = .80$).

Beck Depression Inventory (BDI-13)

This is a short form of the Beck Depression Inventory designed by Beck and Beck (1972) and translated into Persian by Dadfar and Kalibatseva (2016). The inventory consists of 13 groups of statements (scored from 0 to 3) designed to measure frequency and intensity of depressive symptoms. A higher score of the inventory means a more intensified depression. The Persian version of the BDI-13 possesses good concurrent and discriminant validity and high internal consistency ($\alpha = .85$) (Dadfar & Kalibatseva, 2016).

Existential Anxiety Questionnaire (EAQ)

The EAQ is a true-false rating scale designed by Weems et al. (2004) to measure existential anxiety as conceptualized in the work of Tillich (1952). It consists of 13 items half positively worded and half negatively worded. The scale has good internal consistency ($\alpha = .71$) and test-retest reliability ($r = .72$). It has also good convergent and incremental validity estimates (Scott & Weems, 2013). Etemad et al. (2017) reported adequate reliability and good construct validity with the three-factor structure for the Persian version of the EAQ: death-fate ($\alpha = .51$), emptiness-meaninglessness ($\alpha = .41$), and guilt-condemnation ($\alpha = .51$).

De Jong Gierveld Loneliness Scale (DJGLS)

The DJGLS developed by De Jong Gierveld and colleagues (De Jong Gierveld & Van Tilburg, 1999) and translated by Hosseini et al. (2020), was used to assess participants' feeling of loneliness. The scale consists of 11 items and has two subscales; five items positively formulated assess social loneliness ($\alpha = .88$) and six items negatively formulated assess emotional loneliness ($\alpha = .88$), and all items assess general loneliness ($\alpha = .84$). The Persian Version showed good construct validity and adequate reliability (Hosseini et al., 2020).

Satisfaction with Life Scale (SWLS)

The SWLS developed by Diener et al. (1985) and translated by Bayani et al. (2007) was used to assess subjects' satisfaction with life. It consists of 5 items rated on a 7-point Likert scale. A higher score of the scale indicates a more satisfaction with life. The Persian version of the SWLS had good concurrent and discriminant validity, high internal consistency ($\alpha = .83$) and acceptable test-retest reliability ($r = .70$) (Bayani et al., 2007).

Meaning in Life Questionnaire (MLQ)

The MLQ designed by Steger et al. (2006) measures subjects' meaning in life. This is a 10-item scale consisting of two subscales, Presence of Meaning and Search for Meaning, each is measured by 5 items graded in 7-point Likert ratings. A higher score of the scale reflects a higher level of presence of and search for meaning. Subscales MLQ-P and MLQ-S possess acceptable test-retest reliability ($r = .70$ and $.73$ respectively) and high internal consistency ($\alpha = .82$ and $.88$ respectively) (Steger et al., 2006). Mesrabadi et al. (2013) translated the ELQ into Persian and reported good construct validity for the questionnaire.

Data Analysis

The package given the students of sample 1 consisted of Persian versions of the ELQ, DJGLS, EAQ, BDI-13, MLQ and SWLS. The sample 2 students completed only the Persian version of the ELQ. Dataset of Sample 1 was used for all of the statistical analyses but dataset of sample 2 only for confirmatory factor analysis. First, content-based validity was examined through Aiken's V coefficient estimated in terms of the experts' scores (Aiken, 1985). Second, missing values and outliers were examined and descriptive statistics for each item were calculated using SPSS 21, and univariate and multivariate normality was checked by evaluating items skewness, kurtosis, and Mardia's (1970) test using Lisrel 8.8. Third, dimensional structure of the items was checked using Parallel Analysis (PA) and Exploratory Factor Analysis (EFA). To determine the number of factors (Timmerman & Lorenzo-Seva, 2011), the PA with optimal implementation and the EFA with the estimation method of Robust Unweighted Least Squares (RULS) and polychoric correlations matrix were conducted using FACTOR 11.05.01. The Weighted Least Square Mean and Variance Adjusted (WLSMV) was the estimator (Rogers, 2021). Then, Confirmatory Factor Analysis (CFA) and multi-group CFA (MGCFA) were run using Lisrel 8.8 and the Configural, metric, and scalar measurement invariance between two samples were calculated. Following Hu and Bentler (1998, 1999),

model fit was evaluated using a number of adjustment indices and common cut-off criteria, including Chi-Square (χ^2), Normed Chi-Square (χ^2/df) < 2.5 , comparative fit index (CFI) ≥ 0.95 , goodness of fit index (GFI) ≥ 0.90 , Tucker–Lewis index (TLI) ≥ 0.95 , root mean square error of approximation (RMSEA) $\leq .060$, and standardized root mean square residual (SRMR) $\leq .080$. For nested models, adjustment indices and cut-off criteria were used as evidence for measurement invariance: $\Delta CFI \leq 0.01$, $\Delta SRMR \leq .03$ (Chen, 2007), and $\Delta RMSEA < 0.01$ supposed to be adequate for ordinal variables (Finch & French, 2018). Fourth, after exploring the structure of the questionnaire, correlational analyses were conducted to examine convergent and discriminative validity. And the association between ELQ scores with other measures was estimated using SPSS 21. Finally, the internal consistency was tested using Cronbach's alpha and split-half coefficients (acceptable values $\geq .70$) and the stability reliability was evaluated using test-retest reliability coefficient (acceptable values $\geq .70$).

Findings

Content validity

Content validation was based on the method of expert judgement. To examine content validity quantitatively, the questionnaire was administered to 5 experts who were asked to evaluate the Relevance and Clarity of each item on a five-category rating; 1= completely irrelevant, 2=irrelevant, 3= less relevant, 4= relevant, and 5= extremely relevant. By use of Aiken's validity index (Aiken, 1985) the experts agreement was estimated. Based on the Aiken's table, the cutoff value was of $.80$. Thus, according to the two validity criteria, relevance and clarity, two V coefficients were estimated for each item. Finally, all items were presented acceptable (See table 2).

Descriptive Statistics

Related to sample 1, statistical descriptions including mean, standard deviation, variance, skewness, and kurtosis were calculated for each item of the ELQ (see table 2). The assumption of univariate normality was verified for data of sample 1 because univariate values of skewness and kurtosis was in acceptable range (between -2 and $+2$) for each item (George & Mallery, 2010). The foundation for factor analysis is correlational statistics based on the multivariate normality (Zygmunt & Smith, 2014). The test of multivariate normality in was run in terms of Mardia's (1970) indexes and resulted in statistically significant non-normality, meaning that dataset deviates from multivariate normal

Table.2: Items Descriptive Statistics

Items	M	Std	Var	Sk ^a	K ^b	A ^c	A ^d
Q1- I am happy with the way I have lived my life.	3.08	1.418	2.010	.210	-.926	.95	1.0
Q2- There is a purpose to my life	2.45	1.459	2.129	.696	-.601	.90	.90
Q3- I am surrounded by strangers I cannot connect with	2.28	1.259	1.585	.909	.102	1.0	.95
Q4- I have had trouble finding people I can talk to	2.87	1.574	2.479	.488	-.866	.95	.90
Q5- When I feel lonely I do whatever I can not to think about those feelings	3.14	1.639	2.687	.300	- 1.119	1.0	.95
Q6- I feel lonely	2.36	1.479	2.186	1.027	.109	.90	.95
Q7- I feel I have people I can trust and rely on if I need them.	2.82	1.519	2.308	.404	- 1.052	.95	.95
Q8- My fears of being rejected makes it harder to be around other people	2.25	1.312	1.722	.975	.220	.95	1.0
Q9- If I had the right relationship, I would never feel alone	3.23	1.860	3.459	.216	- 1.407	1.0	.90
Q10- I stay in bad relationships too long in order not to be alone	1.94	1.300	1.691	1.423	1.274	.95	1.0
Q11- I immediately get involved in new relationships as soon as I break up	1.90	1.239	1.536	1.482	1.556	.95	1.0
Q12- I feel helpless	2.38	1.444	2.086	.923	-.078	1.0	.95
Q13- I feel alone	2.81	1.523	2.319	.561	-.673	.95	.90
Q14- I mean something to others	2.63	1.322	1.748	.481	-.539	.95	.95
Q15- Important relationships have ended or become weaker	2.65	1.429	2.043	.663	-.391	.90	.95
Q16- I feel at the mercy of the world	2.69	1.480	2.190	.615	-.529	.95	.95
Q17- I feel dead	2.48	1.573	2.474	.896	-.277	1.0	.90
Q18- The universe is full of meaning	2.44	1.439	2.070	.826	-.322	.95	1.0
Q19- I feel that there is little point to life	2.24	1.381	1.908	1.050	.322	1.0	.95
Q20- No one else in the world can understand my feelings	2.74	1.573	2.475	.654	-.635	1.0	1.0
Q21- My world seems so different from everybody else's	2.85	1.586	2.517	.583	-.818	1.0	.90
Q22- I feel hopeless about having a romantic relationship	2.64	1.796	3.225	.713	-.933	1.0	1.0

M: Mean, Std: Standard Deviation, Var: Variance, Sk: Skewness, K: Kurtosis, A: Aiken's Validity Index (V coefficient)

a. Std. Error= 0.117, b. Std. Error= 0.234, c & d. $p < 0.05$, A^c= Relevance, A^d= Clarity distribution in sample 1 (Skewness z: 22.22, $p < .001$; Kurtosis z: 13.29, $p < .001$) and sample 2 (Skewness z: 31.95, $p < .001$; Kurtosis z: 16.37, $p < .001$).

Exploratory Factor Analysis

To examine factorial structure of the Persian ELQ, an EFA test was performed on sample 1. For the reason that dataset did not follow the multivariate normality, and variables are ordinal (e.g., Likert-type scale), the extraction method of RULS was used, based on the polychoric correlation matrix (Rogers, 2021). This method is in fact free from multivariate normality assumption (Zygmunt & Smith, 2014). Also, the PA has been already suggested as one of the best methods for

determining number of factors (Timmerman & Lorenzo-Seva, 2011). According to the PA based on Minimum Rank Factor Analysis (MRFA), the factors number was estimated to be one. Also, results of the Closeness to Unidimensionality Assessment Test (Ferrando & Lorenzo-Seva, 2018) recommended a unidimensional structure for the dataset. An EFA was conducted on the 22 item ELQ. Sampling adequacy was calculated with Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests. The KMO index was 0.916 with a bootstrap Confidence Interval (CI) at 95% (.838 .904) and Bartlett's test was significant ($\chi^2(231) = 3405.9$, $p < .0001$). The Optimal implementation of PA resulted in the extraction of one general factor explaining the 47.35% of the variance. As a result of item analysis, items 5 and 11 were removed for the sake of low factor loading ($< .40$) and low item-total correlation ($< .30$) (Tabachnick & Fidell, 2007). Thus, a new EFA was performed on 20 remaining

Table 3: The results of Exploratory Factor Analysis of the Persian ELQ

Items	Eigenvalue	Factor Loading	Communality	Item-Total Correlation
Q1	8.832	.612	.374	.573
Q2	.688	.672	.452	.610
Q3	.484	.535	.286	.481
Q4	.373	.804	.647	.743
Q6	.233	.640	.410	.574
Q7	.160	.578	.334	.528
Q8	.092	.631	.398	.550
Q9	.040	.590	.348	.528
Q10	.002	.529	.280	.461
Q12	-.021	.786	.618	.711
Q13	-.042	.773	.597	.717
Q14	-.103	.645	.416	.594
Q15	-.122	.654	.427	.610
Q16	-.149	.755	.570	.697
Q17	-.198	.845	.714	.767
Q18	-.229	.623	.388	.573
Q19	-.244	.713	.508	.604
Q20	-.278	.605	.366	.552
Q21	-.330	.549	.301	.480
Q22	-.354	.639	.399	.559

items. The KMO was of .927 with 95% CI (.861 .920) and Bartlett's test was significant ($\chi^2(190) = 3413.6$ $p < .0001$). The main factor explained the 51.25% of the variance. The first eigenvalue was 8.83 and others were less than one. And factor loadings of the unrotated matrix were between .52 and .84. The results of the EFA and item-total correlations for remaining 20 items of Persian ELQ are presented in Table 3. The fit indices of one-dimensional model were as follows: $\chi^2(170) = 294.613$ ($P < .001$); CFI= .989 with 95% CI (.988 .993); GFI= .985 with 95% CI (.984 .987); RMSR=.061 with 95% CI (.059 .061); TLI= .988 with 95% CI (.986 .992); and RMSEA=.049 with 95% CI (.0446 .0478). These results demonstrated a relatively good fit.

Confirmatory Factor Analysis

CFA was performed to test the factorial structure resulted from the EFA. Since there were two samples of university students in this study, Multi-group CFA was conducted to understand whether factorial structure is equivalent across these samples. At first, the CFA was performed on each sample separately. The CFA with the RULS method based on polychoric correlation matrix was conducted on sample 1 and the results demonstrated a relatively poor fit. The goodness of fit indices were $\chi^2(170) = 451.44$ ($p = 0.000$); $\chi^2/df = 2.65$; CFI= .975; TLI= .972; GFI= .985, SRMR= .0588, and RMSEA= .073. Regarding modification indices, correlating error

covariances of the items 1 and 2, 2 and 18, and 7 and 14 were selected as they were closely associated conceptually, i.e., items 1 and 2 focus on meaningfulness of one's life which has an indirect relationship to existential loneliness; similarly, items 2 and 18 also focus on the presence of meaning and purpose in one's life that has an indirect relationship to existential loneliness; and items 7 and 14 focus on one's perceived social support closely associated with the low level of existential loneliness. The modified model fit indices were as follows: $\chi^2(167) = 364.78$ ($p = 0.000$); $\chi^2/df = 2.19$; CFI= .982; TLI= .980; GFI= .987, SRMR= .0543, and RMSEA= .062. Figure 1 presents the path diagram of the model.

The CFA was also conducted on sample 2. As expected, results supported the unidimensional structure of the 20-item Persian ELQ, one-factor model demonstrated evidence of good fit: $\chi^2(170) = 400.59$ ($p = 0.000$); $\chi^2/df = 2.35$; CFI= .980; TLI= .978; GFI= .984, SRMR= .0654, and RMSEA= .072. Regarding modification indices, correlating error covariances of the items 1 and 2, 7 and 14, and 20 and 21 was selected for the sake of their theoretical and conceptual relationship. Similar to sample 1, items 1 and 2 focus on the meaning in life negatively correlated with the existential loneliness, and items 7 and 14 focus on the social support negatively correlated with the existential loneliness; and items 20 and 21 focus on one's sense of being disconnected or emotionally distanced from other

people, which has a direct relationship to the existential loneliness. The modified model fit indices were as follows: $\chi^2(167) = 322.79$ ($p = 0.000$); $\chi^2/df = 1.93$; CFI = .986; TLI = .985; GFI = .987, SRMR = .0593, and RMSEA = .060. Figure 2 presents the path diagram of the model.

In the next, the MGCFA was conducted to examine structural and measurement invariance among the two samples. The result of configural invariance test indicated the same measurement model across two

Finally, scalar invariance was tested by constraining item thresholds to be equal in addition to factor loadings across samples. The results showed that the values of scalar model fit the data well ($SB\chi^2(378) = 515.14$, $p < .001$, CFI = .990, RMSEA = .066, SRMR = .055). Compared to the metric model, the changes in goodness of fit indices were in acceptable range, providing support that scalar invariance held. Therefore, it was concluded that the factor loadings and item thresholds were invariant in the overall model. Generally, the configural,

Models	$SB\chi^2$	df	$\Delta SB\chi^2$	Δdf	CFI	RMSEA	SRMR	ΔCFI	$\Delta RMSEA$	$\Delta SRMR$
Configural Invariance	474.64*	360	-	-	.992	.064	.057	-	-	-
Metric Invariance	468.17*	359	6.47	1	.992	.063	.053	.000	.001	.004
Scalar Invariance	515.14*	378	46.97	19	.990	.066	.055	.002	-.003	-.002

samples; it means that the same factor structure exists across two samples. The results indicated that the configural model fit the data well ($SB\chi^2(360) = 474.64$, $p < .001$, CFI = .992, RMSEA = .064, SRMR = .057). In the next step, metric invariance was tested by constraining factor loadings to be equal across samples. The results of the metric invariance test indicated that the fit values of metric model supported the invariance ($SB\chi^2(359) = 468.17$, $p < .001$, CFI = .992, RMSEA = .063, SRMR = .053). Compared to the configural model, the changes in goodness of fit indices were in acceptable range, providing support that metric invariance held.

metric, and scalar invariance models were supported. The measurement invariance results are presented in Table 4.

Table 4: Testing for measurement invariance across two samples

* $p < .001$ - $SB\chi^2$ = Satorra-Bentler chi-square; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = Standardized root mean square residual.

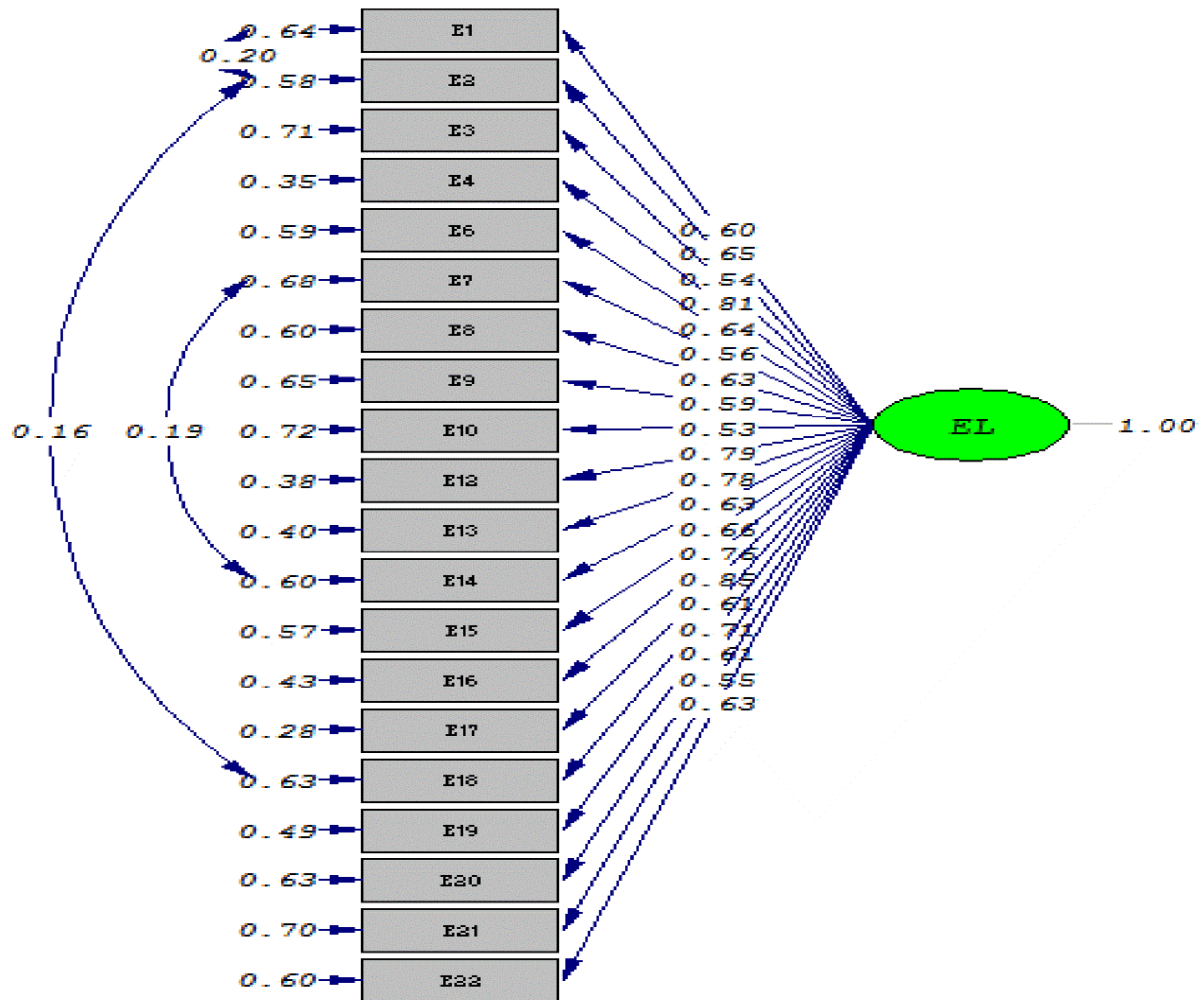


Figure 1: Hierarchical model and factor loadings resulting from performing the CFA on 20-item Persian ELQ in sample 1

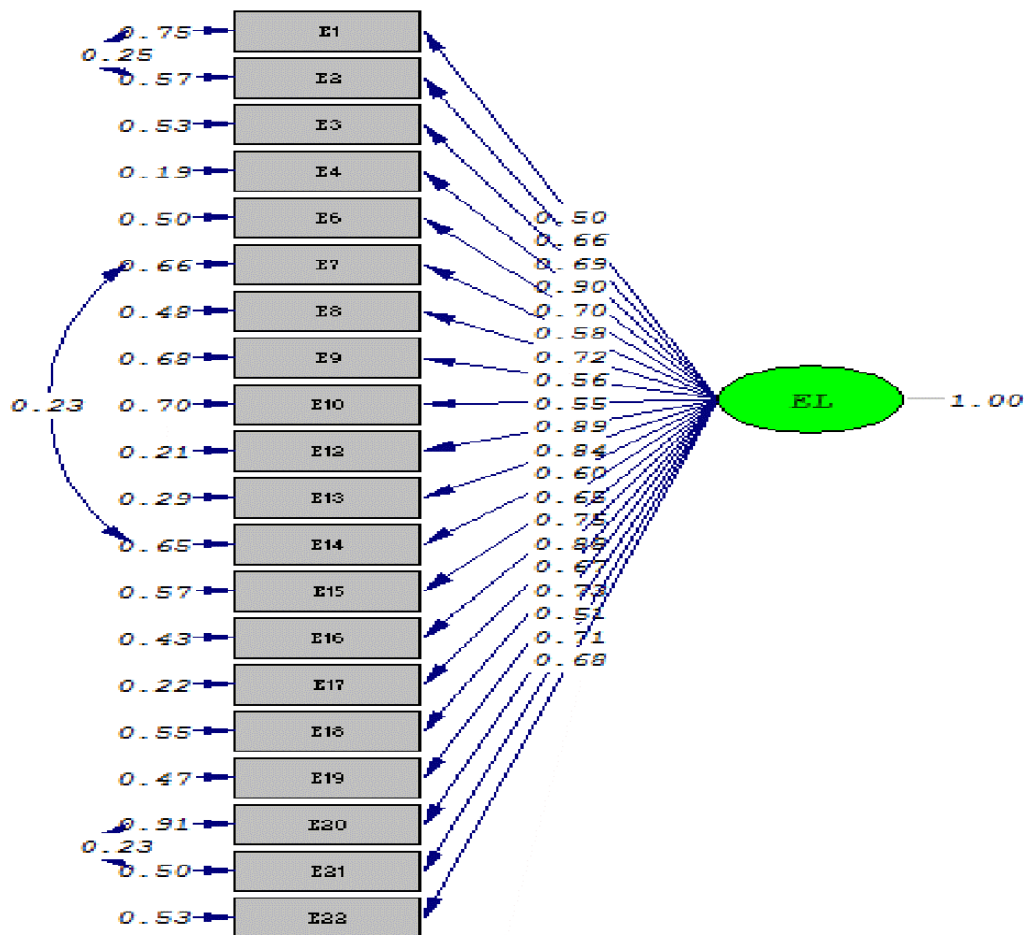


Figure 2: Hierarchical model and factor loadings resulting from performing the CFA on 20-item Persian ELQ in sample 2

Reliability

Cronbach’s alpha coefficient was estimated to assess the questionnaire’s internal consistency ($\alpha = .91$). Also, Spearman-Brown Coefficient was .89 and Guttman split-half coefficient was .88 (Part-1 $\alpha = .79$ and Part-2 $\alpha = .88$). To examine test-retest reliability, 58 participants from the sample 1 filled out the Persian ELQ again after one month. The test-retest reliability coefficient over one month-interval was estimated to be .73 ($p < .01$).

Convergent and Discriminant Validity

To assess convergent validity of the Persian version of the ELQ, relationship between existential loneliness with some related psychological constructs was evaluated. It was hypothesized that existential loneliness to be positively associated with general loneliness, existential anxiety, and depression, consistent with the literature

and previous studies on loneliness (Mayers et al. 2002; Gökdemir-Bulut & Bozo, 2018). Regarding the validity evidence for the scale, Spearman’s correlation between ELQ and DJGLS, EAQ and BDI was positive and statistically significant. As expected, ELQ scores was positively associated with the DJGLS scores ($r = .63, p < .01$). EAQ scores ($r = .51, p < .01$) and BDI scores ($r = .64, p < .01$).

To assess divergent validity of the questionnaire, the negative relationship of existential loneliness with some concepts was evaluated. It was hypothesized that the existential loneliness to be negatively associated with life satisfaction and meaning in life, consistent with previous studies on loneliness (Mayers et al. 2002; Gökdemir-Bulut & Bozo, 2018; Sjöberg et al., 2017). According to correlational analyses, ELQ scores had a significant negative association with SWLS scores ($r = -.55, p < .01$) and MLQ scores ($r = -.52, p < .01$) (see table 5).

Table 5: Correlation coefficient matrix of measures

Measures	ELQ	SWLS	MLQ-P	MLQ-S	MLQ	EAQ	DJGLS	BDI
ELQ	1							
SWLS	-.555*	1						
MLQ-P	-.626*	.588*	1					
MLQ-S	-.230*	.191*	.316*	1				
MLQ	-.521*	.505*	.855*	.762*	1			
EAQ	.514*	-.413*	-.564*	-.203*	-.496*	1		
DJGLS	.631*	-.503*	-.707*	-.241*	-.614*	.591*	1	
BDI	.646*	-.460*	-.447*	-.144**	-.384*	.512*	.511*	1

*($p < .01$) ** ($P < .01$)

ELQ: Existential Loneliness Questionnaire, SWLS: Satisfaction with Life Scale, MLQ: Meaning in Life Questionnaire (MLQ-P: Presence of Meaning, MLQ-S: Search for Meaning), EAQ: Existential Anxiety Questionnaire, DJGLS: De Jung Gierveld Loneliness, BDI: Beck Depression Inventory.

As suggested by previous researchers (Mayers et al. 2002; Gökdemir-Bulut & Bozo, 2018), depression impacts the relationship between existential and general loneliness. By conducting multiple hierarchical regression test, it was found that depression explains 41% of the variance in existential loneliness ($R^2 = .41$, $F(1, 303) = 217.55$, $p < .001$). Adding general loneliness to the regression equation indicated that general loneliness significantly explained 21% of the variance in existential loneliness beyond the variance explained by depression ($R^2 = .63$, $\Delta R^2 = .21$, $F(1, 302) = 179.49$, $p < .001$). Then, adding existential anxiety to the regression equation indicated that existential anxiety explained 2% of the variance in ELQ scores beyond the variance explained by depression and general loneliness ($R^2 = .65$, $\Delta R^2 = .02$, $F(1, 301) = 16.14$, $p < .001$). Also, adding meaning in life to the regression equation indicated that life meaning explained 3% of the variance in ELQ scores beyond the variance explained by depression, general loneliness, and existential anxiety ($R^2 = .68$, $\Delta R^2 = .03$, $F(1, 300) = 25.11$, $p < .001$). Accordingly, 68% of the variance in ELQ scores was explained by general loneliness, depression, existential anxiety, and meaning in life; this was considered as the indication of convergent validity and thus, 32% of the variance in the Persian ELQ scores was remained unexplained; this implied that existential loneliness is conceptually different from related concepts (divergent validity).

Conclusion

The present study was done to examine dimensional structure of the ELQ and evaluate its psychometric properties in Iranian population. Results from this study provide a promising start for

further development of the existential loneliness scale. The study revealed that the Persian ELQ is a unidimensional scale. Also, there was a good fit for such a model. The questionnaire appeared to be a reliable and valid instrument for assessing existential loneliness of Iranian students. Further studies on different populations with larger sample sizes should be done to examine the generalizability of the findings.

As stated by Mayers et al. (2002) the ELQ was developed as a unidimensional scale particularly assessing the existential loneliness. Results of this study support such an assumption; however, these are not similar to those obtained by Gökdemir-Bulut and Bozo (2018). In examining psychometric properties of the Turkish ELQ, they found three factors, i.e., loneliness in social ties, loneliness in close relationships, and finding meaning in life. The first and second factors seem to be relevant to social and emotional loneliness, respectively. According to them, the ELQ not only measure existential loneliness but also other kinds of loneliness, like interpersonal aspects of loneliness and so it is an aggregate scale. After them, Van Tilburg (2020) investigated the multidimensionality of loneliness instruments. In search for evidence of multiple dimensions of loneliness, he combined the first and second factors— derived from the Turkish adaptation of the ELQ— into one dimension, namely 'existential loneliness in relationships', and finally concluded that the ELQ subscale on relationships does not contribute sufficiently to the loneliness conceptualization, and is weakly homogeneous, insufficiently reliable. According to him, this dimension has similar components found in the conceptualization of social loneliness and emotional loneliness, due to addressing different aspects of loneliness.

The most important reason why Turkish researcher found three dimensions for Turkish ELQ is that they made a big and common mistake in adopting the statistical method for assessing dimensionality. Unfortunately, they performed Factor Analysis using inappropriate method of Principal Component Analysis

(PCA). In fact, PCA is not the correct procedure for the EFA model (Ledesma et al., 2021; Lloret et al., 2017). When data distribution does not follow multivariate normality and the variables are ordinal (e.g., Likert-type scale), the Ordinal Least Square methods (e.g., ULS, MRFA, or DWLS) based on the polychoric correlation matrix, are the most appropriate estimation methods for conducting Factor Analysis (both EFA and CFA), and also the PA is the best option for assessing dimensionality or estimating the number of factors (Ledesma et al., 2021; Rogers, 2021; Zygmunt & Smith, 2014).

At the beginning of this study, the EFA test was conducted on the data (of sample 1) with PCA method with Varimax rotation and Kaiser Normalization. The KMO index was .927 and Bartlett test was significant ($\chi^2(231) = 2909.505, p < 0.001$), and scree plot, factor loadings and eigenvalues suggested a four-factor structure. But there were several reasons why the Persian ELQ should be treated as unidimensional. The most important reason was that the factors were not theoretically meaningful (Watkins, 2018) and items loaded under those factors could not be appropriately related and integrated into common conceptual components. In other terms, sum of the items and sum of the factors could not be theoretically meaningful and did not contribute to the conceptualization of existential loneliness. Another issue was the existence of cross-loadings in regard to the items that loaded under two factors (e.g., 2, 3, 6, 7, 10, 11, 14, & 22) (Watkins, 2018). Most importantly, there are two criteria for unidimensionality suggested by Reckase (1979). When these criteria are met from the EFA results unidimensionality can be concluded: (1) *a factor analysis on the inter-item correlation matrix should show that the first factor accounts for at least 20% of the variance of the unrotated factor matrix*, and (2) *scree plot test should clearly show a sudden drop of eigenvalues, i.e. eigenvalue of the first factor clearly exceed that of the second* (Ajeigbe & Afolabi, 2014; Tharayil, 2012). Results showed that before rotation, almost all items, load on the first factor accounted for 39% of the total variance. As shown in figure 3, the scree plot test also showed a sudden drop of eigenvalues from the first factor to the second, third, and fourth factors. The first factor has the eigenvalue (8.525) clearly exceeded that of the second factor (1.442), third factor (1.274), and fourth factor (1.079). The steep slope showed four factors associated with the loading greater

than eigenvalue of 1, and gradual trailing off showed the rest factors lower than eigenvalue of 1. Among four factors with loadings greater than 1, one extracted communality factor is distinctly higher than others. Accordingly, the questionnaire is unidimensional in nature (Ajeigbe & Afolabi, 2014).

The fact is that the ELQ items address some social and emotional aspects of loneliness, not that they assess social and emotional kinds of loneliness. If the ELQ items measure a kind of loneliness other than existential loneliness, so this would be an important limitation. As a fact, existential loneliness has conceptually some interpersonal aspects so-called loneliness in social ties and loneliness in close relationships. To put it differently, the ELQ is based on a conceptualization of existential loneliness in which interpersonal aspects play a specific role. In the main, "intimate and social relationships are inseparable parts of the composite existential loneliness concept as stated in the literature" (Gökdemir-Bulut & Bozo, 2018, p. 10). It is noteworthy that the ELQ description of existential loneliness (Mayers et al., 2002) concentrates on the quality of interpersonal connections and much of its items pertain essentially to the quality of relationships (Marker, 2019). In fact, the lack of intimacy and close attachments as features of emotional loneliness (Tilburg, 2020), and the lack of social support and companionship as features of social loneliness are those conceptual components constituting the composite concept of existential loneliness.

Found in the literature, sometimes existential loneliness is suggested as the source of both emotional and social loneliness (Mayers & Svartberg, 2001), and sometimes is considered alongside these kinds of loneliness (Tilburg, 2020). In general, existential loneliness may be a cause or be a consequence of social and emotional facets of loneliness. For example, empirical research have revealed that experience of existential loneliness may emerge due to the loss of meaningful interpersonal relationships and feeling of not belonging to others (Olofsson et al., 2021), or due to the loss of friends and social network (Sundström et al., 2018), lack of intimate relationships with people (Mayers et al., 2002; Sjöberg et al., 2017 ;Van Tilburg, 2020), feeling of being abandoned by others, and not being understood by others (Sjöberg et al., 2017; Bolmsjö et al., 2019).

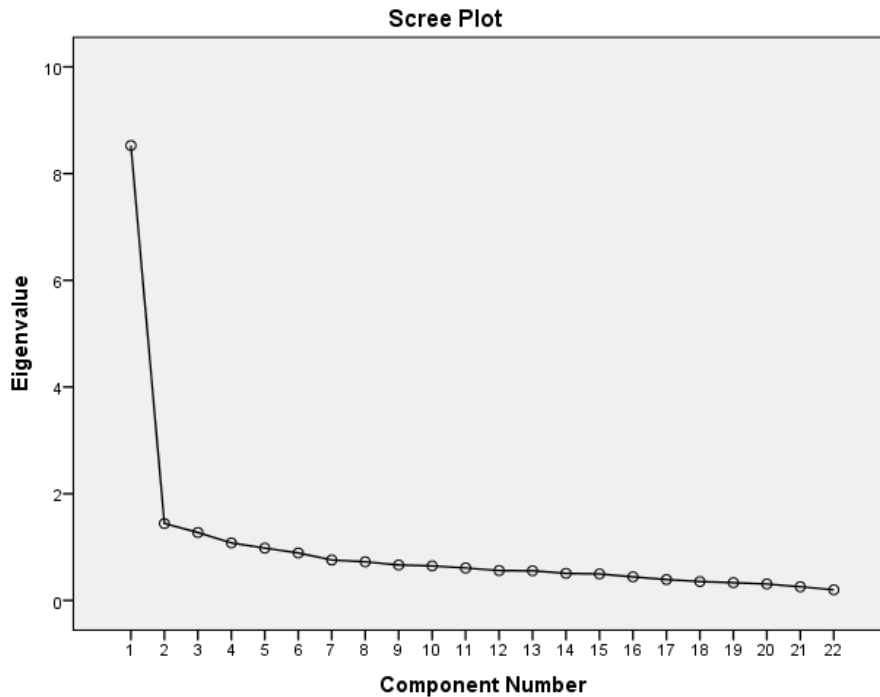


Figure 3: Scree plot of PCA on the 22-item Persian ELQ

It is near impossible to make a sharp distinction between existential and social isolation, since existential isolation is usually accompanied by interpersonal isolation and can be made manageable by interpersonal relationship. As stated by Yalom (1980), social and existential isolation (or loneliness) are closely interrelated and also have many common boundaries. In his view, major defences are usually relational in nature and fear of existential isolation is driving force behind many interpersonal relationships. Common defences are close attachment, constant searching for love, enduring unsatisfactory relationships, etc. (Yalom, 1980).

Therefore, the problem of the ELQ is that most of its items are related directly or indirectly to interpersonal aspects, such as social and emotional. According to Mayers et al. (2002), some items (e.g. 3, 6, 8, 20 & 21) measure the extent to which one feels connected to others; such items are based on the idea that "relationships can assuage a fundamental sense of isolation, and that 'a terror of non-being' may emerge in their absence" (p. 1186). The item 9 (If I had the right relationship, I would never feel alone) refers to the crucial role of interpersonal relationships in confronting with loneliness. Also, items 10 (I stay in bad relationships too long in order not to be alone) and 11 (I immediately get involved in new relationships as soon as I break up) are directly related to interpersonal defences against the sense of existential loneliness. In addition, items 6 (I feel lonely), 7 (I feel I have people I can trust and rely on if I need them), 13 (I feel alone) and 22 (I feel hopeless about having a romantic relationship) are strongly associated with emotional aspects.

Here, one matter requiring attention is that these items are actually related to the basic conditions such as social and emotional isolation that can constitute existential loneliness. In other terms, it is often emotional and social isolation that underlies existential loneliness. Ultimately, if we consider existential loneliness to be a multifaceted phenomenon which has interpersonal and intrapersonal levels, the problem goes away.

As previously indicated, there was a strong and positive association between ELQ and DJGLS scores. This strong association reveals that the two scales have something in common, or each includes particular items pertaining to the same conceptual element (e.g. lack of intimacy, social support, and companionship). This explains similarities in the conceptualization of existential loneliness and other kinds of loneliness assessed by the DJGLS. Similarly, there was a strong negative association between the ELQ and MLQ, in a way that low scores in presence of meaning was strongly associated with high scores in existential loneliness. This indicates that both scales have several elements in common, or items addressing purpose, goals and meaning in life (e.g. items 1, 2, 17, 18, and 19 in the ELQ).

Additional theoretical developments and conceptual analyses regarding social, emotional, and existential loneliness will prove helpful, as these concepts are conflated and interrelated.

Limitations

First, the fact that the data was collected via online survey using self-reporting questionnaires and that participants were recruited by social media platform, may have reduced the generalizability of the results. Second, the study on the structure, validity, and reliability of the ELQ was conducted on two samples of university students, therefore, further studies needed to be performed on different populations with diverse demographic characteristics and larger sample sizes to settle with the issues of generalizability.

Conclusion

As a result, in this study the Persian ELQ was developed and its psychometric properties were examined. It was found that the ELQ is a unidimensional scale which has an adequate internal consistency and reliability. Also, analyses showed good convergent and discriminant validity. The ELQ scores was positively correlated with its relevant negative psychological constructs, i.e. general loneliness, depressive symptoms, and existential anxiety, and was negatively correlated with positive and healthy psychological functioning, i.e. meaning in life and satisfaction with life. In conclusion, the Persian version of the ELQ is a psychometrically suitable instrument which can be applied by psychologists or mental healthcare professionals to study the incidence and intensity of existential loneliness among Iranian university students.

Acknowledgement

The authors would like to thank all participants who contributed in this research.

Data Availability

The raw data supporting the conclusions of this article will be made available on a reasonable request from the corresponding author.

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