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Title page: psychometric properties of literacy of suicide scale (LOSS) in iranian population: long form

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Abstract

Introduction Suicide and suicide attempts are among the most important indicators of mental health in the world. In this research, the validity and reliability of Literacy of Suicide Scale (LOSS) was examined in general people over the age of 18.

Methods This cross-sectional psychometric study was conducted in 2022 among 952 general population in Iran. Participants were selected by two methods of proportional stratified sampling and simple random sampling. The internal consistency of the tools was assessed using Cronbach's alpha coefficient, and McDonald omega coefficient. Also, test-retest reliability was checked by Intraclass Correlation Coefficient (ICC).

Results In the confirmatory factor analysis section, the factor loading of all questions were above 0.4 and one questions were deleted and final model with four factors and 25 questions was confirmed (Some of goodness-of-fit indexes: AGFI = 0.910, RMSEA = 0.050, IFI = 0.901, and $\chi^2/df = 3.333$). For all questions, the Cronbach's alpha coefficient was 0.859, McDonald omega coefficient was 0.866, and ICC was 0.895. Finally, the Persian long version of LOSS was approved with 25 items and four subscales: causes/triggers (9 items), risk factors (7 items), signs and symptoms (5 items) and treatment/prevention (4 items).

Conclusion The Persian long version of LOSS with four subscales and 25 items is an appropriate tool to investigate the state of suicide literacy in the public population.

Keywords Validity, LOSS-26, Reliability, Literacy of suicide, Health literacy suicide, Public population

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Introduction

Suicide is a conscious act that leads to death [1]. Suicide and suicide attempt are an important issue of public concern. In other words, suicide and suicide attempt are among the most important indicators of mental health for individuals in society [2]. The number of suicides has been on the rise over the past 50 years, and in many countries actual suicide rates are not published due to cultural and ethnic concerns [3].

According to the results of the 2020 systematic review, the prevalence of suicide beliefs in the general population was 12.9%, with 15.8% among women and 5.2% among



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men. Also, the prevalence of suicide was 8.8% after a disaster [4]. The results of another systematic review in 2020 showed that the prevalence of suicide beliefs ranged from 9.7 to 58.3%, and the suicide rate ranged from 0.7 to 14.7% [5].

The results of a study in Iran showed that suicide rates are high, with most suicides occurring between the ages of 20 and 29 [6]. Health literacy is one of the variables that affects people's behavior [7]. High health literacy has many benefits such as prevention, early diagnosis and intervention in the early stages, and reduced symptoms related to the disease [8]. Suicide literacy is part of mental health literacy and is defined as an understanding of warning signs/ symptoms, causes/ triggers, risk factors, and treatment/prevention [9]. About 80% of those who commit suicide showed signs and symptoms before acting. These results demonstrate the need for suicide literacy in the community and suggest that increasing suicide literacy in the community can help prevent these behaviors [10]. These symptoms are associated with talks about suicide, has a problem in eating or sleeping, experience severe changes in behavior, exit from social activities or friends, gives you its valuable assets, have already committed suicide, takes unnecessary risks, busy with the thought of death and dying, increases the use of alcohol or drugs, loses his interest in his personal appearance [10].

Low literacy in suicide refers to limited public knowledge about suicide, and this low level of literacy can affect people with suicide thoughts or behaviors [11]. Scientific evidence suggests that individuals with misconceptions about risk factors, treatments, and symptoms of suicide behavior may be at risk for suicide thoughts or behavior [11]. Low awareness of suicide also hinders access to specialized mental health services [12]. Another study showed a positive significant correlation between suicide literacy and seeking psychological help, and increased levels of suicide literacy can increase help seeking [13]. The results in studies in different countries have shown that the rate of suicide literacy is low [14–17].

Appropriate tools are needed in order to examine individual conditions in different domains and to design and implement appropriate educational and interventional programs [18]. In Iran, no instrument was observed to examine the state of suicide literacy. One of the best tools for examining suicide literacy is a questionnaire designed by Calcar et al. The questionnaire contains 26 questions that evaluate people's knowledge of suicide and in four areas, including signs/ symptoms of suicide, causes/ triggers, risk factors, treatment and prevention [19]. This tool has been evaluated in several studies in different countries [13, 16, 20–23]. Due to the lack of appropriate suicide literacy tools in Iranian community and the need

for availability of this scale, this psychometric study was conducted among general population in Iran.

Methods

This cross-sectional study assessed the psychometric properties of long version of LOSS among 954 Iranian public participants in Gonabad city in 2022.

Sample size

In factor analysis, sample size of 100, 200, 300, 500, 1000 and more are considered poor, fair, good, very well, and excellent, respectively [24, 25]. In the CFA section, the sample size of 954 participants was chosen to assess CFA.

Sampling

In this study, two methods of proportional stratified sampling and simple random sampling were used for the selection of participants. At first, the number of health care centers and their population in Gonabad city was identified. Any healthcare center is then considered a stratum, and within each stratum, participants are selected by simple random sampling. Inclusion criteria of age over 18 years, no cognitive problems, residency in Gonabad city for more than one year and informed consent were considered in selecting the participants.

Instruments

- 1) **Demographic section:** In this section, issues such as marital status, age, occupation, sex, and education level were examined.
- 2) **Literacy of Suicide Scale (LOSS-26):** The long version of LOSS was designed and assessed by Calcar et al. This scale consists of 26 questions that survey the people's knowledge of suicide and in four dimensions of signs and symptoms (5 items), causes/ triggers (10 items), risk factors (7 items), and treatment and prevention (4 items) [26]. The questions are measured as "true", "I don't know" and "false". Each question has a correct answer and each answer is awarded one point. To the each "wrong answer" and "I do not know answer" the zero score and to each "correct answer" one score are assigned. In view of the fact that 1 question was finally deleted in this study, the questionnaire was determined to be 25 questions, and the item scores ranged from 0 to 25, with high scores indicating good suicide literacy.

Translation/ cultural adaptation section

This part was checked by WHO Guideline [27]. Before translated the tool, from the designer of the questionnaire, got permission. First, the original English version of LOSS was translated into Persian by two psychologists and health education and health promotion, and the two translated scale were compared and a single Persian

version of the LOSS was created. In the next step, the Persian version of the LOSS was translated into English by two experts and then compared with the original English version of the LOSS. After that, the English version was translated into Persian and the final Persian version of LOSS was created.

Validity

Based on the source, quantify of content validity and quantify of face validity are not required for standard questionnaires [28]. Because in this study, the LOSS is a standard questionnaire, only quality method was used for evaluation the face and content validity. To investigate the quality content face method, the final version of Persian was examined in terms of the desirability of the expressions in terms of clarity (use of simple and understandable words), the use of a common language (avoiding technical and specialized words). To investigate the quality content validity method, the questionnaire was examined by the specialists in terms of grammar compliance, the use of appropriate words, the importance of items, the placement of items in their proper place, the time to complete the designed tool.

CFA The software of AMOS V.24 was used to evaluate the CFA. Before the running the CFA, the Mahalanobis test was used to determine the outlier’s data and eliminate inappropriate data. Also, kurtosis and skewness tests were used to check the normality of the data. The final model was assessed by using the goodness of fit indexes of RMSEA (root mean square error of approximation),

IFI (incremental fit index), PCFI (parsimony comparative fit index), GFI (goodness of fit index), PGFI (parsimony goodness of fit index), CFI (comparative fit index), χ^2/df (chi-square ratio to degree of freedom), AGFI (adjusted goodness of fit index), and PNFI (parsimonious normed fit index) [29–31]. Standard indexes to confirm the final model are RMSEA less than 0.08, χ^2/df less than 5, PNFI, PGFI, and PCFI more than 0.5, CFI, IFI, and GFI more than 0.9, and AGFI more than 0.8 [29–32].

Reliability

SPSS software version 20 was used to survey the internal consistency (Cronbach’s alpha coefficient). For internal reliability, a range score between 0.70 and 0.95 is acceptable [33, 34]. The McDonald’s omega coefficient was checking by using JASP (Version .0.11.1). In this study, 30 participants were selected to assess test-retest reliability (twice, over a one-month period). To check test-retest reliability, the Intraclass correlation coefficient (ICC) was used, and $ICC > 0.80$ is acceptable [35]. For calculation the ICC, the model of Two- Way Mixed and type of Absolute Agreement were used.

Results

Demographic characteristics

The mean (\pm standard deviation) age of people was 33.35 (± 12.96). Most of people were married ($n=532, 55.9\%$) and female ($n=501, 88.9\%$). The occupational status of most people were university students ($n=375, 39.4\%$), employed ($n=250, 26.3\%$), and self-employed ($n=136, 14.3\%$), respectively. The educational level of the majority was a bachelor’s degree ($n=350, 36.8\%$) and a diploma ($n=265, 27.8\%$). Additional demographic information is included in Table 1.

Validity assessment

Qualitative face validity and content validity were evaluated by 8 exerts (Psychologist and health education and promotion) and also by some participants. In this section, 5 questions were modified.

CFA

Based on the results, all goodness-of-fit indexes were acceptable (for example: $\chi^2/df=3.333, RMSEA=0.050, IFI=0.901, AGFI=0.910$) (Table 2). In this section, the factor loading of all questions were above 0.4 and only one question (S10: A person who suicides is mentally ill) was deleted and final model with four factors and 25 questions was confirmed (Table 3; Fig. 1, Table S1).

Reliability assessment

For all questions of LOSS (25 items), the Cronbach’s alpha coefficient was 0.859 and McDonald omega coefficient was 0.866. In test-retest, for all questions ICC

Table 1 Frequency distribution of demographic characteristics ($n=952$)

Variables		N	%
Sex	Male	451	11.1
	Female	501	88.9
Marital status	Married	532	55.9
	Single	397	14.7
	Divorced	23	2.4
Occupation	Housewife	103	10.8
	University student	375	39.4
	Employed	250	26.3
	Retired	48	5
	Self-employed laborer	136	14.3
Education level	Unemployed	22	2.3
	Illiterate	18	1.9
	Elementary school	2	0.2
	Middle school	17	1.8
	High school	25	2.6
	Diploma	35	3.7
	Associate degree	265	27.8
	Bachelor degree	136	14.3
	Master’s degree or high degree	350	36.8
		122	12.8

Table 2 The model fit indicators of the Persian version of long form of LOSS

Goodness of fit indices	Confirmatory factor analysis	Acceptable value
χ^2	883.160	-
df	265	-
χ^2/df	3.333	< 5
P-value	0.000	$P > 0.05$
CFI	0.901	> 0.9
GFI	0.927	> 0.9
RMSEA	0.050	< 0.08
IFI	0.901	> 0.9
PNFI	0.763	> 0.5
PCFI	0.795	> 0.5
PGFI	0.756	> 0.5
AGFI	0.910	> 0.8

was 0.895. Reliability results for causes/triggers, risk factors, signs/symptoms, and treatment/prevention are mentioned in Table 4. Based on the results of Table 5,

there was a significant positive correlation between all subscales ($p < 0.001$) (Table 5).

Discussion

Based on a literature review, no psychometric studies of LOSS have been investigated in Iranian populations. The original LOSS questionnaire consisted of 26 questions, in this study, 1 item was removed after evaluation, and the modified Persian version was confirmed as 25 items and 4 factors. Based on the results, the Persian version appears to be useful for measuring LOSS for age groups of different literacy levels in the community.

Previous studies suggest that the McDonald's omega coefficients provide a more accurate approximation of scale reliability and is a more reasonable indicator than internal compatibility than Cronbach's alpha. Therefore, when creating a new criterion, the reliability coefficient above 0.70 is considered acceptable [36, 37]. In this study, the Omega McDonald coefficient and Cronbach's alpha coefficient were used to measuring the reliability of the instrument, which were appropriated values 0.866 for

Table 3 Factor loadings of the Persian version of long form of LOSS

Subscales	Items	Factor loadings
F1: Causes/triggers	1. If you asked someone directly 'Do you feel like killing yourself?' it will likely lead that person to make a suicide attempt (F)	0.406
	2. Those who attempt suicide do so only to manipulate others and attract attention to themselves (F)	0.577
	3. Very few people have thoughts about suicide (F)	0.565
	4. If assessed by a psychiatrist, everyone who suicides would be diagnosed as depressed (F)	0.591
	5. A suicidal person will always be suicidal and entertain thoughts of suicide (F)	0.623
	6. Talking about suicide always increases the risk of suicide (F)	0.522
	7. Motives and causes of suicide are readily and easily established (F)	0.515
	8. Media coverage of suicide will inevitably encourage other people to attempt suicide (F)	0.485
	9. Most people who attempt suicide fail to kill themselves (T)	0.527
	10. <i>A person who suicides is mentally ill (F)</i>	<i>Deleted</i>
F2: Risk factors	11. Most people who suicide are psychotic (F)	0.558
	12. People with relationship problems or financial problems have a higher risk of suicide (T)	0.512
	13. A person who has made a past suicide attempt is more likely to attempt suicide again than someone who has never attempted (T)	0.512
	14. Men are more likely to suicide than women (T)	0.497
	15. People who are anxious or agitated have a higher risk of suicide (T)	0.570
	16. There is a strong relationship between alcoholism and suicide (T)	0.513
	17. Most people who suicide are younger than 30 (F)	0.489
F3: Signs and symptoms	18. Not all people who attempt suicide plan their attempt in advance (T)	0.614
	19. People who talk about suicide rarely kill themselves (F)	0.610
	20. People who want to attempt suicide can change their mind quickly (T)	0.591
	21. Most people who suicide don't make future plans (F)	0.539
	22. A time of high suicide risk in depression is at the time when the person begins to improve (T)	0.581
F4: Treatment/Prevention	23. Nothing can be done to stop people from making the attempt once they have made up their minds to kill themselves (F)	0.709
	24. Only experts can help people who want to suicide (F)	0.616
	25. People who have thoughts about suicide should not tell others about it (F)	0.681
	26. Seeing a psychiatrist or psychologist can help prevent someone from suicide (T)	0.556

*F = False, T = True

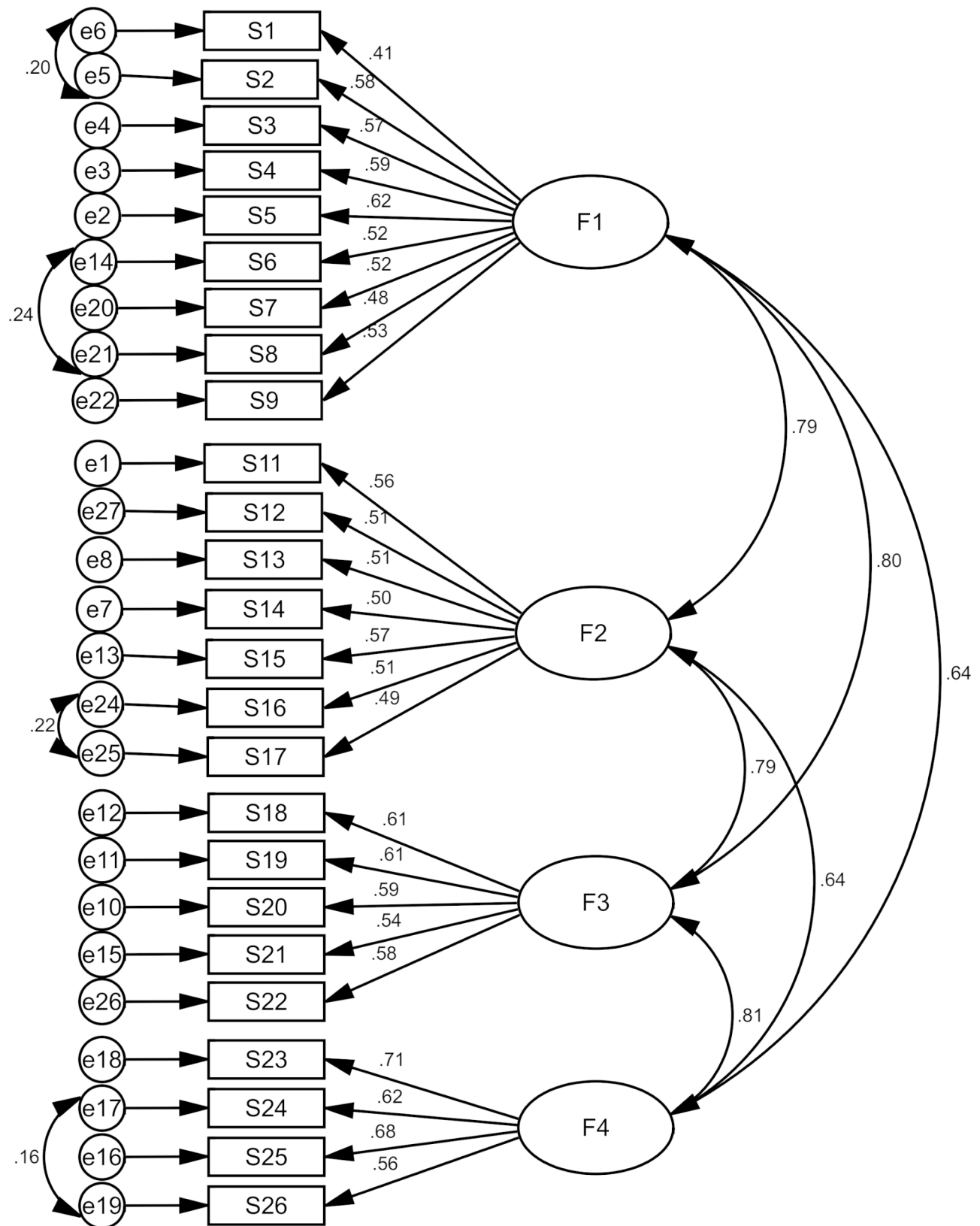


Fig. 1 Standardized parameter estimates for the factor structure of the of long form of suicide literacy (F1: Causes/triggers, F2: Risk factors, F3: Signs/symptoms, F4: Treatment/Prevention)

Table 4 Descriptive statistics of the Persian version of long form of LOSS

Subscales	Item	Range	Cronbach's alpha coefficients	McDonald's omega coefficients	Intraclass Correlation Coefficient (ICC)	95% Confidence Interval		P-value
						Lower Bound	Upper Bound	
Factor 1: Causes/triggers	9	0–9	0.624	0.640	0.885	0.761	0.945	< 0.001
Factor 2: Risk factors	7	0–7	0.792	0.799	0.900	0.793	0.952	< 0.001
Factor 3: Signs and symptoms	5	0–5	0.706	0.722	0.925	0.840	0.964	< 0.001
Factor 4: Treatment/Prevention	4	0–4	0.640	0.684	0.906	0.803	0.955	< 0.001
Total LOSS	25	0–25	0.859	0.866	0.895	0.781	0.950	< 0.001

Table 5 Pearson correlation between subscales of long form of LOSS

Subscales		Causes/triggers	Risk factors	Signs and symptoms
Causes/triggers	Pearson Correlation	1		
	Sig. (2-tailed)			
Risk factors	Pearson Correlation	0.583**	1	
	Sig. (2-tailed)	0.000		
Signs and symptoms	Pearson Correlation	0.600**	0.579**	1
	Sig. (2-tailed)	0.000	0.000	
Treatment/Prevention	Pearson Correlation	0.470**	0.476**	0.569**
	Sig. (2-tailed)	0.000	0.000	0.000

** Correlation is significant at the 0.01 level (2-tailed).

McDonald's omega coefficients and 0.859 for Cronbach's alpha. Also, the ICC rate for all questions is 0.895, which is acceptable. Although there is no similar study examining the psychometric characteristics of LOSS in Iran, but in Rafati study [38], only the psychometric characteristics of another questionnaire designed to examine social attitudes to suicide were examined. In Rafati study, the Persian version of the Social Attitudes to Suicide Questionnaire was validated and Cronbach's alpha (0.94), McDonald's omega coefficients (0.943) and ICC index (0.998) were acceptable [38].

In our study and in the CFA stage, one question was deleted from the original version and the final version of the Persian LOSS was confirmed with 25 questions and four factors of causes/ triggers (9 questions), risk factors (7 questions), sign/symptoms (5 questions), and treatment/ prevention (4 questions). One of the reasons for deleting item S10 ("A person who suicides is mentally ill") may be that the concept of this issue is not easily understood by the Iranian public unless. On the other hand, the concept and meaning of item S10 is somewhat similar to item 11, and it can even be said that item S11 is easier for Iranian people to understand than item S10.

In a study, the Malaysian version of the LOSS with the Rasch model was validated with a one-dimensional scale and 26 items [18]. The difference in dimensionality can be attributed to the model used, since one of the assumptions of the model is that it is one-dimensional. As can be seen in our study, all the dimensions of the main questionnaire were confirmed, although one question was removed from the final version.

According to the results of the Öztürk study, the Turkish version of LOSS based on Item Response Theory showed a single subscale with an ICC calculation of 0.87 [23]. Therefore, the observed difference is somewhat justified and due to the differences between the models used. In the Chan study in the Australian medical students, Cronbach's alpha was reported 0.71 for LOSS questionnaire [20].

Studies that investigated the process of suicide and its death over five years in southern Iran showed that the suicide process had increased during the period under investigation in the general population [39] as well as adolescents [40], and the elderly [41]. Therefore, given the importance of the suicide and the use of this tool in other countries [18, 20, 23], this valid and reliable instrument can be used to determine the status of suicide literacy of the Iranian population and take necessary preventive programs if needed.

Strengths and limitation

Limitations of this study include changes and reductions in the number of questions of the modified Persian version of the questionnaire compared to the original version, resulting in changes in the questionnaire scores. One of the strengths of this study is the use of a high sample size and examination in public population from different age and social groups. Another limitation of this study is that school-age students (15 to 18 years old) were not included in the study, therefore, this may reduce the external validity of the study.

Conclusion

The Persian long version of LOSS with four subscales and 25 items is a valid and reliable instrument. Therefore, given the number of appropriate questions and ease

of use, it will be used to investigate the status of suicide literacy in different populations and different groups and finally, help health decision makers design and implement appropriate intervention programs if necessary.

Abbreviations

LOSS	Literacy of Suicide Scale
CFA	Confirmatory factor analysis
F1	Causes/triggers
F2	Risk factors
F3	Signs and symptoms
F4	Treatment/Prevention
PCFI	parsimony comparative fit index
AGFI	Adjusted goodness of fit index
GFI	Goodness of fit index
IFI	Incremental fit index
RMSEA	Square error of approximation
PNFI	Parsimonious normed fit index
PGFI	Parsimony goodness-of-fit index
x2/df	Chi-square ratio to degree of freedom
CFI	Comparative fit index

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-023-15528-8>.

Supplementary Material 1

Acknowledgements

We would like to thanks to Social Development and Health Promotion Research Center, Gonabad University of Medical Sciences. Also, we would like to thanks all people who assisted the authors to run this research project.

Author' contributions

Authors MN, AJ, MM, AGh, and AM designed the study. MN, AJ, MM, AGh, and AM participated in the conception of the study. MM, AM and AJ managed and conducted the statistical analyses and interpreted the data. AJ and MN wrote the first draft and AJ, MN, MM, and AM revised it to make the final manuscript. All authors have approved the final manuscript.

Funding

This study was received financial support from Social Development and Health Promotion Research Center, Gonabad University of Medical Sciences.

Data Availability

All data generated or analysed during this study are included in this published article.

Declarations

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

This study is based on a research project approved by Ethics Committee of Gonabad University of Medical Sciences with the code of ethics IR.GMU.REC.1401.090. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable. Written Informed Consent was obtained from all subjects.

Consent for publication

Not applicable

Received: 6 February 2023 / Accepted: 26 March 2023

Published online: 30 March 2023

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