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Psychometric properties of the Persian version of the suicidal intrusions attributes scale (SINAS) in patients with suicidal attempt

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Abstract

Background The Suicidal Intrusions Attributes Scale (SINAS) is a brief self-report measure designed to assess the frequency, distress, and controllability of suicidal intrusions—vivid, uncontrollable mental images and thoughts related to suicide or its aftermath. Despite its clinical relevance, its psychometric properties remain underexplored. This study aimed to evaluate the psychometric properties of the Persian version of the SINAS.

Methods A cross-sectional design was employed. 304 outpatients (aged 18 to 65, $M = 27.27$, $SD = 8.53$) including 243 males and 61 females with a history of suicide attempts were recruited using a convenience sampling method from psychiatric clinics and hospitals in Tehran. Participants completed the SINAS along with the Beck Depression Inventory-II (BDI-II) to assess depressive symptoms, the Beck Hopelessness Scale (BHS) to measure negative expectations about the future, the Beck Scale for Suicide Ideation (BSSI) to evaluate suicidal thoughts and intentions, and the Suicide Behaviors Questionnaire-Revised (SBQ-R) to assess past suicidal behaviors and future risk.

Results Confirmatory factor analysis supported a one-factor structure of the SINAS, which was invariant across gender groups. The scale demonstrated strong internal consistency and good test-retest reliability over a two-week interval. Additionally, the SINAS showed significant associations with depressive symptoms, hopelessness, suicide ideation, and suicide risk behaviors, supporting its convergent validity.

Conclusions Overall, the findings indicate that the Persian version of the SINAS is a valid and reliable instrument for assessing suicidal intrusions in both clinical and research settings in Iran.

Keywords Suicide, SINAS, Reliability, Validity, Factor structure

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Background

Suicidal intrusions refer to vivid, involuntary thoughts or mental images related to suicide or its fatal consequences [1, 2]. These intrusions may range in content from visualizations of future suicide attempts—such as jumping from a high place—to imagined reactions of loved ones to one's death. Research suggests that initially, these intrusive thoughts can serve as a coping mechanism to avoid distressing experiences [1–4]. However, as the intensity of these intrusions increases, they often become distressing and unpleasant for some individuals [5]. Studies indicate that suicidal intrusions occur across a range of psychiatric conditions, including unipolar and bipolar depression [6–8], as well as borderline personality disorder [9].

Suicidal intrusions are a particularly significant phenomenon, as they may increase the risk of engaging in suicidal behavior [10]. Unlike verbal thoughts, mental imagery has a unique ability to amplify motivation toward action [11]. Moreover, research has consistently shown that individuals experiencing suicidal intrusions report more intense suicidal ideation than those who do not experience these intrusions [9]. In addition, individuals who visualize suicide tend to exhibit a higher preoccupation with suicide compared to those who only experience verbal suicide-related thoughts [3]. Among vulnerable populations, such as adolescent psychiatric inpatients, suicidal imagery has been linked to an elevated risk of suicide attempts [5]. Similarly, studies involving undergraduate students have reported that suicidal imagery is associated with a greater likelihood of developing both suicide plans and attempts [12].

Due to the significance of suicidal intrusions, various tools have been created to assess this phenomenon. One such measure is the Suicidal Cognitions Interview (SCI; 13), which evaluates the presence, nature, and characteristics of suicidal intrusions and cognitions in both clinical and general populations. The SCI is a semi-structured interview designed to capture verbal thoughts and mental imagery related to suicide by prompting individuals to provide examples and rate them based on distress level, vividness, and time spent on the imagery. While the SCI offers an in-depth exploration of suicidal cognitions, its application in clinical settings is challenging due to its time-intensive nature and limited psychometric validation. Additionally, the interview was originally developed based on imagery experiences observed in individuals with social phobia, agoraphobia, and post-traumatic stress disorder, rather than being specifically tailored to populations at risk for suicide [13, 14]. Meanwhile, to address the absence of self-report measures in this area, Ko and You [15] introduced the Suicidal Imagery Questionnaire (SIQ). This 10-item scale is composed of two subdimensions: spontaneous suicidal imagery (six items) and intrusive suicidal imagery (four items). A review found that the SIQ demonstrates strong psychometric properties [16], however, the scale has only been tested in a non-clinical Korean sample and more studies are needed to examine its psychometric properties. Additionally, while the intrusive suicidal imagery subscale assesses the presence of such thoughts, it does not capture key characteristics like vividness, intensity, and the extent to which they can be controlled [14].

To fill these gaps in the literature and address the need for a brief self-report measure specifically designed to screen for suicidal intrusions, van Bentum et al. [14] developed the Suicidal Intrusion Attributes Scale (SINAS). This 10-item instrument assesses the severity of suicidal intrusions experienced over the past week, providing a quick and efficient tool for evaluation. It focuses explicitly on suicide-related mental images, assessing their intensity, compulsiveness, and intrusiveness. The scale includes six distinct attributes of suicidal intrusions. The first two attributes, frequency and controllability, address the ruminative nature of suicidal imagery. The third attribute, closeness to attempt, reflects how suicidal intrusions may escalate toward actual behavior. The fourth and fifth attributes measure the distress and vividness of these images, while the sixth attribute captures the compulsive nature of suicidal intrusions [14]. The initial factor structure study of the SINAS involved 168 outpatients from mental health institutions in the Netherlands, all of whom were experiencing suicidal ideation and receiving outpatient treatment for depressive symptoms. The results supported a one-factor model with strong internal consistency (Cronbach's $\alpha = 0.91$) and showed expected correlations with related measures, such as Suicidal Ideation Attributes Scale (SIDAS) scores and depression severity scores, supporting the convergent validity of the SINAS. Overall, findings from this study suggest that the SINAS may serve as a valuable screening tool for assessing suicidal intrusions in both research and clinical contexts.

Despite its initial validation, significant gaps remain in the literature regarding the psychometric properties of the SINAS, which must be addressed before its broader application in research and clinical settings. First, aside from the original study, no other research has explored the psychometric properties of the SINAS, highlighting the need for further investigation across diverse populations and cultures. Cultural differences, particularly between Western and Eastern contexts, may influence how individuals interpret and rate items related to psychological constructs like suicidal intrusions [17, 18]. Therefore, studies examining the SINAS in Middle Eastern populations are essential to enhance its cross-cultural validity. Second, the measurement invariance (MI) of the SINAS across gender groups has yet to be assessed. MI

is critical, as it verifies that the measure operates consistently across groups, a prerequisite for valid group comparisons and for generalizing findings across different groups (e.g., [19]). Finally, while the SINAS demonstrated good internal consistency ($\alpha = 0.91$), its test-retest reliability has not yet been examined. Establishing test-retest reliability is crucial to determine the stability of the measure over time.

The current study

To address the aforementioned gaps in the literature, the current study aimed to examine the factor structure, measurement invariance, internal consistency, and convergent validity of the Persian version of the SINAS in a sample of outpatients with a history of suicide attempts. First, a confirmatory factor analysis (CFA) was performed to evaluate the fit of the proposed one-factor model. Next, measurement invariance (MI) of the one-factor SINAS was examined across gender groups to determine whether the scale operates consistently across these groups. Following this, the internal consistency of the SINAS was examined using multiple reliability indices, as well as test-retest reliability to assess its stability over time. Finally, to assess convergent validity, the correlations between the SINAS scores with measures of suicide ideation, depression, and hopelessness, were examined as these constructs are theoretically and empirically linked to suicidal intrusions. Specifically, since suicidal intrusions involve distressing, uncontrollable thoughts and mental imagery related to suicide, individuals experiencing higher levels of suicidal intrusions are also likely to report greater suicide ideation, depressive symptoms, and hopelessness [20]. Therefore, significant positive associations were expected between the SINAS and these measures.

Method

Participants and procedure

This study employed a cross-sectional design. The sample size was determined based on established guidelines for factor analysis and measurement invariance (MI) testing. Muthén and Muthén [21] recommend a minimum sample of approximately 150 participants for adequate confirmatory factor analysis (CFA), while Kline [22] suggests that at least 100 observations per group are necessary for robust MI analyses. Additionally, a common rule of thumb suggests recruiting 10 to 15 participants per item of a measure, which would correspond to a sample of 100 to 150 participants for the 10-item SINAS. To enhance the statistical power and robustness of our findings, we opted for a larger sample. Consequently, the study included 304 outpatients (aged 18 to 65, $M = 27.27$, $SD = 8.53$), comprising 243 males and 61 females, recruited through convenience sampling from psychiatric clinics and hospitals in Tehran. All participants had a history of at least one suicide attempt. Inclusion criteria required participants to be at least 18 years old, have adequate proficiency in Persian, and demonstrate willingness to participate in the research. Exclusion criteria consisted of a diagnosis of psychotic disorders, any condition preventing participation, or insufficient physical or mental capacity to engage in the study, as assessed by the data collectors' judgments. In terms of educational background, participants with less than a high school diploma ($n = 88$), high school diploma ($n = 115$), bachelor's degree ($n = 71$), and master's degree or higher ($n = 30$) were included. Regarding marital status, the majority were single ($n = 211$), while married ($n = 74$) and divorced ($n = 19$) individuals were also part of the sample. Participants were ethnically Persian, as the study targeted Persian-speaking individuals.

Prior to data collection, research assistants provided participants with an explanation of the study's objectives and assured them of confidentiality. Informed consent was then obtained, and participants completed the measures under the supervision of specially trained research assistants. This study was first reviewed and approved by the Research Deputy of Aja University of Medical Sciences.

Measures

The suicidal intrusions attributes scale (SINAS)

The SINAS [14] is a 10-item self-report measure designed to assess suicidal intrusions. Each item is rated on a 10-point scale, ranging from 0 (*"Not at all"*) to 10 (*"Constantly"*), evaluating aspects such as frequency, intensity, vividness, uncontrollability of suicidal intrusions over the past week, and perceived proximity to a potential future attempt. Item responses are summed to produce a total score, with higher scores indicating greater severity of suicidal intrusions.

Persian SINAS To ensure an accurate and comprehensive translation of the SINAS from English to Persian, a multi-step process was undertaken. First, the initial translation into Persian was completed by the first author, who is fluent in both languages. Following this, an independent translator back-translated the Persian version into English. Next, a native English speaker compared the back-translation with the original to assess clarity and accuracy. Finally, after reviewing all versions together, the translators and authors discussed any discrepancies and reached a consensus on the finalized Persian version.

The Beck depression inventory-II (BDI-II)

The BDI-II, developed by Beck [23], is a widely used 21-item self-report measure to assess the severity of

depressive symptoms in adolescents and adults. Each item corresponds to a symptom or attitude associated with depression and is rated on a scale from 0 to 3, with higher scores reflecting greater symptom severity. The total score, which represents overall depression severity, is derived by summing all item scores. In this study, the Persian version of the BDI-II was used which has demonstrated acceptable psychometric properties in an Iranian sample [24].

The Beck hopelessness scale (BHS)

The BHS [25] is a well-established self-report measure of hopelessness. This 20-item scale uses true/false statements to evaluate three key dimensions of hopelessness: perspectives on the future, loss of motivation, and expectations. Respondents answer each item based on how they have felt over the past week. The total score, ranging from 0 to 20, reflects the level of hopelessness, with higher scores indicating more pronounced hopelessness. The Persian version of the BHS has demonstrated acceptable psychometric properties in an Iranian sample [26].

The Beck scale for suicide ideation (BSSI)

The BSSI, developed by Beck [27], is a 19-item measure designed to assess the severity of suicidal thoughts. This tool evaluates various dimensions of suicidal ideation, including the frequency, duration, and specific nature of these thoughts. Each item is rated on a scale from 0 to 2, with higher scores indicating greater severity of suicidal ideation. Total scores range from 0 to 38, with elevated scores suggesting a higher risk of suicide. The Persian version of the BHS has demonstrated acceptable psychometric properties in an Iranian sample [28].

The suicide behaviors Questionnaire-revised (SBQ-R)

The SBQ-R [29] is a self-report instrument developed to assess suicide risk factors. It comprises four key items that evaluate dimensions such as suicidal attitudes, ideation, and past or potential future suicide attempts. Each item includes a set of response options that correspond to specific point values, which are then summed to produce a total score ranging from 3 to 18. Higher scores on the SBQ-R indicate a greater risk of suicidal behavior. The Persian version of the SBQ-R has demonstrated acceptable psychometric properties in an Iranian sample [30].

Data analyses

Based on existing literature [17, 31], once the factor structure of a measure has been established in previous research, subsequent validation studies should employ confirmatory factor analysis (CFA) rather than exploratory factor analysis (EFA) to verify the predefined structure. As such, the lavaan package in RStudio (version 2023.3.1.446) was used to conduct a confirmatory factor analysis (CFA) with robust weighted least squares (WLSMV), suitable for ordinal data [32]. Model fit was evaluated using standard fit indices: Comparative Fit Index (CFI; cutoff ≥ 0.90), Tucker-Lewis Index (TLI; cutoff ≥ 0.90), and Root Mean Square Error of Approximation (RMSEA; cutoff < 0.08) [33, 34]. A CFA was performed to test the fit of a one-factor model for the SINAS, where the 10 items served as observed variables loading onto a single latent variable. Next, MI was assessed across three levels: configural, metric, and scalar, to examine whether the factor structure, factor loadings, and item thresholds were respectively consistent across gender groups. The change in CFI (ΔCFI) was used as a criterion for testing MI, with a ΔCFI value below 0.01 indicating minimal change in model fit [35]. If MI was confirmed, gender differences in SINAS scores were examined using Student's *t*-tests, and Cohen's d was calculated to determine effect size, with thresholds of 0.20, 0.50, and 0.80 representing small, medium, and large effects, respectively [36]. The internal consistency of the SINAS was evaluated using Cronbach's alpha (values $\alpha \geq 0.70$ considered acceptable; [35]), McDonald's omega ($\omega \geq 0.70$ considered acceptable; [37]), and the Mean Inter-Item-Correlation (MIC; $0.15 \leq MICs \leq 0.50$ considered adequate; [38]). Also, the intra-class correlation (ICC) was calculated to assess the test-retest reliability of the SINAS over a two-week interval, using a subset of participants from the study sample ($n = 52$). The ICC was interpreted as weak (< 0.50), moderate (0.50 to 0.75), good (0.75 to 90), and excellent (> 0.90; [39]). Finally, to assess the convergent validity of the SINAS, zero-order correlations were calculated between SINAS scores and external correlates, with effect sizes interpreted as follows: ≤ 0.30 = small, 0.30-0.50 = medium, and ≥ 0.50 = strong [36].

Results

Confirmatory factor analysis and measurement invariance

The results of the CFA showed that the one-factor model of the SINAN reached acceptable fit (CFI = 0.987, TLI = 0.984, RMSEA = 0.048 [90% CI: 0.026 – 0.069]). Standardized loadings for the CFA model are also represented in Table 1. In terms of measurement invariance (MI), configural, metric, and scalar invariances were sequentially assessed across gender groups. Results indicated that fit indices fell within acceptable ranges for configural (CFI = 0.999, TLI = 0.999, RMSEA = 0.002 [90% CI: 0.000 – 0.046]),

Table 1 Standardized item loadings for the One-Factor model of the SINAS ($n = 304$)

Item Content	Standardized Loadings
1. How often did you have mental images of your own suicide?	0.66
2. How much control did you feel over these mental images?	0.27
3. How close were you to a suicide attempt?	0.71
4. To what extent have you been tormented by mental images of suicide?	0.52
5. To what extent have mental images of suicide interfered with your daily activities such as work, household, and social activities?	0.78
6. How intrusive were the mental images of suicide you experienced?	0.74
7. How vivid were the images of suicide you experienced?	0.75
8. Could you stop these mental images if you wanted to?	0.26
9. Have you had mental images so clear that they seemed to be real?	0.72
10. Did you feel like you had to have such mental images, like a compulsion you couldn't escape?	0.74

Note. *SINAS* = Suicidal Intrusions Attributes Scale

Table 2 Descriptive information for study variables ($n = 304$)

Measures	Mean	SD	Skewness	Kurtosis	ω	α	MIC
SINAS	58.01	21.68	−0.51	0.01	0.86	0.85	0.38
BDI-II	35.09	12.83	−0.37	−0.31	0.87	0.87	0.28
BSSI	20.42	9.86	−0.11	−0.36	0.92	0.92	0.41
SRB-R	11.74	4.81	−0.45	−0.55	0.85	0.85	0.24
BHS	12.68	5.81	0.99	5.43	0.62	0.60	0.21

Note. SINAS = Suicidal Intrusions Attributes Scale; *BDI-II* = Beck Depression Inventory-II; *BSSI* = Beck Scale for Suicide Ideation; *SBQ-R* = Suicide Behaviors Questionnaire-Revised; *BHS* = Beck Hopelessness Scale; *SD* = standard deviation; *Skew* = skewness; *Kurt* = kurtosis; *α* = Cronbach's alpha coefficient; *ω* = McDonald's Omega; *MIC* = mean inter-item correlation

Table 3 Correlations between SINAS and external correlates of interest ($n = 304$)

Measure	BDI-II	BSSI	SRB-*R*	BHS
SINAS	0.51**	0.48**	0.61**	0.41**

Note. SINAS = Suicidal Intrusions Attributes Scale; *BDI-II* = Beck Depression Inventory-II; *BSSI* = Beck Scale for Suicide Ideation; *SBQ-R* = Suicide Behaviors Questionnaire-Revised; *BHS* = Beck Hopelessness Scale; **$p < .001$

metric (CFI = 0.995, TLI = 0.995, RMSEA = 0.028 [90% CI: 0.000 – 0.055]), and scalar (CFI = 0.998, TLI = 0.998, RMSEA = 0.016 [90% CI: 0.000 – 0.048]) invariances. Moreover, decreases in CFA (ΔCFIs) across MI levels were minimal (ΔCFIs ≤ 0.01), supporting the MI of the model across gender groups.

Descriptive statistics and internal consistency of the SINAS

Table 2 displays the descriptive statistics for all study variables. The SINAS total score demonstrated solid internal consistency, reflected by McDonald's omega ($\omega = 0.86$), Cronbach's alpha ($\alpha = 0.85$), and a mean inter-item correlation (MIC = 0.38). In terms of test-retest reliability, the ICC for single measures was 0.80, indicating good stability of the measure over the two-week interval. Finally, given the establishment of MI for SINAS across gender groups, SINAS scores were compared between males ($M = 57.14$, $SD = 21.81$) and females ($M = 61.44$, $SD = 20.94$). An independent t-test revealed that the groups did not differ significantly in SINAS scores, $t(302) = 1.39$, $p = .17$.

Convergent validity

As presented in Table 3, the SINAS score demonstrated a strong positive correlation with the BDI-II ($r = .51$) and SRB-R ($r = .61$) scores. Additionally, moderate correlations were observed with the BSSI ($r = .48$) and BHS ($r = .41$) scores.

Discussion

This study aimed to examine the factor structure, measurement invariance, internal consistency, and convergent validity of the Persian version of the SINAS in a sample of outpatients with a history of suicide attempts. The results indicated that the one-factor model of the SINAS demonstrated excellent fit, strong internal consistency, good test-retest reliability, and significant correlations with theoretically relevant external variables. These findings are discussed in detail below.

A CFA demonstrated that the one-factor model of the SINAS provided an excellent fit, aligning with the findings of the original study [14]. Meanwhile, standardized loadings for all items, except for item two, exceeded the minimum threshold cutoff of 0.30 [31]. Although the loading for item two (0.27) was slightly below this cutoff, it was close enough to warrant its retention in the model. Given that the low loading may be influenced by the specific characteristics of the current study sample, this item was kept for future research to explore its validity and performance in different contexts. Furthermore, the

one-factor model of the SINAS demonstrated invariance across gender groups, which permits meaningful comparisons between genders. However, findings revealed no significant differences in mean SINAS scores between male and female subgroups. As this study is the first to explore MI of the SINAS and gender differences, future research is needed to further investigate these aspects and confirm the robustness of these findings across diverse populations.

The findings indicated that the SINAS demonstrated strong internal consistency, as evidenced by various internal consistency indices, including McDonald's omega (ω), Cronbach's alpha (α), and the Mean Inter-Item Correlation (MIC). These results are consistent with the findings from the original study [14]. This study also represents the first to examine the test-retest reliability of the SINAS, yielding an ICC of 0.80, which reflects the good stability of the measure over a two-week interval. Overall, these results suggest that the SINAS is a reliable tool for assessing suicidal intrusions, supporting its effectiveness in providing accurate and nuanced assessments. Finally, evidence supporting the convergent validity of the SINAS was demonstrated by its significant positive correlations with measures of related constructs, including depressive symptom severity, suicide risk behaviors, suicidal ideation, and hopelessness [10, 14, 40–42]. These findings align with theoretical expectations, as suicidal intrusions are conceptually linked to these psychological domains, reinforcing the measure's relevance for both clinical assessment and research purposes.

This study provides preliminary evidence supporting the psychometric properties of the Persian version of the SINAS, offering a valuable tool for assessing suicidal intrusions in clinical settings. However, several limitations should be considered when interpreting the findings. First, the reliance on self-report measures may have inflated correlations between SINAS scores and external correlates due to shared method variance. Future research would benefit from a multimethod approach, incorporating clinician-administered assessments or behavioral measures to enhance validity. Second, the cross-sectional design precludes causal inferences and limits the ability to examine the temporal dynamics of suicidal intrusions. Longitudinal studies are necessary to explore how these intrusions evolve over time and their predictive role in suicide-related outcomes. Third, the sample consisted solely of adult patients with a history of suicide attempts, which restricts the generalizability of the findings to other populations, such as adolescents, individuals without prior suicide attempts, or non-clinical groups. Future research should evaluate the SINAS across diverse populations to establish its broader applicability.

Conclusion

The present study provided robust evidence for the psychometric properties of the Persian version of the SINAS in a clinical sample of adults with a history of suicide attempts. The findings confirm the unidimensional structure of the SINAS, its measurement invariance across gender groups, and its strong internal consistency and test-retest reliability over a two-week interval. Moreover, the SINAS demonstrated convergent validity through significant correlations with established measures of depression, hopelessness, suicidal ideation, and suicide risk behaviors, underscoring its utility as a reliable and valid tool for assessing suicidal intrusions. Overall, the SINAS emerges as a valuable tool for both research and clinical practice, offering a nuanced measure of suicidal intrusions.

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Author contributions
SM and MEA were involved in the conceptualization, project administration, research, writing of original draft, and review; SM, MEA, and HZ were involved in supervision, writing, review and editing; MEA conducted data analyses; HZ, SFD, MZM, and FA collected data. All authors have read and approved the manuscript.

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Data availability
The data analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The ethics committee of the Aja University of Medical Sciences first approved this study. All procedures performed in studies involving human participants 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 ethical standards. All participants provided informed consent after explaining the study purpose and assuring confidentiality.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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