Current Psychology
https://doi.org/10.1007/s12144-023-05422-2

Psychometric assessment of the Suicidal Ideation Questionnaire Junior: A two-study validation in Spanish-speaking adolescents

Daniel Núñez[1,2] · César Villacura-Herrera[1] · Jorge Gaete[2,3] · Daniela Meza[2] · Javiera Andaur[1] · Jo Robinson[4,5]

Accepted: 8 November 2023

Abstract

Suicide ideation is prevalent and associated with negative adolescent outcomes, including psychopathology and suicide-related behaviors. Despite the increasing research aimed at improving the capability to predict, the evidence on which of the available tools is best for specific populations or settings, such as educational settings, is inconclusive. We examined the psychometric properties of the Suicidal Ideation Questionnaire Junior (SIQ-JR) through two studies conducted with Spanish-speaking students from the general population. Study 1 ($n_1 = 619$, female = 51.21%) explored the underlying factor structure and internal consistency of the measure. Study 2 ($n_2 = 524$, female = 43.51%) aimed to confirm the factor structure, equivalence of suicidal ideation measurement for male and female subjects, validity, sensitivity, and specificity of the scale. Our results demonstrated that the three-factor structure proposed by the original authors had the best fit. Additionally, there we found good internal consistency for the full scale and subscales in both samples ($\omega \geq .772$; $\alpha \geq .772$). We also found evidence supporting convergent and concurrent validity of the SIQ-JR. Our findings suggest that the SIQ-JR is a valid and reliable measure for the assessment of suicidal ideation in Spanish-speaking adolescents aged 14–19 from the general population.

Keywords SIQ-JR · Suicidal ideation · Spanish speaking adolescents

Introduction

Early identification of adolescents at risk of suicide is a public health priority and a critical challenge in suicide prevention (Wasserman et al., 2021). It requires an accurate assessment of sensitive risk markers (Reichl & Kaess, 2021), including suicidal ideation (SI), which is a common precursor of more severe outcomes like suicide attempts or completed suicide (Mann et al., 2005). Although self-report scales are frequently used, there is still inconclusive evidence about the capacity to accurately predict suicide, their psychometric properties, effectiveness, and applicability in specific contexts and populations (Harris et al., 2019).

SI encompasses thoughts, wishes and preoccupations with death and suicide (Harmer et al., 2023). Despite some controversies on its definition, SI is a coherent construct independent of the items used to assess it, and is worthy of greater empirical, clinical, and policy attention (Mandel et al., 2023). Recent literature highlights its prominent role as predictor of subsequent suicidal behavior (Berman, 2017), its heterogeneous and fluctuating nature (Forkmann et al., 2018; Kleiman et al., 2017), and the current uncertainty about how to interpret, assess and treat it in different settings (Harmer et al., 2023). The evidence about risk factors and mechanisms leading to SI in adolescents shows complex interactions among biological, environmental, and psychological correlates (Kumar et al., 2021). Among environmental correlates, adverse childhood experiences (McKinnon et al., 2016), childhood maltreatment, particularly sexual abuse (Núñez et al., 2022) as well as bullying (Holt et al., 2015) among the most relevant factors. Most mental disorders, particularly depression, are important predictors (Klonsky et al., 2016). However, other factors beyond psychiatric disorders have also been proposed. As

✉ Daniel Núñez
dnunez@utalca.cl

1 Centro de Investigación en Ciencias Cognitivas, Faculty of Psychology, Universidad de Talca, Talca, Chile

2 Millennium Nucleus to Improve the Mental Health of Adolescents and Youths, Imhay, Santiago, Chile

3 Universidad de los Andes, Santiago, Chile

4 Orygen, Parkville, VIC 3052, Australia

5 Centre for Youth Mental Health, University of Melbourne, Parkville, VIC 3010, Australia

Published online: 24 November 2023

summarized by Harmer et al. (2023), these factors include affective (worthlessness; low self-esteem; hopelessness; emotion dysregulation), cognitive (impulsivity/aggression; information-processing biases, memory biases) and social processes (loneliness; thwarted belongingness and perceived burdensomeness).

The associations between depressive symptoms and hopelessness and suicide ideation in adolescents have been well documented (Ribeiro et al., 2018). For instance, Gijzen et al (2021) found higher scores in depression symptoms in adolescent from the general population endorsing suicidal ideation, and Wolfe et al. (2017) reported that hopelessness was related to suicidal ideation over treatment, independent of changes in depression severity, which persisted only for females. Moreover, SI has been related to social problem-solving difficulties in adults (Chu et al., 2018) and adolescents (Speckens & Hawton, 2005), which in turn has been found associated with different internalizing symptoms, including depression (Ruan-Iu et al., 2022). As recently shown, in adolescents, the association between problem-solving and suicidal ideation could be mediated by severity of depressive symptoms (Lopez & Weisman de Mamani, 2020). On the other side, adaptive and maladaptive emotion regulation strategies have been respectively reported as protector and risk factor for suicide ideation (Ong & Thompson, 2019; Villacura-Herrera et al., 2022), but the evidence on these associations is inconclusive. For instance, it has been shown that both strategies could moderate the association between stress and SI and that emotional suppression could be an effective short-term strategy among individuals considering suicide (Franz et al., 2021).

Prior research shows that the severity of suicidal thoughts and the risk of attempting suicide are strongly linked (Nock et al., 2013), and that adolescents with suicidal thoughts and those who attempt suicide are part of the same at-risk population (McAuliffe, 2002). In accordance, the timely detection of severe SI in adolescents and the availability and level of access to referral resources are crucial for prevention (Potard et al., 2014; Wasserman et al., 2021). Self-report screening questionnaires are frequently used for this purpose in clinical and community scenarios (Baek et al., 2021; Ghasemi et al., 2015; Harris et al., 2019). However, the evidence is insufficient to recommend for or against screening for suicide risk (Simon et al., 2023) and there is a lack of consensus about a clinical gold standard for assessing SI (Harmer et al., 2023). Therefore, further research is needed to provide evidence about psychometric properties of available tools (Erford et al., 2017; Runeson et al., 2017) and their accuracy in predicting suicide-related behavior (SRB) in different settings (Harris et al., 2019) and cultures (Chu et al., 2022).

One of these tools is the Suicidal Ideation Questionnaire (SIQ) and its brief version (SIQ-JR; Reynolds, 1987), developed as a screening tool to be used in educational contexts (Hill et al., 2018). It has been used to assess SI in scenarios such as emergency departments (King et al., 2009), psychiatric units (Thompson et al., 2020), ambulatory treatment services (Santamarina-Perez et al., 2020), and schools (Hetrick et al., 2017). The original psychometric studies found good internal consistency reliability (alpha coefficients from 0.93 to 0.97) (Davis, 1992; Keane et al., 1996; Reynolds, 1987, 1991). This was confirmed by Reynolds & Mazza (1999), who additionally reported high test–retest reliability as also shown by King et al. (2014), but only for females. The scale has proved to be a good predictor of future suicide attempts when compared to other measures of distress (Robinson et al., 2016), and it is regarded as an appropriate outcome measure to evaluate interventions aimed at reducing SI in young people (Hetrick et al., 2021).

Contrary to the good results on the reliability of the SIQ-JR (Davis, 1992; Jia et al., 2014), inconsistent findings have been reported concerning its internal structure. For instance, King et al. (2008) found a three-factor structure with 12 items (active ideation, interpersonal ideation, and general ideation), which differs from the full 15-item version initially proposed by Reynolds (1987). Moreover, Zhang et al. (2014), in a Hong Kong community adolescent sample, did not confirm the structure proposed by Reynolds and offered a four-item version of the scale. Additionally, Hill et al. (2018), in American Indian adolescents, found better fit indices for a two-factor structure (a general ideation index and an active ideation index). On the other hand, mixed evidence has also been found concerning the cutoff points. As shown by Keane et al. (1996) a cutoff of 31 was adequate with a sensitivity and specificity of 0.80 and 0.86, respectively. However, when lowering the cutoff point to 20, a higher sensitivity level was reached (0.90). Additionally, Huth-Bocks et al. (2007) found a moderate sensitivity (0.74) and fair specificity (0.47) for a cutoff score of 31 in suicidal versus nonsuicidal psychiatrically hospitalized youth aged 12–17. King et al. (2008) found that a cutoff point of 31 provided a sensitivity of 0.81, which remained stable when the cutoff point was increased. Specificity was low (0.28) and did not improve meaningfully with more stringent cutoff points. Finally, according to Hill et al. (2018), a cutoff of 20 showed marginally better positive and negative predictive values, with sensitivity within acceptable ranges.

To our knowledge, no studies have examined the psychometric properties of the SIQ-JR for adolescents in Chile. Additionally, to date there are no SIQ-JR studies for adolescents from Spanish-speaking Latin-American countries. Considering this research gap, and given both the suitability of self-report questionnaires to assess SI in young people (Czyz et al., 2016) and the well-established need to validate specific instruments to evaluate SI for specific populations (Harris et al., 2019), we examined the psychometric properties of the SIQ-JR through two studies with two different

samples of Spanish-speaking adolescents. In Study 1, we explored the underlying factor structure of the scale. In study two, we tested the factor structure previously reported in the literature and examined for measurement invariance to determine its usefulness for assessing suicidal ideation in both males and females. Additionally, Study 2 allowed us to add evidence of convergent and concurrent validity of this instrument. We also examined potential cutoff values for the severity of suicidal ideation in this population, comparing them with previously established criteria (Hill et al, 2018; Keane et al., 1996). Complementarily, considering the "gender paradox of suicidal behavior" (higher rates of SI in females and higher rates of deaths by suicide in males) and need to accurately measure SI in males and females, we aimed to provide evidence for equivalence of measurement of the latent constructs of the SIQ-JR through measurement invariance analysis based on sex.

Study 1

Materials and methods

Participants

A total of 619 adolescents (female = 51.21%) from ten secondary public schools from Chile were recruited between May and December 2021. Participants' age ranged between 14 to 19 years old (M = 15.943; SD = 1.346). 339 participants (54.77%) reported having no psychiatric treatment history, 203 (32.79%) had psychiatric treatment history in the past, and 77 participants (12.44%) reported currently being on psychiatric treatment. Participants did not receive any financial or academic incentive for participating in the study (See Supplementary Table S1).

Instruments

Suicidal Ideation Questionnaire Junior (SIQ-JR) The SIQ-JR is a 15-item self-report measure designed for assessing suicidal ideation on a 7-point Likert-type scale, where a higher score indicates greater severity of SI. It is a shortened version of the 30-item Suicidal Ideation Questionnaire (SIQ; Reynolds, 1987). The SIQ-JR was developed by Reynolds as a screening tool for the assessment of suicidal ideation in adolescents. Response options range from 1 ('I never had this thought') to 7 ('almost every day'). Scores range from 0 to 90, with a published clinical cut-off score of 31 (Keane et al., 1996). As initially proposed by Reynolds (1987) the scale has a three-factor structure, comprising: a) minor suicidal ideation, associated with general wishes of being dead; b) specific plans and desires for suicide, associated with concrete actions towards suicide; and c) morbid ideation, associated with leaving a suicide note or will. Previous research has reported good internal consistency, with Cronbach alpha for the total scale ranging between 0.917 and 0.978 in adolescents and high school students respectively (Davis, 1992; Jia et al., 2014); along with good construct, criterion, and convergent validity (King et al., 1993; Reynolds & Mazza, 1999), good temporal stability ($r = 0.890$; Reynolds & Mazza, 1999), and good predictive validity (King et al., 1997).

Procedure

We invited ten public schools to participate in the study. We gave information regarding the aims and procedures of the study to school administrative teams during in-person meetings. All ten schools agreed to participate. Upon obtaining each school's written approval, caregivers were contacted and informed at parents' meetings of the characteristics of the study. The confidentiality, voluntary nature of the study, and information on action protocols in case of detecting potential risks or the need for psychological assessment, were explicitly stated. Students received information about the study in their classrooms during school hours. Written and informed consent was obtained from both the caregivers and the students. Participants completed the questionnaires through an online platform. Ethical approval was obtained from the Ethics Scientific Committee of the Universidad de Talca (02-2021).

Data analysis

Before examining the underlying factor structure of the SIQ-JR, we performed the corresponding sample adequacy tests. First, we used the Kaiser-Meyer-Olkin (KMO) test, where a value over 0.80 would provide evidence that the sample is suitable for factor analysis (Watkins, 2018). Second, we performed Bartlett's sphericity test, where a statistically significant result would indicate that the variables are correlated and thus are adequate for structure detection (Bartlett, 1954).

Next, we performed an Exploratory Factor Analysis (EFA) using all fifteen items from the SIQ-JR. The number of factors to be extracted was determined through parallel analysis using a principal axis factoring estimator with an Oblimin rotation. A polychoric correlation matrix was used, as recommended when working with items with ordinal data and up to five or seven response categories (Özdemir et al., 2019).

We also examined the internal consistency of the extracted factors through both Cronbach's alpha (α) and McDonald's omega (ω). General cut-off for both coefficients has been well established in the literature, where values

over 0.70 are considered to be good indicators of a scale or subscale's internal consistency (McNeish, 2018; Nunnally, 1978; Nunnally & Bernstein, 1994).

Data analysis was performed using JASP v0.16.4 (Love et al., 2019).

Results

Exploratory factor analysis (EFA)

Both the KMO (> 0.80) and Bartlett's sphericity test ($p < 0.05$), showed that our sample was found to be suitable for performing factor analysis. An EFA was performed on our sample based on the polychoric correlation matrix, where a three-factor structure was extracted. This structure was identical to the one originally proposed by Reynolds (1987) and explained 78.9% of the variance.

These three factors were initially described by the author as 'minor suicidal ideation' (MSI; items 1, and 11–15), 'specific plans and desires for suicide' (SPD; items 2–4, and 7–9) and 'morbid ideation' (MID; items 5 and 6).

Internal consistency

Internal consistency indices were good for all factors extracted and for the full scale (α = 0.954; ω = 0.954). All values are detailed in Table 1.

While this study replicates the original three-factor structure, a number of different structures have been reported in the literature. For instance, the three-factor structure by King et al. (2008) showed a different configuration based on general, active, and interpersonal suicidal ideation in a sample of adolescent psychiatric inpatients. In addition, two-factor structures have also been reported by Zhang et al. (2014) in a sample of Chinese adolescents, and Hill et al. (2018) in a sample of American Indian tribes. This may suggest that the underlying construct of suicidal ideation may differ across different settings and cultures, and that the understanding that individuals have of this concept can potentially be related to the context in which each person develops.

The following study will aim to confirm this three-factor structure in a second sample of Spanish-speaking students, also examining the structures found by King et al. (2008), Zhang et al. (2014), and Hill et al. (2018) in order to determine which model shows better fit for its use in this population.

Study 2

Method

Participants

A total of 524 adolescents (female = 43.51%) from 6 secondary public schools from Chile were recruited between April and October 2022. Participants' ages ranged between 14 to 19 years old (M = 15.408; SD = 1.110). 274 participants

Table 1 Exploratory factor analysis, sample adequacy tests and internal consistency indices

		EFA			Sample adequacy test		
		F1	F2	F3	KMO	$\chi^2_{Bartlett}$	*p*
Factor loadings	1. Better if not alive	0.704			0.956	11,585.029	0.000
	2. Thoughts of killing self		0.673				
	3. Thoughts of method		0.773				
	4. Thought of time		0.787				
	5. Thought of people dying			0.859			
	6. Thought of death			0.577			
	7. Writing suicide note		0.930				
	8. Writing will		0.667				
	9. Telling others		0.661				
	10. How others would feel		0.456				
	11. Wished were dead	0.703					
	12. Would solve problems	0.553					
	13. Others happier if gone	0.921					
	14. Wished never been born	0.808					
	15. No one cared if alive	0.945					
Internal consistency	Cronbach's alpha (α)	0.954	0.911	0.795			
	McDonald's omega (ω)	0.954	0.903	0.795			

EFA Exploratory factor analysis; *F* Factor; *KMO* Kaiser–Meyer–Olkin index; $\chi^2_{Bartlett}$ Bartlett sphericity test

(52.29%) reported having no psychiatric treatment history, 172 (32.82%) had psychiatric treatment history in the past, and 78 (14.89%) reported currently being on psychiatric treatment. Participants did not receive any financial or academic incentive for participating in the study (Supplementary Table S2).

Instruments

Suicidal ideation Beside the SIQ-JR (Reynolds, 1987), we used seven items of the Columbia Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011), regarded as a "gold standard" to assess suicidal risk (Gipson et al., 2015). The scale was adapted for being used as a self-report questionnaire in adolescents in Chile (Núñez et al., 2019). The severity of SI was rated on a 7-point ordinal scale in which 1 = wish to be dead, 2 = nonspecific active suicidal thoughts, 3 = thoughts about how to commit suicide, 4 = suicidal thoughts and intentions, 5 = suicidal thoughts with a detailed plan, 6 = intentions to conduct plan, 7 = prior behaviors or planning acts to commit suicide. Scores over 3 points represent an elevated risk of suicidal ideation. The frequency of SI was addressed by asking participants when these thoughts happened: ever in life (SIL) and/or during the last month (SIM). We only reported the former (SIL) because there were few reports of SIM. In our sample the internal consistency was excellent (α = 0.887; ω = 0.898).

Depressive symptoms We used the Patient Health Questionnaire-9 (PHQ-9) (Johnson et al., 2002). It is a 9-item self-report questionnaire with responses ranging from 0 (not at all) to 3 (nearly every day). Total scores can range from 0 to 27. Scores of 0–4 indicate no depressive symptoms, 5–9 mild severe depressive symptoms, 10–14 moderate depressive symptoms, 15–19 moderately severe depressive symptoms, and 20–27 severe depressive symptoms [42]. Internal consistency was found to be good in our sample (α = 0.886; ω = 0.887).

Hopelessness We used the Beck Hopelessness Scale (Beck, 1988), a self-report scale with 20 true or false items, 9 of which are keyed 'false' and 11 are keyed 'true'. For every statement, each response is assigned a score of 0 or 1, and the total hopelessness score is the sum of the scores on the individual items. Internal consistency was found to be good in our sample (α = 0.854; ω = 0.859).

Social problem-solving We used the Short Form of the Social Problem-Solving Inventory Revised (SPSI-R Short Form; D 'Zurilla et al., 1998), Spanish version (De La Torre et al., 2010).This is a 25-item self-report instrument measuring two adaptive problem-solving dimensions (positive problem orientation [PPO] and rational problem solving [RPS]) and three dysfunctional dimensions (negative problem orientation [NPO], impulsivity/carelessness style [IPS], and avoidance style [APS]). Each item is rated on a 5-point scale ranging from 0 (not at all true of me) to 4 (extremely true of me). Internal consistency in our sample was found to be good for the PPO (α = 0.748; ω = 0.746), NPO (α = 0.853; ω = 0.856), IPS (α = 0.759; o = 0.763), and APS (α = 0.804; ω = 0.807) subscales, while being relatively low for the PDF (α = 0.643; o = 0.643) and RPS (α = 0.622; ω = 0.623) subscales.

Emotion regulation We used the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA) (Gullone & Taffe, 2012), validated in adolescents in Chile (Villacura-Herrera et al., 2022). It is a 10-item measure with Likert responses ranging from 1 (completely disagree) to 5 (completely agree) assessing two main dimensions: Cognitive reappraisal (CR, 6 items) and expressive suppression (ES, 4 items). A higher score means a higher usage of each ER strategy. Internal consistency in our sample was found to be good for the CR scale (α = 0.819; ω = 0.819), but relatively low for the ES subscale (α = 0.629; ω = 0.643).

Procedure

We invited six public schools to participate in the study. We followed the same procedure described in Study 1. Ethical approval was obtained from the Ethics Scientific Committee of the Universidad de Talca (1210093; 05/12/2021).

Data analysis

To determine the best fitting configuration for the SIQ-JR in adolescents, we tested the structures previously identified to date through Confirmatory Factor Analysis (CFA). Thus, we examined the two-factor structures reported by Zhang et al. (2014) and Hill et al. (2018), and the three-factor structures by Reynolds (1987) and King et al. (2008). Additionally, we tested a single-factor structure to determine if a simpler model would show a better fit in this population.

To assess model fit, we used Chi-square divided by degrees of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), comparative fit index (CFI), Tucker-Lewis index (TLI), and goodness of fit index (GFI). Comparison between models were made based on their closeness to established cut-off values (χ^2/df < 5; RMSEA < 0.08; SRMR < 0.08; CFI ≥ 0.90; TLI ≥ 0.90; GFI ≥ 0.95; Hu & Bentler, 1999). We also examined for model parsimony using the Akaike information criterion (AIC) and the Bayesian information criterion (BIC), with lower values in both indices indicating better fit and model parsimony. In addition, the structure was examined once again through

exploratory structural equation modeling (ESEM), a confirmatory analysis technique which integrates exploratory elements in the context of a structural equations model (Prokofieva et al., 2023). The same fit indices were extracted in order to compare them with the CFA results and determine the most parsimonious model for our data (Alamer & Marsh, 2022).

Once the best fitting model was selected, we tested for equivalence of measurement of suicidal ideation in both males and females through multi-group CFA. Assessment of measurement invariance was conducted to test for equivalence of the baseline model (configural invariance) of factor loadings (metric invariance), of item intercepts (scalar invariance) and of item residuals (strict invariance) when possible (Putnick & Bornstein, 2016). Gamma hat ($\tilde{\gamma}$) and McDonald's noncentrality index (NCI) were calculated as they are strong indices when examining complex models (Fan & Sivo, 2007). We also estimated the Probability of close fit (*p*Close) at each invariance level to examine for significant changes in RMSEA after constraints were imposed. Minimal variations in fit indices across models and non-significant changes in χ^2 and RMSEA, are expected to establish measurement invariance (Cheung & Rensvold, 2002).

Next, we tested for concurrent validity using the C-SSRS as the gold standard for suicidal ideation measurement. We examined the sensitivity and specificity of the SIQ-JR when using the C-SSRS measure as criterion, through a receiver operating characteristic (ROC) curve. Area under the Curve (AUC) value was categorized as slight (0.50–0.59), fair (0.60–0.69), moderate (0.70–0.79), substantial (0.80–0.89) and almost perfect (> 0.90) (Landis & Koch, 1977).

We assessed convergent validity by examining the associations between the SIQ-JR and the PHQ-9, the BHS and the SPSI-R, expecting negative correlations with the latter as research has consistently shown negative associations between suicidal ideation and perceived problem-solving abilities (Chu et al., 2018; McAuliffe et al., 2003). Correlations with emotion regulation strategies measured through the ERQ-CA were also examined, where we expected suicidal ideation to be positively associated with expressive suppression (ES) and negatively associated with cognitive reappraisal (CR).

Data analysis was performed using JASP v0.16.4, IBM SPSS Statistics v18, IBM Amos Graphics v24 and RStudio v2023.06.0 with R v4.3.1 and the *lavaan* package (Rosseel, 2012).

Results

Confirmatory factor analysis (CFA)

Five different factor structures were examined in Study 2, out of which the original three-factor observed in Study 1 showed the best fit in our sample and was selected as the most appropriate model for Spanish-speaking students.

Given that some indices remained suboptimal, modification indices (MI) were examined. MI provide an estimate of the change in the model's χ^2 value resulting from releasing constraints that were set in the initial specification, such as correlating residuals to reduce the redundancy of items measuring the same construct (Schermelleh-Engel & Moosbrugger, 2003).

Recommendations by Kaplan (1989) and Whittaker (2012)'s suggest freeing parameters with high MI and estimated parameter change (EPC) higher than 0.10 until no parameters over that cutoff remain. However, this may potentially lead to overfitting as the number of modifications required by this criteria can be considerable. Our analysis detected two parameters' residual covariances with notably high values (MI > 100; EPC > 0.40). These were items 7 (*"writing suicide note"*) and 8 (*"writing will"*) (MI = 119.712; EPC = 0.447), and items 13 (*"others happier if gone"*) and 15 (*"no one cared if alive"*) (MI = 103.153; EPC = 0.461). Thus, only these residuals were correlated.

The final three-factor model after MI examination (Fig. 1) demonstrated good fit indices. Detailed results for all analyses are presented in Table 2.

Exploratory structural equation modeling (ESEM)

In addition to the confirmatory analysis, we examined the factor structure through ESEM (Fig. 2). Results show a slightly different three-factor structure, where loadings for item 10 (*"how others would feel"*) were higher on the third factor (MBI). Overall, fit indices for this model were adequate. Absolute fit indices showed mixed results in comparison with the original three-factor model ($\chi^2 = 425.771$; df = 63; $p = 0.000$; $\chi^2/df = 6.758$; RMSEA = 0.096; SRMR = 0.028), while relative fit indices were higher (CFI = 0.957; TLI = 0.928; GFI = 0.910). However, this model showed lower parsimony levels (AIC = 26,746.912; BIC = 26,999.314). When compared to the original three-factor structure after MI examination, the ESEM model showed lower fit and parsimony overall.

Moreover, testing the three-factor ESEM model through CFA for a more direct comparison shows an acceptable fit overall, although still inferior to the original structure all around ($\chi^2 = 647.058$; df = 87; $p = 0.000$, $\chi^2/df = 7.437$; RMSEA = 0.111; SRMR = 0.048; CFI = 0.923; TLI = 0.907; GFI = 0.851; AIC = 24,152.270; BIC = 24,188.149). Thus, as the original three-factor structure showed the best fit and parsimony under multiple conditions, was maintained as the final model (Alamer & Marsh, 2022).

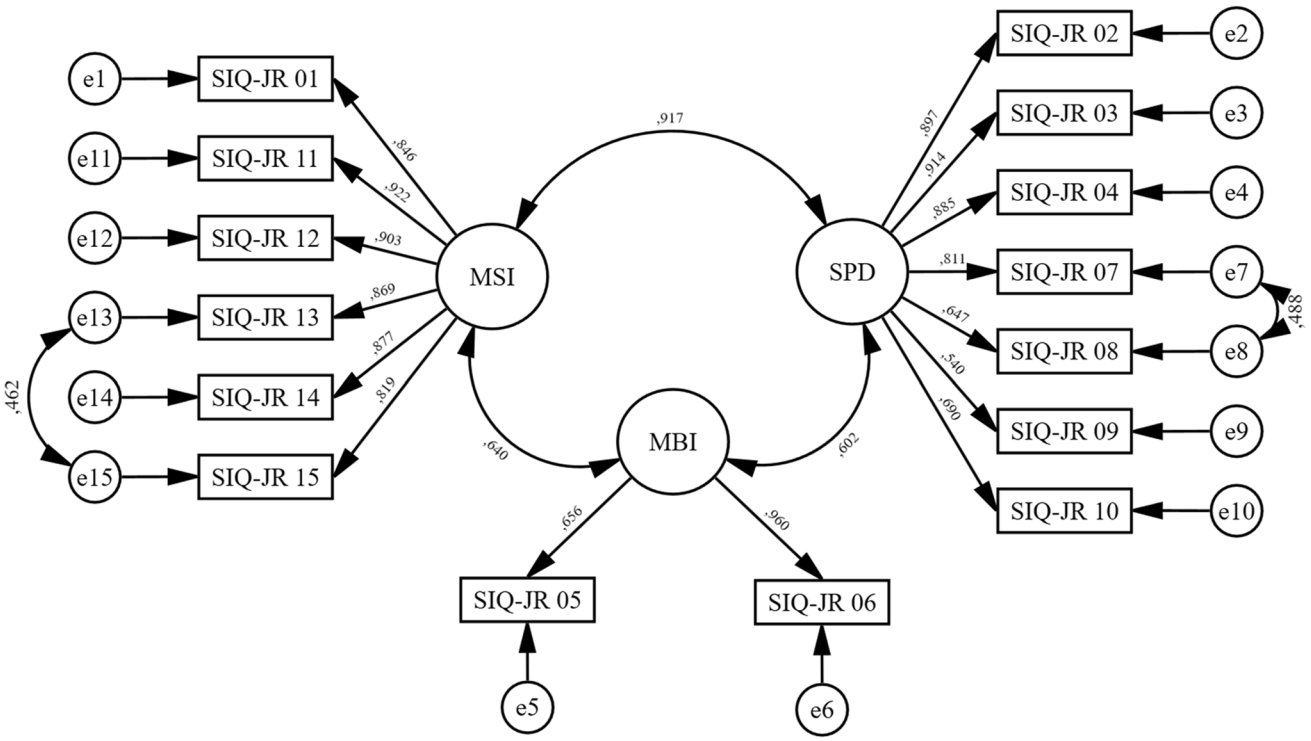

Fig. 1 Path diagram for the three-factor model of the SIQ-JR, showing standardized factor loadings and regression coefficients. MSI = Minor suicidal ideation; SPD = Specific plans and desires for suicide; MBI = Morbid ideation

Table 2 Confirmatory factor analysis

		Absolute fit						Relative fit			Parsimony	
		χ^2	df	*p*	χ^2/df	RMSEA	SRMR	CFI	TLI	GFI	AIC	BIC
	1-factor	1033.589	90	0.000	11.484	0.142	0.058	0.870	0.849	0.774	24,533.540	24,661.384
	2-factor (Zhang et al., 2014)	860.845	89	0.000	9.672	0.129	0.059	0.894	0.875	0.811	24,362.465	24,494.572
	2-factor (Hill et al., 2018)	828.497	89	0.000	9.309	0.126	0.055	0.898	0.880	0.829	24,330.056	24,462.162
	3-factor (Reynolds, 1987; EFA)	596.057	89	0.000	6.697	0.106	0.041	0.930	0.916	0.863	24,101.172	24,241.801
	3-factor (King et al., 2008)	661.653	87	0.000	7.605	0.112	0.048	0.921	0.905	0.853	24,166.893	24,307.522
MI	3-factor (Reynolds, 1987; EFA)	366.832	85	0.000	4.316	0.080	0.036	0.961	0.952	0.913	23,875.508	24,024.660

EFA Exploratory factor analysis; *RMSEA* Root mean square error of approximation; *SRMR* Standardized root mean square; *CFI* Comparative fit index; *TLI* Tucker-Lewis index; *GFI* Goodness of fit index; *AIC* Akaike information criteria; *BIC* Bayesian information criteria; *MI* Model after modification indices examination

Measurement invariance

Next, we conducted tests for measurement invariance of the final model based on sex (male/female). At a configural level, we observed that full measurement invariance was established, showing that the free and fixed loadings followed a similar pattern across groups (Putnick & Bornstein, 2016). However, we could not confirm invariance when constraints were added to factor loadings at a second step at the metric level. Thus, a partial metric invariance model was tested. In this step, to achieve partial metric invariance, the constraints for items 1 (*"better if not alive"*), 7 (*"writing suicide note"*), 8 (*"writing will"*), and 10 (*"how others would feel"*) needed to be released, as these items showed the highest amount of variability between male and female participants.

After partial metric invariance was established, intercepts were constrained in a third step in order to test for a partial scalar invariance model. This model showed satisfactory results, where the changes in χ^2 and most of the indices

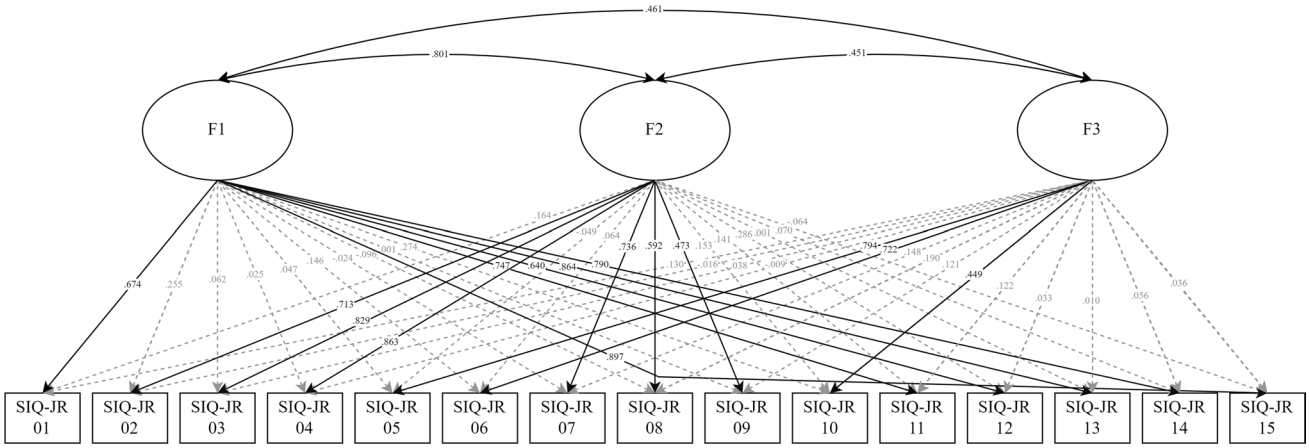

Fig. 2 Path diagram for the ESEM-based three-factor model of the SIQ-JR, showing standardized factor loadings and regression coefficients. Loadings over 0.45 are displayed in black

were not significantly different from the previous model ($p\Delta\chi^2 > 0.05$; ΔCFI < 0.01; ΔNCI < 0.02; ΔRMSEA < 0.01; *p*Close > 0.05). Finally, we tested for partial strict invariance by constraining item residuals, but equivalence of measurement could not be established at this level regardless of how many constraints were released. Measurement invariance at a partial scalar level suggests that the mean differences between males and females in the SIQ-JR's latent constructs scores are able to account, at least partially, for the mean differences in the items' shared variance (Putnick & Bornstein, 2016). Results for all steps of the analysis are detailed in Table 3.

Internal consistency

For the final 3-factor model, reliability indices were similar to those found in Study 1, being excellent for MSI (α = 0.953; ω = 0.953) and SPD (α = 0.913; ω = 0.920) and good for the MBI subscale (α = 0.772; ω = 0.772). Reliability was also excellent for the full scale (α = 0.954; ω = 0.958).

Concurrent validity, sensitivity and specificity

The SIQ-JR total score showed good concurrent validity with the C-SSRS ($r = 0.728$; $p = 0.000$). This was also true for the MSI ($r = 805$; $p = 0.000$), SPD ($r = 0.772$; $p = 0.000$) and MID subscales ($r = 0.461$; $p = 0.000$).

The Receiver Operating Characteristic (ROC) curve yielded an almost perfect AUC value of 0.941 for the SIQ-JR (95% CI 0.920—0.962, $p = 0.000$) when contrasted with CSSRS, which indicates a good criterion validity for this measure (see Supplementary Fig. S1). Sensitivity and specificity levels for the SIQ-JR (93% and 83%; 35 cutoff points) were adequate. Ideal cutoff points for men and women were 37 and 35 points, respectively (see Supplementary Table S3).

Convergent validity

The SIQ-JR total score and subscales showed positive and statistically significant associations with depressive symptoms ($r_{TOT} = 0.728$; $r_{MSI} = 0.724$; $r_{SDP} = 0.629$; $r_{MID} = 0.553$;

Table 3 Measurement invariance tests

	Model fit						Invariance tests							
	χ^2	df	CFI	NCI	$\tilde{\gamma}$	RMSEA	$\Delta\chi^2$	Δdf	$p\Delta\chi^2$	ΔCFI	ΔNCI	$\Delta\tilde{\gamma}$	ΔRMSEA	*p*Close
Configural	334.216	152	0.974	0.840	0.956	0.068	–	–	–	–	–	–	–	–
Metric	363.865	164	0.971	0.826	0.949	0.068	29.649	12	0.003	−0.003	−0.014	−0.007	0.000	0.651
Metric (partial)	348.422	160	0.973	0.835	0.952	0.047	14.206	8	0.077	−0.001	−0.005	−0.004	−0.021	0.720
Scalar (partial)	362.277	168	0.972	0.830	0.949	0.047	13.855	8	0.086	−0.001	−0.005	−0.003	0.000	0.759
Strict (partial)	449.588	179	0.961	0.772	0.933	0.054	87.311	11	0.000	−0.011	−0.058	−0.016	0.007	0.152

CFI Comparative fit index; *NCI* McDonald's noncentrality index; $\tilde{\gamma}$ Gamma Hat; *RMSEA* Root mean square error of approximation; Δ Difference with previous level; *p*Close Probability of close fit

$ps < 0.001$) and hopelessness ($r_{Total} = 0.566$; $r_{MSI} = 0.581$; $r_{SDP} = 0.473$; $r_{MID} = 0.417$; $ps < 0.001$).

When examining associations with the SPSI-R, the SIQ-JR score showed small but statistically significant negative correlations with positive problem orientation (PPO; $r = -0.322$; $p = 0.000$) and problem definition and formulation (PDF; $r = -0.110$; $p = 0.000$), while also showing positive correlations with negative problem orientation (NPO; $r = 0.583$; $p = 0.000$) and both the impulsive (IPS; $r = 0.141$; $p = 0.000$) and avoidant (APS; $r = 0.344$; $p = 0.000$) problem solving styles. No significant correlations were found between the SIQ-JR and the rational problem solving (RSP) subscale. We found positive correlations with the ERQ-CA's ES subscale ($r = 0.208$; $p = 0.000$) and negative associations with the CR subscale ($r = -0.309$; $p = 0.000$).

General discussion

This is the first study examining the psychometric properties of the SIQ-JR in Spanish-speaking adolescents in Latin America. We conducted two studies to provide evidence on the structure, reliability, validity and sensitivity and specificity of the SIQ-JR in adolescents from secondary schools in Chile. In these two studies, we found that the original three-factor structure by Reynolds (1987) showed the best fit indices, supporting the structural validity of the scale. We also observed good reliability values. Moreover, Study 2 yielded good convergent and concurrent validity, and also very good sensitivity and specificity. This initial evidence supports that the SIQ-JR is a reliable and valid instrument to assess suicidal ideation in Spanish-speaking adolescents.

Internal structure

Our findings on the internal structure of the scale fit with Reynolds (1987), who proposed a three-factor structure comprising minor suicidal ideation (MSI), specific plans and desires for suicide (SPD) and morbid ideation (MBI). In our model, as in the original three-factor structure, the MSI factor was composed of 6 items, MBI had 2 items and factor SPD contained 7 items.

Our results slightly differ from King et al. (2008) who also found a three-factor structure encompassing active ideation (6 items), general ideation (6 items) and interpersonal problems (3 items). Our findings also differ from Hill et al. (2018), who, in young people, observed that a two-factor structure where the interpersonal problems and general ideation subscales were combined into one construct, allowing active ideation to remain a second factor, showed a better fit than the three-factor structure. Moreover, in Chinese adolescents, Zhang et al. (2014) found that a two-factor structure (a general ideation factor and a morbid ideation/written signals factor), showed the best fit. It should be noted that other studies have reported different factor structures for SIQ and SIQ-JR (Pinto et al., 1997; Cassady & Cross, 2006). As stated by Zhang et al. (2014), these inconsistent findings could be probably due to the factor construct varying significantly in different populations due to cultural issues. Results obtained through ESEM revealed a slightly different three-factor configuration, where item 10 ("how others would feel") loaded in the MBI factor instead of SPD. Considering the content similarity shared with both factors, it could be argued that this particular item could belong to either of them. Following the parsimony principle proposed by Alamer and Marsh (2022), we have kept the original model found in Study 1. However, this is an issue deserving further examination. Overall, our findings support the necessity to conduct further research to explore potential cultural differences between countries and understand these results (Chu et al., 2022). Concerning the internal consistency, we found good alpha and omega values, which are comparable to those reported by prior studies (Keane et al., 1996; McGlinchey et al., 2016; Reynolds & Mazza, 1999). Additionally, the SIQ-JR and its three dimensions showed a high concurrent validity with the C-SSRS, proposed as a good "gold standard" scale to assess suicide risk adolescents (Gipson et al., 2015). These results support the use of SIQ-JR as a screening tool but also as a measure to test the effectiveness of preventive interventions and, due the three-factor structure, enrich the evaluation of different mediators in the mechanisms of effectiveness of such interventions.

Convergent and concurrent validity

Our results concerning convergent validity fit with prior research showing associations between suicidal ideation and depressive symptoms in adolescents (Fredrick et al., 2018), and also with other emotion regulation processes (Brausch et al., 2022). Moreover, our results on concurrent validity mirror prior research with adolescents (Zhang et al., 2014) providing additional evidence on the validity of the scale. Notably, as measured by the AUC values, the SIQ-JR questionnaire performed well upon comparison with the C-SSRS, demonstrating good criterion validity and discriminative power (Hanley & McNeil, 1982). The ideal cutoff point was established at 35 points, which is higher than the 31-point cut-off proposed by Reynolds (1987). Other studies have shown that a clinical cutoff of 20 also produces an accurate identification of adolescents at high-risk of suicidality (Keane et al., 1996; Hill et al., 2018). However, in our sample the positive predictive value performed better with a cutoff of 35 than with 31 or 20 (59.1, 49.8, and 30.9 respectively), and the false positive cases were reduced (72, 109, and 251 respectively).

Measurement invariance

In terms of equivalence of suicidal ideation measurement for male and female participants, measurement invariance was fully established only at a configural level. A partial scalar invariance model was confirmed only after releasing constraints for items 1 ("better if not alive"), 7 ("writing suicide note"), 8 ("writing will") and 10 ("how others would feel"), which showed the highest amount of variability between both groups. This partially fits with prior research showing that the item 8 has been consistently reported to contribute to model misfit in previous studies (Hill et al., 2018; King et al., 2008). Equivalence of measurement could not be established at a partial strict level by constraining item residuals. Overall, these findings suggest that the scale is partially invariant, which means that the measurement of suicidal ideation for male and female participants may not be fully equivalent. This is also supported by the slight difference in the cutoff points observed between men and women. This should be considered in prevalence studies and also when assessing interventions aimed at reducing suicidal ideation.

Regarding this, literature has consistently reported a general difference on suicidal thoughts and behaviors across both groups, with males being more likely to commit serious suicide attempts and females reporting more suicidal ideation in general (Freeman et al., 2017; Zhang et al., 2019). This illustrates the complexity of how males and females perceive the construct of suicidal ideation. As this is the first study examining measurement invariance on the SIQ-JR, additional research is required to fully determine the extent to which the scale can capture suicidal ideation across both groups. This combined evidence suggests that the SIQ-JR is a valid and reliable instrument for measuring suicidal ideation in Spanish-speaking adolescents. Furthermore, this research contributes to future studies aimed both to better understand SRB and develop effective detection and prevention strategies, which is strongly encouraged nowadays (Costanza et al., 2020), particularly in young people (Wasserman et al., 2021).

Practical implications

Our findings highlight the value of the SIQ-JR as a tool for a comprehensive and timely assessment of suicidality in school settings by measuring different components of SI. This approach contributes to the widely recognized need for accurate measures to determine specific changes in SI in the context of universal, selective, and indicated interventions (Gordon, 1987; Sakashita & Oyama, 2022), which can potentially stop the progression of suicidal thoughts in adolescents at high risk. This is particularly relevant in South American countries, where evidence on the effectiveness of school-based interventions to prevent suicide is scant and the development of mental health-oriented policies is growing (Alarcón & Aguilar-Gaxiola, 2000; Henao et al., 2016; Walsh et al., 2022).

Limitations

Still, some limitations need to be addressed. First, the cross-sectional design of both studies did not allow to establish causality or to assess for temporal stability as an additional measure of internal consistency. Second, we recruited participants from public schools, potentially underrepresenting students from higher socioeconomic status backgrounds who typically attend private schools. Third, we did not assess other potential predictors of suicide in adolescents, such as non-suicidal self-injury (Castellví et al., 2017), adverse childhood experiences (Núñez et al., 2022), and substance and alcohol abuse (Borges et al., 2017). It is also worth mentioning that potential redundancy among items cannot be ruled out, which may be reflected in high values on internal consistency coefficients. Further research and item examination may be required in this regard.

Another relevant point that can initially seem problematic is this measure's factor structure including a factor (namely, MBI) being composed of only two items. In this sense, it is important to note that this finding is not exclusive to this study but derives from the original three-factor model by Reynolds (1987). In addition, researchers should note that the commonly employed 'three items per factor' rule of thumb comes from a comment by Tabachnick & Fidell (2001) which did not state that two-item factors were not valid or should be avoided, but that with two items it may be difficult for the factor to properly reflect the underlying construct. Thus, conceptual interpretability and meaningfulness of the factor and its items should always be the main criteria for retention. If two items are able to properly reflect the underlying phenomenon being measured, then two items can be considered enough (Steinmetz, 2023; Worthington & Whittaker, 2006).

Conclusions

In summary, through this two-study assessment of the SIQ-JR, we provide additional evidence demonstrating the usefulness of this measure as a brief tool for preliminary screening of suicidal ideation in Spanish-speaking adolescents. This has relevant implications for both clinical settings and research, as suicidal thoughts have been addressed as risk factors for suicide attempts and non-suicidal injuries in young people from clinical and general populations. Thus, using the SIQ-JR for screening of suicidal ideation

in conjunction with the examination of other risk factors can help to improve the timely detection of adolescents at suicide risk.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12144-023-05422-2.

Acknowledgements The authors would like to thank Dr. Cheryl King for kindly providing additional information and details regarding her work.

Funding This work was funded by the Agencia Nacional de Investigación y Desarrollo (ANID), through grant FONDECYT 1210093, by ANID—Millennium Science Initiative Program—NCS2021_081 and by the Programa de Investigación Asociativa (PIA) en Ciencias Cognitivas (RU-158–2019), Centro de Investigación en Ciencias Cognitivas (CICC), Faculty of Psychology, Universidad de Talca, Chile. JR is supported by a National Health and Medical Research Council Investigator Grant (ID2008460) and a Dame Kate Campbell Fellowship from The University of Melbourne.

Data availability Data used in this study is available from the corresponding author upon reasonable request.

Declarations

Ethical approval Ethical approval was obtained from the Scientific Ethics Committee of the University of Talca (1210093; 05/12/2021).

Conflicts of interest The authors have no conflict of interest to disclose.

References

Alamer, A., & Marsh, H. (2022). Exploratory structural equation modeling in second language research: An apple example using the dualistic model of passion. *Studies in Second Language Acquisition, 44*(5), 1477–1500. https://doi.org/10.1017/S0272263121000863

Alarcón, R. D., & Aguilar-Gaxiola, S. A. (2000). Mental health policy developments in Latin America. *Bulletin of the World Health Organization, 78*(4), 483–490.

Baek, I.-C., Jo, S., Kim, E. J., Lee, G. R., Lee, D. H., & Jeon, H. J. (2021). A review of suicide risk assessment tools and their measured psychometric properties in Korea. *Frontiers in Psychiatry, 12*. https://doi.org/10.3389/fpsyt.2021.679779

Bartlett, M. S. (1954). A further note on the multiplying factors for various chi-square approximations in factor analysis. *Journal of the Royal Statistical Society, Series B, 16*, 296–298.

Beck, S. (1988). *Beck hopelessness scale*. Psych Corporation.

Berman, A. L. (2017). Risk factors proximate to suicide and suicide risk assessment in the context of denied suicide ideation. *Suicide and Life-Threatening Behavior, 48*(3), 340–352. https://doi.org/10.1111/sltb.12351

Borges, G., Benjet, C., Orozco, R., Medina-Mora, M. E., & Menendez, D. (2017). Alcohol, cannabis and other drugs and subsequent suicide ideation and attempt among young Mexicans. *Journal of Psychiatric Research, 91*, 74–82. https://doi.org/10.1016/j.jpsychires.2017.02.025

Brausch, A. M., Clapham, R. B., & Littlefield, A. K. (2022). Identifying specific emotion regulation deficits that associate with nonsuicidal self-injury and suicide ideation in adolescents. *Journal of Youth and Adolescence, 51*, 556–569. https://doi.org/10.1007/s10964-021-01525-w

Cassady, J. C., & Cross, T. L. (2006). A factorial representation of suicidal ideation among academically gifted adolescents. *Journal for the Education of the Gifted, 29*(3), 290–304. https://doi.org/10.1177/016235320602900303

Castellví, P., Lucas-Romero, E., Miranda-Mendizábal, A., Parés-Badell, O., Almenara, J., Alonso, I., Blasco, M. J., Cebrià, A., Gabilondo, A., Gili, M., Lagares, C., Piqueras, J. A., Roca, M., Rodríguez-Marín, J., Rodríguez-Jiménez, T., Soto-Sanz, V., & Alonso, J. (2017). Longitudinal association between self-injurious thoughts and behaviors and suicidal behavior in adolescents and young adults: A systematic review with meta-analysis. *Journal of Affective Disorders, 215*, 37–48. https://doi.org/10.1016/j.jad.2017.03.035

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5

Chu, C., Walker, K. L., Stanley, I. H., Hirsch, J. K., Greenberg, J. H., Rudd, M. D., & Joiner, T. E. (2018). Perceived problem-solving deficits and suicidal ideation: Evidence for the explanatory roles of thwarted belongingness and perceived burdensomeness in five samples. *Journal of Personality and Social Psychology, 115*(1), 137–160. https://doi.org/10.1037/pspp0000152

Chu, J., O'Neill, S. E., Ng, J. F., & Khoury, O. (2022). the cultural theory and model of suicide for youth. In J. P. Ackerman & L. M. Horowitz (Eds.), *Youth suicide prevention and intervention: Best practices and policy implications* (pp. 99–106). SpringerBriefs in Psychology.

Costanza, A., Amerio, A., Odone, A., Baertschi, M., Richard-Lepouriel, H., Weber, K., Di Marco, S., Prelati, M., Aguglia, A., Escelsior, A., Serafini, G., Amore, M., Pompili, M., & Canuto, A. (2020). Suicide prevention from a public health perspective. What makes life meaningful? The opinion of some suicidal patients. *Acta Biomedica, 91*, 128–134. https://doi.org/10.23750/abm.v91i3-S.9417

Czyz, E. K., Horwitz, A. G., & King, C. A. (2016). Self-rated expectations of suicidal behavior predict future suicide attempts among adolescent and young adult psychiatric emergency patients. *Depression and Anxiety, 33*(6), 512–519. https://doi.org/10.1002/da.22514

D'Zurilla, T. J., Nezu, A. M., & Maydeu-Olivares, A. (1998). *Manual for the social problem-solving inventory—revised*. Multi-Health Systems.

Davis, J. M. (1992). Suicidal ideation questionnaire. *Journal of Psychoeducational Assessment, 10*(3), 298–301. https://doi.org/10.1177/073428299201000031

De La Torre, M., Morera, O., & Wood, J. (2010). Measuring social problem solving using the Spanish version for Hispanics of the Social Problem Solving Inventory-Revised. *Cultural Diversity and Ethnic Minority Psychology, 16*(4), 501–506. https://doi.org/10.1037/a0021372

Erford, B. T., Jackson, J., Bardhoshi, G., Duncan, K., & Atalay, Z. (2017). Selecting suicide ideation assessment instruments: A meta-analytic review. *Measurement and Evaluation in Counseling and Development, 51*(1), 42–59. https://doi.org/10.1080/07481756.2017.1358062

Fan, X., & Sivo, S. A. (2007). Sensitivity of fit indices to model misspecification and model types. *Multivariate Behavioral Research, 42*(3), 509–529. https://doi.org/10.1080/00273170701382864

Forkmann, T., Spangenberg, L., Rath, D., Hallensleben, N., Hegerl, U., Kersting, A., & Glaesmer, H. (2018). Assessing suicidality in Real time: A psychometric evaluation of self-report items for the assessment of suicidal ideation and its proximal risk factors using ecological momentary assessments. *Journal of Abnormal*

Psychology, 127(8), 758–769. https://doi.org/10.1037/abn0000381

Franz, P. J., Kleiman, E. M., & Nock, M. K. (2021). Reappraisal and suppression each moderate the association between stress and Suicidal Ideation: Preliminary evidence from a daily diary study. *Cognitive Therapy and Research, 45*(6), 1120–1127. https://doi.org/10.1007/s10608-021-10214-8

Fredrick, S. S., Demaray, M. K., Malecki, C. K., & Dorio, N. B. (2018). Can social support buffer the association between depression and suicidal ideation in adolescent boys and girls? *Psychology in the Schools, 55*(5), 490–505. https://doi.org/10.1002/pits.22125

Freeman, A., Mergl, R., Kohls, E., Széleky, A., Gusmao, R., Arensman, E., Koburger, N., Hegerl, U., & Rummel-Kluge, C. (2017). A cross-national study on gender differences in suicide intent. *BMC Psychiatry, 17*(1), 234. https://doi.org/10.1186/s12888-017-1398-8

Ghasemi, P., Shaghaghi, A., & Allahverdipour, H. (2015). Measurement scales of suicidal ideation and attitudes: A systematic review article. *Health Promotion Perspectives, 5*(3), 156–168. https://doi.org/10.15171/hpp.2015.019

Gijzen, M. W. M., Rasing, S. P. A., Creemers, D. H. M., Smit, F., Engels, R. C. M. E., & De Beurs, D. (2021). Suicide ideation as a symptom of adolescent depression. A network analysis. *Journal of Affective Disorders, 278*, 68–77. https://doi.org/10.1016/j.jad.2020.09.029

Gipson, P. Y., Agarwala, P., Opperman, K. J., Horwitz, A., & King, C. A. (2015). Columbia-suicide severity rating scale: Predictive validity with adolescent psychiatric emergency patients. *Pediatric Emergency Care, 31*(2), 88–94. https://doi.org/10.1097/PEC.0000000000000225

Gordon, R. (1987). An operational classification of disease prevention. *Public Health Reports*, *98*(2). https://doi.org/10.1037/e659532007-006

Gullone, E., & Taffe, J. (2012). The emotion regulation questionnaire for children and adolescents (ERQ-CA): A psychometric evaluation. *Psychological Assessment, 24*(2), 409–417. https://doi.org/10.1037/a0025777

Hanley, J. A., & McNeil, B. J. (1982). The meaning and use of the area under a receiver operating characteristic (ROC) curve. *Radiology, 143*(1), 23–36.

Harmer, B., Lee, S., Duong, Tv. H., & Saadabadi, A. (2023). *Suicidal ideation*. StatPearls. https://www.ncbi.nlm.nih.gov/books/NBK565877/. Accessed 22 Aug 2023

Harris, I. M., Beese, S., & Moore, D. (2019). Predicting future self-harm or suicide in adolescents: A systematic review of risk assessment scales/tools. *BMJ Open, 9*(9), e029311. https://doi.org/10.1136/bmjopen-2019-029311

Henao, S., Quintero, S., Echeverri, J., Hernández, J., Rivera, E., & López, S. (2016). Políticas Públicas Vigentes de Salud mental en Suramérica: UN estado del arte. *Revista Facultad Nacional de Salud Pública, 34*(2). https://doi.org/10.17533/udea.rfnsp.v34n2a07

Hetrick, S. E., Yuen, H. P., Bailey, E., Cox, G. R., Templer, K., Rice, S. M., Bendall, S., & Robinson, J. (2017). Internet-based cognitive behavioural therapy for young people with suicide-related behaviour (Reframe-IT): A randomised controlled trial. *Evidence-Based Mental Health, 20*(3), 76–85. https://doi.org/10.1136/eb-2017-102719

Hetrick, S. E., Gao, C. X., Filia, K. M., Menssink, J. M., Rickwood, D. J., Herrman, H., Hickie, I., McGorry, P., Telford, N., Parker, A. G., & Cotton, S. M. (2021). Validation of a brief tool to assess and monitor suicidal ideation: The Youth Suicide Ideation Screen (YSIS-3). *Journal of Affective Disorders, 295*, 235–242. https://doi.org/10.1016/j.jad.2021.08.053

Hill, K., Van Eck, K., Goklish, N., Larzelere-Hinton, F., & Cwik, M. (2018). Factor structure and validity of the SIQ-JR in a southwest American Indian tribe. *Psychological Services*, 1541–1559. https://doi.org/10.1037/ser0000298

Holt, M. K., Vivolo-Kantor, A. M., Polanin, J. R., Holland, K. M., DeGue, S., Matjasko, J. L., Wolfe, M., & Reid, G. (2015). Bullying and suicidal ideation and behaviors: A meta-analysis. *Pediatrics, 135*(2), e496–e509. https://doi.org/10.1542/peds.2014-1864

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Huth-Bocks, A. C., Kerr, D. C., Ivey, A. Z., Kramer, A. C., & King, C. A. (2007). Assessment of psychiatrically hospitalized suicidal adolescents: Self-report instruments as predictors of suicidal thoughts and behavior. *Journal of the American Academy of Child & Adolescent Psychiatry, 46*, 387–395. https://doi.org/10.1097/chi.0b013e31802b9535

Jia, C. X., Wang, X. T., & Zhao, Z. T. (2014). Psychometric properties of the Suicidal Ideation Questionnaire among Chinese high school students. *Omega, 70*(2), 195–207. https://doi.org/10.2190/OM.70.2.c

Johnson, J. G., Harris, E. S., Spitzer, R. L., & Williams, J. B. (2002). The patient health questionnaire for adolescents: Validation of an instrument for the assessment of mental disorders among adolescent primary care patients. *Journal of Adolescent Health, 30*(3), 196–204. https://doi.org/10.1016/s1054-139x

Kaplan, D. (1989). Model modification in covariance structure analysis: Application of the expected parameter change statistic. *Multivariate Behavioral Research, 24*(3), 285–305. https://doi.org/10.1207/s15327906mbr2403_2

Keane, E. M., Dick, R. W., Bechtold, D. W., & Manson, S. M. (1996). Predictive and concurrent validity of the suicidal ideation questionnaire among American Indian adolescents. *Journal of Abnormal Child Psychology, 24*(6), 735–747. https://doi.org/10.1007/BF01664737

King, C. A., Hill, E. M., Naylor, M., Evans, T., & Shain, B. (1993). Alcohol consumption in relation to other predictors of suicidality among adolescent inpatient girls. *Journal of the American Academy for Child and Adolescent Psychiatry, 32*(1), 82–88. https://doi.org/10.1097/00004583-199301000-00012

King, C. A., Hovey, J. D., Brand, E., & Ghaziuddin, N. (1997). Prediction of positive outcomes for adolescent psychiatric inpatients. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*(10), 1434–1442. https://doi.org/10.1097/00004583-199710000-00026

King, C. A., O'Mara, R. M., Hayward, C. N., & Cunningham, R. M. (2009). Adolescent suicide risk screening in the emergency department. *Academic Emergency Medicine, 16*(11), 1234–1241. https://doi.org/10.1111/j.1553-2712.2009.00500.x

King, C. A., Jiang, Q., Czyz, E. K., & Kerr, D. C. (2014). Suicidal ideation of psychiatrically hospitalized adolescents has one-year predictive validity for suicide attempts in girls only. *Journal of Abnormal Child Psychology, 42*(3), 467–477. https://doi.org/10.1007/s10802-013-9794-0

King, C. A., Woolley, M. E., Kerr, D. C. R., & Vinokur, A. (2008). *Factor structure, internal consistency, and predictive validity of the Suicidal Ideation Questionnaire-Junior (SIQ–JR), in a sample of suicidal adolescents.* [Unpublished manuscript].

Kleiman, E. M., Turner, B. J., Fedor, S., Beale, E. E., Huffman, J. C., & Nock, M. K. (2017). Examination of real-time fluctuations in suicidal ideation and its risk factors: Results from two ecological momentary assessment studies. *Journal of Abnormal Psychology, 126*(6), 726–738. https://doi.org/10.1037/abn0000273

Klonsky, E. D., May, A. M., & Saffer, B. Y. (2016). Suicide, suicide attempts, and suicidal ideation. *Annual Review of Clinical Psychology, 12*(1), 307–330. https://doi.org/10.1146/annurev-clinpsy-021815-093204

Kumar, P., Srivastava, S., Mishra, P. S., & Sinha, D. (2021). Suicidal ideation among adolescents—the role of sexual abuse, depression, and impulsive behavior. *Frontiers in Psychiatry, 12*. https://doi.org/10.3389/fpsyt.2021.726039

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*(1), 159. https://doi.org/10.2307/2529310

Lopez, D., & Weisman de Mamani, A. (2020). Family-related risk and protective factors for suicidal ideation in individuals with schizophrenia spectrum disorders. *Professional Psychology: Research and Practice, 51*(6), 537–544. https://doi.org/10.1037/pro0000307

Love, J., Selker, R., Marsman, M., Jamil, T., Dropman, D., Verhagen, J., Ly, A., Gronau, Q., Šmíra, M., Epskamp, S., Matzke, D., Wild, A., Knight, P., Rouder, J. N., Morey, R. D., & Wagenmakers, E. (2019). JASP: Graphical statistical software for common statistical designs. *Journal of Statistical Software, 88*(2), 1–15. https://doi.org/10.18637/jss.v088.i02

Mandel, A. A., Kleiman, E. M., Johnson, S., Rogers, M. L., Jobes, D. A., & Joiner, T. (2023). A test of invariance of the construct of suicidal ideation across three diverse samples. *Journal of Affective Disorders, 329*, 124–130. https://doi.org/10.1016/j.jad.2023.02.055

Mann, J.J., Apter, A., Bertolote, J., Beautrais, A., Currier, D., Haas, A., Hegerl, U., Lonnqvist, J., Malone, K., Marusic, A., Mehlum, L., Patton, G., Phillips, M., Rutz, W., Rihmer, Z., Schmidtke, A., Shaffer, D., Silverman, M., Takahashi, Y.,… Hendin, H. (2005). Suicide prevention strategies: A systematic review. *JAMA*, *294*(16), 2064–2074. https://doi.org/10.1001/jama.294.16.2064

McAuliffe, C. M. (2002). Suicidal ideation as an articulation of intent: A focus for suicide prevention? *Archives of Suicide Research, 6*(4), 325–338. https://doi.org/10.1080/13811110214524

McAuliffe, C., Corcoran, P., Keeley, H. S., & Perry, I. J. (2003). Risk of suicide ideation associated with problem-solving ability and attitudes toward suicidal behavior in university students. *Crisis: The Journal of Crisis Intervention and Suicide Prevention, 24*(4), 160–7. https://doi.org/10.1027//0227-5910.24.4.160

McGlinchey, E. L., Courtney-Seidler, E. A., German, M., & Miller, A. L. (2016). The role of sleep disturbance in suicidal and non-suicidal self-injurious behavior among adolescents. *Suicide and Life-Threatening Behavior, 47*(1), 103–111. https://doi.org/10.1111/sltb.12268

McKinnon, B., Gariépy, G., Sentenac, M., & Elgar, F. J. (2016). Adolescent suicidal behaviours in 32 low- and middle-income countries. *Bulletin of the World Health Organization, 94*(5), 340-350F. https://doi.org/10.2471/blt.15.163295

McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods, 23*(3), 412–433. https://doi.org/10.1037/met0000144

Nock, M. K., Green, J. G., Hwang, I., McLaughlin, K. A., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2013).Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents. *JAMA Psychiatry*, *70*(3), 300. https://doi.org/10.1001/2013.jamapsychiatry.55

Núñez, D., Arias, V., Méndez-Bustos, P., & Fresno, A. (2019). Is a brief self-report version of the Columbia severity scale useful for screening suicidal ideation in Chilean adolescents? *Comprehensive Psychiatry, 88*, 39–48. https://doi.org/10.1016/j.comppsych.2018.11.002

Núñez, D., Gaete, J., Guajardo, V., Libuy, N., Araneda, A. M., Contreras, L., Donoso, P., Ibañez, C., & Mundt, A. P. (2022). Brief Report: The association of adverse childhood experiences and suicide-related behaviors among 10th-Grade secondary school students. *Archives of Suicide Research*, 1–12. https://doi.org/10.1080/13811118.2022.2134067

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill, Inc.

Ong, E., & Thompson, C. (2019). The importance of coping and emotion regulation in the occurrence of suicidal behavior. *Psychological Reports, 122*(4), 1192–1210. https://doi.org/10.1177/0033294118781855

Özdemir, H. F., Toraman, Ç., & Kutlu, Ö. (2019). The use of polychoric and Pearson correlation matrices in the determination of construct validity of Likert type scales. *Turkish Journal of Education, 8*(3), 180–195. https://doi.org/10.19128/turje.519235

Pinto, A., Whisman, M. A., & McCoy, K. J. M. (1997). Suicidal ideation in adolescents: Psychometric properties of the suicidal ideation questionnaire in a clinical sample. *Psychological Assessment, 9*(1), 63–66. https://doi.org/10.1037//1040-3590.9.1.63

Posner, K., Brown, G. K., Stanley, B., Brent, D. A., Yershova, K. V., Oquendo, M. A., ... & Mann, J. J. (2011). The Columbia–Suicide Severity Rating Scale: Initial validity and internal consistency findings from three multisite studies with adolescents and adults. American *Journal of Psychiatry, 168*(12), 1266–1277. https://doi.org/10.1176/appi.ajp.2011.10111704

Potard, C., Kubiszewski, V., Gimenes, G., & Courtois, R. (2014). Validation of the French version of the Suicidal Ideation Questionnaire among adolescents. *Psychiatry Research, 215*(2), 471–476. https://doi.org/10.1016/j.psychres.2013.11.025

Prokofieva, M., Zarate, D., Parker, A., Palikara, O., & Stavropoulos, V. (2023). Exploratory structural equation modeling: A streamlined step by step approach using the R Project Software. *BMC Psychiatry*, *23*(1). https://doi.org/10.1186/s12888-023-05028-9

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review, 41*, 71–90. https://doi.org/10.1016/j.dr.2016.06.004

Reichl, C., & Kaess, M. (2021). Early detection of risk-taking, self-harming, and suicidal behaviour. In D. Wasserman (Ed.), *Suicidology and suicide prevention* (pp. 429–436). Oxford University Press.

Reynolds, W. M. (1987). *Suicidal Ideation Questionnaire-Junior*. Psychological Assessment Resources.

Reynolds, W. M. (1991). Psychometric characteristics of the adult suicidal ideation questionnaire in college students. *Journal of Personality Assessment*, *56*(2), 289–307. https://doi.org/10.1207/s15327752jpa5602_9

Reynolds, W. M., & Mazza, J. J. (1999). Assessment of suicidal ideation in inner-city children and young adolescents: Reliability and validity of the suicidal ideation questionnaire-JR. *School Psychology Review, 28*(1), 17–30. https://doi.org/10.1080/02796015.1999.12085945

Ribeiro, J. D., Huang, X., Fox, K. R., & Franklin, J. C. (2018). Depression and hopelessness as risk factors for suicide ideation, attempts and death: Meta-analysis of longitudinal studies. *British Journal of Psychiatry, 212*(5), 279–286. https://doi.org/10.1192/bjp.2018.27

Robinson, J., Hetrick, S., Cox, G., Bendall, S., Yuen, H. P., Yung, A., & Pirkis, J. (2016). Can an Internet-based intervention reduce suicidal ideation, depression and hopelessness among secondary school students: Results from a pilot study. *Early Intervention in Psychiatry, 10*(1), 28–35. https://doi.org/10.1111/eip.12137

Rosseel, Y. (2012). lavaan: Anrpackage for structural equation modeling. *Journal of Statistical Software*, *48*(2). https://doi.org/10.18637/jss.v048.i02

Ruan-Iu, L., Rivers, A. S., Barzilay, R., Moore, T. M., Tien, A., & Diamond, G. (2022). Identifying youth at risk for suicidal thoughts and behaviors using the "P" factor in primary care: An exploratory

study. *Archives of Suicide Research, 27*(3), 1047–1062. https://doi.org/10.1080/13811118.2022.2106925

Runeson, B., Odeberg, J., Pettersson, A., Edbom, T., Jildevik Adamsson, I., & Waern, M. (2017). Instruments for the assessment of suicide risk: A systematic review evaluating the certainty of the evidence. *PLOS ONE, 12*(7), e0180292. https://doi.org/10.1371/journal.pone.0180292

Sakashita, T., & Oyama, H. (2022). Suicide prevention interventions and their linkages in multilayered approaches for older adults: A review and comparison. *Frontiers in Public Health, 10.* https://doi.org/10.3389/fpubh.2022.842193

Santamarina-Perez, P., Mendez, I., Singh, M. K., Berk, M., Picado, M., Font, E., Moreno, E., Martínez, E., Morer, A., Borràs, R., Cosi, A., & Romero, S. (2020). Adapted dialectical behavior therapy for adolescents with a high risk of suicide in a community clinic: A pragmatic randomized controlled trial. *Suicide and Life-Threatening Behavior, 50*(3), 652–667. https://doi.org/10.1111/sltb.12612

Schermelleh-Engel, K., & Moosbrugger, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, 8*(2), 23–74.

Simon, G. E., Richards, J. E., & Whiteside, U. (2023). Reframing the key questions regarding screening for suicide risk. *JAMA*, *329*(23), 2026. https://doi.org/10.1001/jama.2023.7241

Speckens, A. E., & Hawton, K. (2005). Social problem solving in adolescents with suicidal behavior: A systematic review. *Suicide and Life-Threatening Behavior, 35*(4), 365–387. https://doi.org/10.1521/suli.2005.35.4.365

Steinmetz, H. (2023). In a factor analysis, what should happen with a factor that has only two items? [Question]. *ResearchGate*. https://rg.link/52bku

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Harper & Row

Thompson, E. C., Fox, K. A., Lapomardo, A., Hunt, J. I., & Wolff, J. C. (2020). Youth self report thought problems and sleep difficulties are linked to suicidal ideation among psychiatrically hospitalized adolescents. *Journal of Child and Adolescent Psychopharmacology, 30*(8), 522–525. https://doi.org/10.1089/cap.2019.0160

Villacura-Herrera, C., Gaete, J., Andaur, J., Meza, D., Robinson, J., & Núñez, D. (2022). Evidence for validity, reliability and measurement invariance of the emotion regulation questionnaire for children and adolescents (ERQ-CA) in secondary students from Chile. *Current Psychology*, 1–12. https://doi.org/10.1007/s12144-022-03833-1

Walsh, E. H., McMahon, J., & Herring, M. P. (2022). Research review: The effect of school-based suicide prevention on suicidal ideation and suicide attempts and the role of intervention and contextual factors among adolescents: A meta-analysis and meta-regression. *Journal of Child Psychology and Psychiatry, 63*(8), 836–845. https://doi.org/10.1111/jcpp.13598

Wasserman, D., Carli, V., Iosue, M., Javed, A., & Herrman, H. (2021). Suicide prevention in childhood and adolescence: A narrative review of current knowledge on risk and protective factors and effectiveness of interventions. *Asia-Pacific Psychiatry, 13*(3), 1–17. https://doi.org/10.1111/appy.12452

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology, 44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Whittaker, T. A. (2012). Using the modification index and standardized expected parameter change for model modification. *The Journal of Experimental Education, 80*(1), 26–44. https://doi.org/10.1080/00220973.2010.531299

Wolfe, K. L., Nakonezny, P. A., Owen, V. J., Rial, K. V., Moorehead, A. P., Kennard, B. D., & Emslie, G. J. (2017). Hopelessness as a predictor of suicide ideation in depressed male and female adolescent youth. *Suicide and Life-Threatening Behavior, 49*(1), 253–263. https://doi.org/10.1111/sltb.12428

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research. *The Counseling Psychologist*, *34*(6), 806–838. https://doi.org/10.1177/0011000006288127

Zhang, Y., Yip, P. S. F., & Fu, K. W. (2014). Validation of the Chinese version of the Reynolds' suicidal ideation questionnaire: Psychometric properties and its short version. *Health and Quality of Life Outcomes, 12*(1), 1–9. https://doi.org/10.1186/1477-7525-12-33

Zhang, Y. Y., Lei, Y. T., Song, Y., Lu, R. R., Duan, J. L., & Prochaska, J. J. (2019). Gender differences in suicidal ideation and health-risk behaviors among high school students in Beijing, China. *Journal of Global Health, 9*(1). https://doi.org/10.7189/jogh.09.010604