



Research article

Psychometric properties of the Alexian Brother Urge to Self-Injure (ABUSI) Spanish version for adolescents

Marly Johana Bahamón^{a,b,*}, José Julián Javela^{a,b}, Nidia-Johanna Bonilla-Cruz^c, Diego Rivera^{d,e}, Stefano Vinaccia^a, Jesús Forgiony-Santos^c^a Faculty of Health Sciences and Investigation Group I-Flor, University of Sinú, Montería, Colombia^b Red Iberoamericana de Suicidología REDISUI, Colombia^c Simón Bolívar University, Faculty of Legal and Social Sciences, Cúcuta, Colombia^d Department of Health Science, Public University of Navarre, Pamplona, Spain^e Instituto de Investigación Sanitaria de Navarra (IdiSNA), Pamplona, Spain

ARTICLE INFO

Keywords:

Self-injurious behavior

Suicidal behavior

Adolescence

Suicide

ABUSI

ABSTRACT

Objective: This study aimed to evaluate the psychometric properties of the Alexian Brother Urge to Self-Injure (ABUSI) in its Spanish version for Colombian adolescents. This instrument was created to measure cognitive and emotional aspects of the urge to self-injure by assessing the frequency, the urge, thoughts associated with time and place, the capacity for resistance, and thoughts associated with the urge to self-injure.

Method: A total of 752 preadolescents and adolescents between 10 and 18 years of age, with a mean of 15.3 years (SD = 1.97), participated. The instruments used were The Alexian Brother Urge to Self-Injure ABUSI, ERS Suicide Risk Scale, Plutchik Suicide Risk Scale, and the Zimet The MSPSS Perceived Social Support Scale. Confirmatory factor analysis, inter-test correlations, to estimate cut-off point discriminant validity Receiver Operating Characteristics (ROC) and to determine convergent validity, a Pearson's coincidence analysis was performed between the ABUSI total score and the ERS Suicide Risk Scale, the Plutchik's Suicide Risk Scale and Zimet's Perceived Social Support Scale assessments.

Results: The presence of a unidimensional model of the instrument is confirmed with adequate fit, reliability, and concurrent validity indices. The high score classification was determined from six (6) points for the total of the scale. These results show that ABUSI is a valid and reliable tool for the clinical assessment of self-injurious behavior in adolescents and preadolescents.

1. Introduction

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), defines non-suicidal self-injury (NSSI) as the tissue damage that a subject inflicts on his body without the intention of dying [1–4]. For its part, the DSM-5 establishes that the NSSI has at least three basic characteristics that involve the non-existence of a fatality, the subject's own initiative reflected in obvious damage (cuts to the wrists, abdominal wall, inner thighs), and the knowledge of the subject that the action performed can cause harm

* Corresponding author. Faculty of Health Sciences and Investigation Group I-Flor, University of Sinú, Montería, Colombia.

E-mail addresses: marlyjohanab@gmail.com (M.J. Bahamón), jjavela@gmail.com (J.J. Javela), nidia.bonilla@unisimon.edu.co (N.-J. Bonilla-Cruz), diego.rivera@unavarra.es (D. Rivera), vinalpi47@hotmail.com (S. Vinaccia), jesus.forgiony@unisimon.edu.co (J. Forgiony-Santos).

<https://doi.org/10.1016/j.heliyon.2023.e16167>

Received 5 December 2022; Received in revised form 22 April 2023; Accepted 8 May 2023

Available online 5 June 2023

2405-8440/© 2023 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

and leave signs [5–7].

The NSSI has been linked to different self-reported functions, such as emotional regulation, self-punishment or anxiety communication, constituting a focus of interest for health professionals since it is associated with a wide range of psychological difficulties such as depression, anxiety and post-traumatic stress disorder, having repercussions on negative family and interpersonal relationships [8]. The presence of NSSI represents a risk factor for subsequent suicidal behaviors, although protection against suicide is a reported function of NSSI in the first instance, however, in the long term it may increase suicidal risk through the development of suicidality acquired capacity for suicide [9].

At the epidemiological level in the world, the prevalence of NSSI in adolescents is presented as 16% and 18% for the general population and 60% for the clinical population, with percentage variations according to the country, region and years where the population samples were evaluated [10–13]. However, there are no sufficiently robust studies on the prevalence of non-suicidal self-injurious behaviors in Latin American adolescents that allow locating the specific characteristics of this population, as well as determining risk groups and the severity of the behavior to carry out action measures or routes of acting [14].

Regarding psychometric instruments for measuring NSSI, the Alexian Brothers Urge to Self-Injure Scale (ABUSI) developed by Washburn in 2010 [15], the Impulse, Self-Harm, and Suicidal Ideation Questionnaire for Adolescents (ISSIQ-A) developed by Carvalho in 2015 [16], the RTSHIA developed by Vrouva (2010) [17], and The Self Harm Questionnaire (SHQ) developed by Ougrin & Boege in 2013 [18]. Ougrin are identified as the most used instruments. However, the only instrument validated in Spanish for the Mexican population is the Self Harm Questionnaire SHQ [19].

The Alexian Brothers Self-Harm Impulse Scale (ABUSI) was created by Washburn in 2010 [15] to measure the severity of a cognitive and emotional state in which an individual is motivated or driven to commit self-harm. The ABUSI is a 5-item Likert-type scale designed to assess the motivation of the impulse to self-harm in the last week. The first item assesses the frequency of injuries, the second item the strength of the impulse to self-harm, the third the thoughts associated with the time and place of the injury, the fourth item the ability to resist self-harm, and the fifth item the thoughts associated with the urge to self-harm.

Psychometric analyzes of the Alexian Brothers Self-Harm Impulse Scale (ABUSI) provided evidence for the reliability and validity of this psychometric instrument, finding that ABUSI is a one-dimensional measure of self-harm impulse severity with internal discharge and test-retest reliability. In addition, it has good convergent validity and sensitivity to change over the course of treatment [15].

In Colombia, studies on self-harm in adolescents have been developed [14,20], but there is no research that adapts or explores the psychometric properties of the instruments that measure self-harm in adolescents of this type. context according to the review carried out. Given the above, this research aims to review the psychometric properties of the Alexian Brothers Self-Harm Impulse Scale (ABUSI) in a sample of Colombian adolescents.

The context described raised the need to assess concurrent validity with assessment instruments that theoretically assess dimensions related to the NSSI such as suicide risk and perceived social support.

2. Method

2.1. Participants and procedure

All the participants (N = 752) were preadolescents and adolescents between 10 and 18 years old, with a mean of 15.30 years (SD = 1.97). The minimum schooling was 3 years and the maximum 16 years (M = 10.42), 57.40% women and 42.50% men, income socio-economic stratum between 1 (low) and 6 (high) (1 = 16.084%, 2 = 33.52%, 3 = 29.33%, 4 = 15.01% 5 = 3.70%, 6 = 1.40%). A proportion corresponding to 13.83% reported having made at least one suicide attempt in their life, of which 1.73% reported having been hospitalized for this reason. 25.10% of the participants indicated the existence of a history of suicide attempts in at least one member of their family. Of the total respondents, 16.62% identified themselves as suicide survivors by reporting having at least one family member or loved one who died by suicide.

Participants were recruited through university students in their final year of psychology training who had been previously trained in applying the instruments and possible referral to psychological care pathways if necessary. The parents of the identified adolescents were personally visited to inform them about the purposes and processes of the research and ask them to sign a consent form agreeing to their children's participation in the research process. Subsequently, the adolescents were contacted personally to request their voluntary involvement and apply the evaluation instruments. This was done in an individualized manner and with the biosafety measures required in the framework of the COVID19 contingency.

2.2. Instruments

The Alexian Brother Urge to Self-Injure ABUSI [15] is an instrument assessing the cognitive and emotional aspects of the intensity of the urge to self-injure in the previous week by evaluating its frequency, intensity, and duration. It was developed as an adaptation of the Penn Alcohol Craving Scale (PACS), which assesses the frequency, intensity, and duration of alcohol craving. Its structure is unidimensional, and it is made up of 5 items with 7 response options scoring between 0 and 6. The internal consistency reported by the authors ranged between $\alpha = 0.92$ in the initial measurement and $\alpha = 0.96$ in the second measurement. All its items were highly correlated with the general scale (0.87–0.92). It also showed convergent validity with measures of quality of life, suicidal ideation, self-injury, and frequency of self-injury.

ERS Suicide Risk Scale [21] is a Likert-type scale made up of 20 items containing six response options, from 1 (strongly disagree) to 6 (strongly agree). This instrument assesses the following factors: a) hopelessness (items 1, 2, 3, 4, 5, 6), b) ideation, planning and

self-harm (7, 8, 9, 10, 11, 12), c) isolation/social support (items 13, 14, 15, 16) and d) lack of family support (items 17, 18, 19, 20). The cut-off points for determining the level of suicidal risk in men are: low (1 and 32), moderate (33 and 48), high (49 and 112), and in women: low (1 and 36), medium (37 and 53) and high (54–112). Reliability reports using Cronbach's Alpha show indices between $\alpha = 0.711$ and 0.929 for the subscales and $\alpha = 0.933$ for the total scale. These values were similar to McDonald's Omega's, except for the reliability index for the overall scale, which increased slightly from 0.933 to 0.934 . The fit indices reported by AFC showed adequate fits ($\chi^2 = 600.151$; $gl = 164$; $CFI = 0.939$; $RMR = 0.105$; $RMSEA = 0.07$).

The *Plutchik Suicide Risk Scale* (1989), validated in Colombia by Suárez-Colorado in 2019 [22], evaluates previous self-harm attempts, the intensity of current suicidal ideation, feelings of depression, hopelessness, and others. It is scored by giving the value of 1 to all affirmative responses and 0 to negative responses. Scores above 6 indicate suicidal risk. Two factors were found in the Colombian adolescent population: suicidal risk (items 13, 14, 15) and depressive symptoms (2, 3, 6, 8, 9, 10). Cronbach's Alpha reliability for depression was .72 and .80 for suicide risk; McDonald's Omega was 0.82 and 0.94, respectively. The AFC showed a good fit ($\chi^2S-B = 26.36$, $gl = 26$, $p = .34$; $NNFI = 1.0$, $CFI = 1.0$, $RMSEA = 0.02$, $IC\ 90\% (0.00, 0.05)$).

The Multidimensional Scale of Perceived Social Support developed by Zimet in 1998, validated by Trejos in 2018 [23] consists of 12 items that assess the perception of social support through three dimensions: family (3, 4, 8, 11), friends (6, 7, 9, 12), significant others (1, 2, 5, 10). These 12 items have a 7-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7). Its internal consistency is 0.84 (95% CI = 0.83–0.86), and the AFC indices show a good fit ($AGFI = 31,680.98$, $BIC = 31,824.74$, $NNFI = 0.946$, $CFI = 0.975$, $RMSEA = 0.049$).

2.3. Statistical analysis

A confirmatory factor analysis (AFC) was carried out to evaluate the factorial structure of the ABUSI, assuming a unidimensional model, where all items correspond to the same factor. The univariate normality test was estimated using the Kolmogorov Smirnov-Lilliefors test, and the multivariate test by using Mardia [24]. Since the results showed a lack of normality, the diagonal weighted least squares estimation method (DWLS) was chosen, which yielded a root mean squared error of approximation (RMSEA) of 0.03 ($IC_{90\%} 0.00 - 0.06$), SRMR (Standardized residual root mean square) of 0.01, where an RMSEA less than 0.06 indicates a reasonable approximation error and good fit given the degrees of freedom of the model. The comparative fit index (CFI) and incremental fit index (IFI) were 0.998 and 0.998, respectively, where 0.95 and above is considered a good fit [25].

To determine the psychometric properties of the ABUSI, the internal consistency of the scale was calculated using the Cronbach's α and McDonald's Omega. To determine convergent validity, a Pearson's coincidence analysis was performed between the ABUSI total score and the ERS Suicide Risk Scale, the Plutchik's Suicide Risk Scale and Zimet's Perceived Social Support Scale assessments.

The effect of the variables age, age², sex, and presence of previous suicide attempts, and all two-level interactions were estimated as predictors through a multivariate regression model. Age squared terms were added to the model to assess the curvilinear effect, previously centralizing them to avoid multicollinearity (age in years - Mean age in the sample). Sex was coded as male = 1 and female = 0. The model assumes that the residuals are normally distributed with a mean 0 and variance σ_e^2 , $\epsilon_i \sim N(0, \sigma_e^2)$.

Independent variables that were not statistically significant (corrected α level of 0.01) in the multiple regression models were eliminated, except for those predictors also included in a higher-order term [26]. After eliminating each variable, the model was refitted (forward selection). The following assumptions were then evaluated for each model: multicollinearity (VIF values), homoscedasticity, normality of the standardized residuals, and assessment of the existence of influential values (calculation of the maximum Cook's distance) [27].

To generate normative data adjusted for variable selections, a four-step procedure was performed for total scores [28,29]: a) the expected test score (\hat{Y}_i) is calculated using the fixed-effects parameter of the final regression model: $\hat{Y}_i = B_0 + B_1X_{1i} + B_2X_{2i} + \dots + B_KX_{Ki}$, b) the residual value $e_i = Y_i - \hat{Y}_i$ is calculated, c) the residuals are standardized using the residual value of the standard deviation (SD_e) provided by the regression model: $z_i = e_i/SD_e$, and d) the exact percentile corresponding to the z-score is obtained using the standard normal cumulative distribution function (if the normality assumption is met) or the empirical cumulative distribution function of the standardized residuals (if the normality assumption is not met).

Finally, to estimate cut-off point discriminant validity Receiver Operating Characteristics (ROC) or ROC curve analysis was conducted in order to determine whether the ABUSI discriminated between PwMS and HCs using low percentiles. The curve was created by plotting the true positive rate (also known as sensitivity) against the false positive rate (also known as specificity) for various cutoff points. The Area Under the Curve (AUC) was calculated as a measure of accuracy or precision, wherein high accuracy was deemed at a value equal to 0.9 or higher, moderate accuracy at a value from 0.7 to 0.9, and low accuracy at a value from 0.5 to 0.7. Additionally, Youden Index and Index of Union were calculated to determine the optimal cutoff point for the number of low-scores below the 10th percentile and below the 5th percentile to discriminate PwMS or HCs. These data were calculated from a matching process, differentiating between those who had attempted suicide and those who had not reported. R 3.6.3 for Windows was used to perform the analyses. The *MVN* package (Korkmaz et al., 2014) was used to estimate univariate and multivariate normality distribution. To conduct ROC analyzes *pROC* package [30] was used.

2.4. Ethics committee

The data of this manuscript was collected and treated in accordance with the provisions of the ethics committee of the Simón Bolívar University through the approval code CEI-USB-CE-0294-00-00.

Table 1
Descriptive, Statistic of Normality and Proportion for each level of response by item.

	Descriptive information							Statistic of Normality		Proportion for each level of response						
	Mean	Std.Dev	Median	Min	Max	Skew	Kurtosis	Lilliefors (KS)	p value	0	1	2	3	4	5	6
Item_1	0.43	0.88	0.000	0	6	0.411	9.800	2.856	<0.001	0.72	0.20	0.04	0.03	0.01	0.00	0.00
Item_2	0.51	1.14	0.000	0	6	0.409	7.962	2.832	<0.001	0.74	0.17	0.03	0.02	0.02	0.02	0.01
Item_3	0.42	0.89	0.000	0	6	0.403	15.393	3.445	<0.001	0.72	0.20	0.04	0.01	0.00	0.01	0.01
Item_4	0.39	0.94	0.000	0	6	0.432	12.995	3.374	<0.001	0.77	0.16	0.03	0.02	0.01	0.01	0.01
Item_5	0.51	0.94	0.000	0	6	0.379	7.089	2.481	<0.001	0.67	0.23	0.04	0.03	0.02	0.00	0.00

Note: KS = Kolmogorov-Smirnov.

3. Results

3.1. Descriptive results

According to the results of the Kolmogorov-Smirnov test, none of the ABUSI items met the assumption of univariate normal distribution (p 's < 0.001, see Table 1). Furthermore, the scale-items do not show a multivariate normal distribution (Mardia Skewness = 7902.91 p < .001; Mardia Kurtosis = 240.87, p < .001).

3.2. Confirmatory factor analysis

The fit of the unidimensional model corresponding to all five items of the scale was explored using the CFA. The goodness-of-fit tests provided evidence that the one-factor solution was an adequate fit, especially considering that the ratio of χ^2/df was 1.80 (the cutoff point of the critical ratio is 2.0) and CFI = 0.998, IFI = 0.998, GFI = 0.995, AGFI = 0.986, RNI = 0.998, NFI = 0.996 all scored above 0.95, indicating an adequate fit given that their scores were above 0.95 [31]. Although the RMSEA of 0.033 was slightly above the expected range [IC of 90% = 0.016 - 0.036] and SRMR = 0.011, the item loadings on their latent constructs were statistically significant (p < .001), suggesting that all items had a good index of the latent construct. The estimated parameter values between latent constructs and items are presented in Table 2 and Fig. 1.

3.3. Reliability analysis

In order to analyze the reliability of the instrument, Cronbach's alpha (α) and Omega (ω_t) were calculated with the overall score of the scale that included five items. ω_t uses the uniqueness estimates u^2 from the factor analysis to find the random error e_j^2 [32]. For the scale as a unidimensional instrument, the following indices $\alpha = 0.894$ and $\omega_t = .90$ were obtained, which were high.

3.4. Convergent construct validity

ABUSI showed correlations in the expected directions and sizes with the other variables assessed (Table 3). Moderate correlations were identified with the ideation, planning, and self-harm subscale (0.618**) and the global suicide risk score assessed by the ERS (0.565**). Significant correlations were also found, although low, with the hopelessness subscale of ERS (0.426**), depressive symptoms (0.424**), and suicidal potential (0.444**) assessed by the Plutchik scale. On the other hand, significant, although low correlations of ABUSI with the subscales and the global score of the Zimet scale were found in a negative direction as expected.

3.5. Normative data

3.5.1. Age, sex, and presence of suicide attempts

The analysis model for establishing the normative data included age, sex, and the presence of suicide attempts as independent variables. In this respect, the assumptions considered in the multiple regression analysis were mostly fulfilled. There was no multicollinearity 1.055 (VIF values \leq 3) and no influential cases (maximum Cook's distance = 0.11, which indicates the presence of influential cases). Levene's test showed evidence of heteroscedasticity in the model. The standardized residuals of the models were normally distributed (Kolmogorov-Smirnov test). The final regression model showed that scores increase due to the presence of suicide attempts and decrease in function of age (Table 4).

3.6. Sensitivity and specificity

The data of sensitivity and specificity of the ABUSI, to indicate the probability of suicidal risk in adolescents with a high impulse to self-injurious behavior, differentiating subjects with high scores of impulse to problematic self-injurious behavior, from subjects without this condition, the Youden's index. A total of 288 subjects matched by sex, age, and suicide attempt report were analyzed. The cut-off points with the maximum Youden index showed that the optimal cut-off point was ≥ 6 (Sensitivity = 0.680 CI = 0.623), which is between low and moderate precision for subject discrimination (Table 5 and Fig. 2). With this information, it was identified that in the entire sample, 15.30% ($n = 100$) of the subjects obtained scores ≥ 6 , of which 35% ($n = 35$) were men and 65.00% ($n = 65$) they were women.

Table 2
ABUSI confirmatory factor analysis indices.

Model	χ^2	df	χ^2/df	CFI	IFI	GFI	AGFI	RNI	RMSEA	SRMR
Model 1	9.014	5	1.800	0.998	.998	0.995	.986	.998	.033	0.110

Note: χ^2 = Normal Theory Weighted Least Squares Chi-Square; df = degrees of freedom; CFI = comparative fit index; IFI=Incremental fit index; GFI = Goodness-of-fit index; AGFI = Adjusted GFI; RNI= Relative non-centrality fit index; RMSEA = Root Mean Square Error of Approximation; SRMR= Standardized RMR.

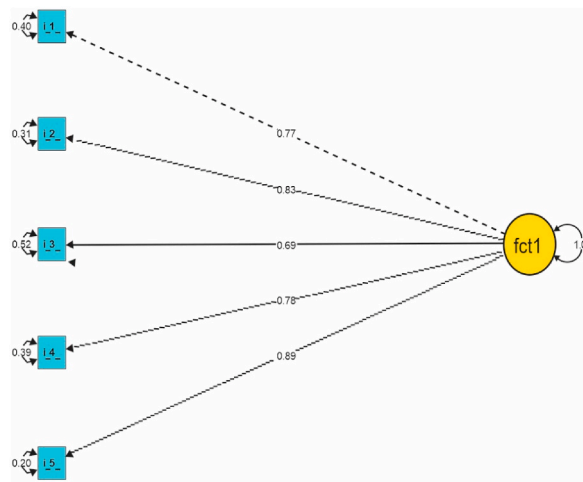


Fig. 1. ABUSI factorial solution.

Table 3
Convergent construct validity of the ABUSI.

Instrument	N	r
ERS Suicide Risk Scale		
Despair		.426**
Ideation, planning, and self-injury	752	.618**
Isolation/social support		.335**
Lack of family support		.397**
Overall suicide risk		.565**
Plutchik's Suicide Risk Scale		
Suicide risk	752	.387**
Depressive symptoms		.424**
Suicidal potential		.444**
Zimet's Perceived Social Support Scale		
Family	752	-.374**
Friends		-.157**
Significant others		-.252**
Overall social support score		-.331**

Table 4
Regression results using F1 as the criterion.

Predictor	b	b 95% CI [LL, UL]	beta	Fit
(Intercept)	3.61**	[1.52, 5.70]		R ² = .160**
Age	-0.14*	[-0.27, -0.00]	-0.07	95% CI [.11, .21]
Inttent	4.29**	[3.59, 5.00]	0.40	

Note. A significant *b-weight* indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. * indicates *p* < .05. ** indicates *p* < .01.

4. Discussion

The ABUSI instrument is one of the best-known and most widely used scales to measure self-injurious behaviors in the adolescent population [11]. However, few studies have developed analyzes of its psychometric properties, and it was not translated into Spanish. Therefore, the ABUSI was translated into this language and its psychometric properties, factorial structure, and normative data were analyzed for its application in this context.

The results of this study identified that the Spanish version of the ABUSI demonstrated adequate psychometric properties in Colombian samples. Specifically, the internal consistency was adequate, although slightly below the index reported by the original authors, which was between 0.92 and 0.96 [33,34]. The ABUSI demonstrated construct validity through confirmatory factor analysis, identifying that the unifactorial solution had a good fit.

Table 5
Cut-points and associated sensitivity and specificity values.

Cut-point	Se	Sp	J
≥1	1.000	.000	.000
≥2	.666	.576	.242
≥3	.583	.645	.228
≥4	.562	.694	.256
≥5	.534	.701	.235
≥6	.486	.715	.201
≥7	.402	.951	.353
≥8	.368	.958	.326
≥9	.305	.972	.277
≥10	.270	.986	.256
≥11	.229	.993	.222
≥12	.194	.993	.187
≥13	.173	.993	.166
≥14	.152	.993	.145
≥15	.138	1.00	.138
≥16	.118	1.00	.118
≥17	.111	1.00	.111
≥18	.083	1.00	.083
≥19	.062	1.00	.062
≥20	.048	1.00	.048
≥21	.034	1.00	.034
≥22	.013	1.00	.013
≥23	.006	1.00	.006
≥24	.000	1.00	.000

Se = Sensitivity; Sp = Specificity; J = Youden index.

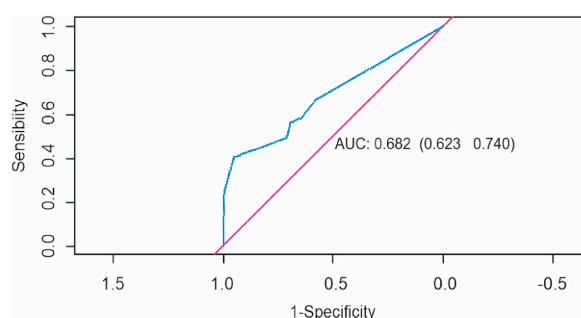


Fig. 2. Sensibility and specificity.

The analysis of the items showed a tendency to high scores in questions 2 and 5, which explore how strong the desire and impulse to self-harm has been during the last week, an issue that should be considered since the means corresponded to the population adolescent in general and no discrimination was made between those who self-harm and those who do not. This trend should be considered as an important indicator of high risk of NSSI among the adolescent population, reflecting the need for extensive screening in this age group that may be experiencing the problem and not seeking help.

The analysis of the subjects based on the optimal cut-off point showed that 15.3% of the participants obtained high scores in the impulse to self-injurious behavior, a figure slightly below the self-injurious behavior itself found by other authors who have reported a prevalence 17.2% [35]. These data support the hypothesis that the measure of impulse to self-injurious behavior is closely related to self-injurious behavior and shows the need to include the correlation between these variables in other studies, given that one of the problematic aspects in the measurement of self-injurious behavior is the inconsistency between the behavior and its self-report. With these data, the possibility of including the ABUSI in broad screening measures opens up as an instrument that provides relevant information on the presence of NSSI, reducing the perceived stigma in the self-report measures, since adolescents can interpret that the impulse to self-report is not the same conduct.

Although it was not the purpose of the study, we included information on characteristics related to suicidal behavior in the subjects evaluated, finding that the prevalence of self-reported suicide attempt was 13.83%, a percentage that coincides with what was found by Lee in 2021 [36] in adolescents from Africa, Asia, and the Americas [range 1.2% (Laos) to 13.8% (Ghana)], however, this is a high number at the upper end of the range.

Another aspect that was explored to better characterize the participants was the family and social history of suicide, identifying that 16.60% of adolescents were suicide survivors, a figure slightly lower than that found in studies with Ecuadorian adolescents, where the percentage was 17.60% [37]. These data show that the risk characteristics present in the adolescents surveyed are similar to the

characteristics of other populations and therefore it is expected that the results referring to the impulse to self-injurious behavior and its evaluation will not be affected by these conditions.

Regarding the similarity with other instruments, the ABUSI also showed convergent construct validity, since correlations were established in size and expected direction with ideation, planning and self-harm, and with the global suicide risk score, as well as negative correlations of lower magnitude with perceived social support in all cases. Its subscales. These data are consistent with what was reported by the authors of the original trial [33], who identified correlations with a different measure of self-harm (0.768**) and suicidal ideation (0.446**).

As for the negative correlations, although low, of the impulse to self-injurious behavior and social support, particularly family social support, exposes the need for greater family participation in the healthy development of the adolescent [38].

On the other hand, these results on correlations between suicidal potential and NSSI can be confusing if we take into account that a primary factor in NSSI is non-suicidality; however, recent studies on suicide risk have identified self-injurious behavior as an important predictor of suicidal potential [37,39–41]. This approach provides clues about possible future lines of research, since this study did not explore the motivations for NSSI, which were not necessarily directly related to suicidal ideation.

What has been previously stated shows an important limitation of this research since it is not possible to infer the real nature of the correlations found between suicidal ideation and suicidal potential with the impulse to self-injurious behavior in the participants, an issue that shows the need to continue carrying out processes of exploration and research that allows generating explanatory models of self-injurious behavior to delve into the theoretical development of this concept.

The limitations of the study include the use of the convenience sampling method and the recruitment of the school population, an issue that increases the selection bias, limiting the generalization of the results.

Another limitation of this research was the use of the instrument in an adolescent population not clinically evaluated, limiting the comparison of clinical and non-clinical samples. In future studies, it would be desirable to include participants who have been assessed through different measures at different points in time, as previous studies have noted a tendency for subjects to report much lower self-harm on earlier assessments [42,43].

In this direction, other studies should include formal diagnoses of clinical participants that make it possible to establish correlations with measures other than self-report, since previous studies have warned that measures based on self-report may not adequately represent the construct [44]. Issue that may have affected the size of the correlations found.

Although a greater number of self-injurious behaviors have been reported at younger ages [45–47], future research should examine the psychometric properties of ABUSI in samples of older participants that allow for cluster analysis.

Another element to consider and that was not explored in this study is the role of stigma in relation to NSSIs, as well as any other behavior related to suicide, which becomes an obstacle to obtain more accurate information from the participants who with they often fear stigma for their behavior [48].

Finally, it was possible to obtain a cut-off point (6) for the ABUSI to discriminate between subjects with a higher probability of making a suicide attempt. Taking into account that the value of the ROC curve was between low and moderate precision, the ABUSI scores should be taken with caution by clinical staff to discriminate between those who can or cannot make a suicide attempt, which can be corrected with the support of complementary diagnostic tools.

Author contribution statement

Marly Johana Bahamón: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Jose Julián Javela: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Nidia Johanna Bonilla; Stefano Vinaccia; Jesus Forgioni: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Diego Rivera: Analyzed and interpreted the data; Wrote the paper.

Data availability statement

Data included in article/supplementary material/referenced in article.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: MARLY JOHANA BAHAMON reports administrative support and statistical analysis were provided by University of Sinu.

Acknowledgments

The authors would like to thank the University of Sinú, Montería Colombia, Simón Bolívar University at Barranquilla and the Public of Navarra University for their support during the execution of this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e16167>.

References

- [1] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, Diagnostic Stat. Man. Ment. Disord., 2013, <https://doi.org/10.1176/APPLBOOKS.9780890425596>.
- [2] R.C. Brown, P.L. Plener, Non-suicidal self-injury in adolescence, *Curr. Psychiatr. Rep.* 19 (2017), <https://doi.org/10.1007/S11920-017-0767-9>.
- [3] E.D. Klonsky, S.E. Victor, B.Y. Saffer, Nonsuicidal self-injury: what we know, and what we need to know, *Can. J. Psychiatr.* 59 (2014) 565–568, https://doi.org/10.1177/070674371405901101/ASSET/070674371405901101.FP.PNG_V03.
- [4] D. Sánchez-Teruel, M.A. Robles-Bello, J.A. Camacho-Conde, Self-inflicted injuries in adolescents and young adults: a longitudinal approach, *Psicothema* 32 (2020) 322–328, <https://doi.org/10.7334/PSICOTHEMA2019.347>.
- [5] R.L. Møhl B, Self-injury, Converting Emotional Distress into Physical Pain, vol. 179, *Ugeskr Laeger*, 2017. <https://pubmed.ncbi.nlm.nih.gov/28648163/>. (Accessed 22 March 2023).
- [6] J.L. Pedreira-Massa, Conductas suicidas en la adolescencia: una guía práctica para la intervención y la prevención, *Rev. Psicopatol. Psicol. Clínica* 24 (2019) 217–237, <https://doi.org/10.5944/RPPC.26280>.
- [7] D. Vega, A. Sintes, M. Fernández, J. Puntí, J. Soler, P. Santamarina, À. Soto, A. Lara, I. Méndez, R. Martínez-Giménez, S. Romero, J.C. Pascual, Review and update on non-suicidal self-injury: who, how and why? *Actas Esp. Psiquiatr.* 46 (2018) 146–155.
- [8] P.J. Taylor, K. Jomar, D. Dhingra, R. Forrester, U. Shahmalak, J.M. Dickson, A meta-analysis of the prevalence of different functions of non-suicidal self-injury, *J. Affect. Disord.* 227 (2018) 759–769, <https://doi.org/10.1016/J.JAD.2017.11.073>.
- [9] T.E. Joiner, J.D. Ribeiro, C. Silva, Nonsuicidal Self-Injury, Suicidal Behavior, and Their Co-occurrence as Viewed Through the Lens of the Interpersonal Theory of Suicide 21 (2012) 342–347, <https://doi.org/10.1177/0963721412454873>.
- [10] H. Bergen, K. Hawton, K. Waters, J. Cooper, N. Kapur, Epidemiology and trends in non-fatal self-harm in three centres in England: 2000–2007, *Br. J. Psychiatry* 197 (2010) 493–498, <https://doi.org/10.1192/BJP.BP.110.077651>.
- [11] Y.V. Chávez-Flores, C.A. Hidalgo-Rasmussen, L.Y. Yanez-Peñúñuri, Assessment tools of non-suicidal self-injury in adolescents 1990–2016: a systematic review, *Ciència Saúde Coletiva* 24 (2019) 2871–2882, <https://doi.org/10.1590/1413-81232018248.18502017>.
- [12] G. Geulayov, N. Kapur, P. Turnbull, C. Clements, K. Waters, J. Ness, E. Townsend, K. Hawton, Epidemiology and trends in non-fatal self-harm in three centres in England, 2000–2012: findings from the Multicentre Study of Self-harm in England, *BMJ Open* 6 (2016), <https://doi.org/10.1136/BMJOPEN-2015-010538>.
- [13] D. Gillies, M.A. Christou, A.C. Dixon, O.J. Featherston, I. Rapti, A. Garcia-Anguita, M. Villasis-Keever, P. Reebye, E. Christou, N. Al Kabir, P.A. Christou, Prevalence and characteristics of self-harm in adolescents: meta-analyses of community-based studies 1990–2015, *J. Am. Acad. Child Adolesc. Psychiatry* 57 (2018) 733–741, <https://doi.org/10.1016/J.JAAC.2018.06.018>.
- [14] D. Obando, Á. Trujillo, M. Prada, Conducta autolesiva no suicida en adolescentes y su relación con factores personales y contextuales, *Rev. Psicopatol. Psicol. Clínica* 23 (2019) 189–200, <https://doi.org/10.5944/rppc.vol.23.num.3.2018.21278>.
- [15] J.J. Washburn, K.R. Juzwin, D.M. Styer, D. Aldridge, Measuring the urge to self-injure: preliminary data from a clinical sample, *Psychiatr. Res.* 178 (2010) 540–544, <https://doi.org/10.1016/J.PSYCHRES.2010.05.018>.
- [16] C.B. Carvalho, C. Nunes, P. Castilho, C. da Motta, S. Caldeira, J. Pinto-Gouveia, Mapping non suicidal self-injury in adolescence: development and confirmatory factor analysis of the impulse, self-harm and suicide ideation Questionnaire for adolescents (ISSIQ-A), *Psychiatr. Res.* 227 (2015) 238–245, <https://doi.org/10.1016/J.PSYCHRES.2015.01.031>.
- [17] I. Vrouva, P. Fonagy, P.R.M. Fearon, T. Roussov, The risk-taking and self-harm inventory for adolescents: development and psychometric evaluation, *Psychol. Assess.* 22 (2010) 852–865, <https://doi.org/10.1037/A0020583>.
- [18] D. Ougrin, I. Boege, Brief report: the Self Harm Questionnaire: a new tool designed to improve identification of self harm in adolescents, *J. Adolesc.* 36 (2013) 221–225, <https://doi.org/10.1016/J.ADOLESCENCE.2012.09.006>.
- [19] J.F. García-Mijares, G. de J. Alejo-Galarza, S.R. Mayorga-Colunga, L.F. Guerrero-Herrera, J.L. Ramírez-GarcíaLuna, J.F. García-Mijares, G. de J. Alejo-Galarza, S. R. Mayorga-Colunga, L.F. Guerrero-Herrera, J.L. Ramírez-GarcíaLuna, Validación al español del Self-Harm Questionnaire para detección de autolesionismo en adolescentes, *Salud Ment* 38 (2015) 287–292, <https://doi.org/10.17711/SM.0185-3325.2015.039>.
- [20] L.F. Ferro Valencia, J. Juliana Franco Maya, G.V. Izquierdo Cubillos, L.F. González Suárez, M.J. Villegas Moreno, Relación entre conductas autolesivas con fines no suicidas y depresión en población adolescente escolarizada, *Cuad. Hispanoam. Psicol.* ISSN 1657-3412, ISSN-e 2346-0253, Vol. 19, N^o. 2, 2019, Ejemplar Dedic. a Cuad. Hispanoam. Psicol. Págs. 1–25 (19) (2019) 1–25, <https://doi.org/10.18270/chps.v19i2.3145>.
- [21] M.J.B. Muñeton, Y. Alarcón-Vásquez, Diseño y validación de una escala para evaluar el Riesgo Suicida (ERS) en adolescentes colombianos, *Univ. Psychol.* 17 (2018) 1–15, [https://doi.org/10.11144/JAVERIANA.UPSY17-4 \(DVEE\)](https://doi.org/10.11144/JAVERIANA.UPSY17-4 (DVEE)).
- [22] Y. Suárez-Colorado, J. Palacio-Sañudo, C.C. Caballero-Domínguez, C.A. Pineda-Roa, Y. Suárez-Colorado, J. Palacio-Sañudo, C.C. Caballero-Domínguez, C. A. Pineda-Roa, Adaptación, validez de constructo y confiabilidad de la escala de riesgo suicida Plutchik en adolescentes colombianos, *Rev. Latinoam. Psicol.* 51 (2019) 145–152, <https://doi.org/10.14349/RLP.2019.V51.N3.1>.
- [23] A.M. Trejos-Herrera, M.J. Bahamón, Y. Alarcón-Vásquez, J.I. Vélez, S. Vinaccia, Validity and reliability of the multidimensional scale of perceived social support in Colombian adolescents, *Psychosoc. Interv.* 27 (2018) 56–63, <https://doi.org/10.5093/PI2018A1>.
- [24] S. Korkmaz, D. Gökşülük, G. Zararsiz, MVN: an R package for assessing multivariate normality, *R J* 6 (2014).
- [25] P.M. Bentler, P. Dudgeon, Covariance structure analysis: statistical practice, theory, and directions, *Annu. Rev. Psychol.* 47 (1996) 563–592, <https://doi.org/10.1146/annurev.psych.47.1.563>.
- [26] G.E. Aiken, W.D. Pitman, C.G. Chambliss, K.M. Portier, Responses of yearling steers to different stocking rates on a subtropical grass-legume pasture, *J. Anim. Sci.* 69 (1991) 3348–3356, <https://doi.org/10.2527/1991.6983348X>.
- [27] M.H. Kutner, C.J. Nachtsheim, J. Neter, W. Li, *Applied Linear Statistical Models*, fifth ed., Irwin, New York., 2005.
- [28] D. Rivera, L. Olabarrieta-Landa, W. Van der Elst, I. Gonzalez, Y. Rodríguez-Agudelo, A. Aguayo Arellis, W. Rodríguez-Irizarry, C. García de la Cadena, J. C. Arango-Lasprilla, Normative data for verbal fluency in healthy Latin American adults: letter M, and fruits and occupations categories, *Neuropsychology* 33 (2019) 287–300, <https://doi.org/10.1037/neu0000518>.
- [29] D. Rivera, L. Olabarrieta-Landa, W. Van der Elst, I. Gonzalez, R. Ferrer-Cascales, A.I. Peñalver Guía, A. Rodríguez-Lorenzana, J. Galarza-del-Angel, M.J. Irías Escher, J.C. Arango-Lasprilla, Regression-based normative data for children from Latin America: phonological verbal fluency letters M, R, and P, *Assessment* 28 (2021) 264–276, <https://doi.org/10.1177/1073191119897122>.
- [30] X. Robin, N. Turck, A. Hainard, N. Tiberti, F. Lisacek, J.C. Sanchez, M. Müller, pROC: an open-source package for R and S+ to analyze and compare ROC curves, *BMC Bioinf.* 12 (2011) 1–8, <https://doi.org/10.1186/1471-2105-12-77/TABLES/3>.
- [31] L. Hu, P.M. Bentler, Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives, *Struct. Equ. Model.* 6 (1999) 1–55, <https://doi.org/10.1080/10705519909540118>.
- [32] W.R. Revelle, Procedures for Personality and Psychological Research, psych, 2017, in: <https://www.scholars.northwestern.edu/en/publications/psych-procedures-for-personality-and-psychological-research>. (Accessed 23 March 2023).
- [33] J.J. Washburn, K.R. Juzwin, D.M. Styer, D. Aldridge, Measuring the urge to self-injure: preliminary data from a clinical sample, *Psychiatr. Res.* 178 (2010) 540–544, <https://doi.org/10.1016/J.PSYCHRES.2010.05.018>.
- [34] J.J. Washburn, L.M. Potthoff, K.R. Juzwin, D.M. Styer, Assessing DSM-5 nonsuicidal self-injury disorder in a clinical sample, *Psychol. Assess.* 27 (2015) 31–41, <https://doi.org/10.1037/PAS0000021>.
- [35] Y.J. Wang, X. Li, C.H. Ng, D.W. Xu, S. Hu, T.F. Yuan, Risk factors for non-suicidal self-injury (NSSI) in adolescents: a meta-analysis, *EClinicalMedicine* 46 (2022), <https://doi.org/10.1016/J.ECLINM.2022.101350>.
- [36] L. Smith, J. II Shin, C. Carmichael, H. Oh, L. Jacob, G.F. López Sánchez, M.A. Tully, Y. Barnett, L. Butler, D.T. McDermott, A. Koyanagi, Prevalence and correlates of multiple suicide attempts among adolescents aged 12–15 years from 61 countries in Africa, Asia, and the Americas, *J. Psychiatr. Res.* 144 (2021) 45–53, <https://doi.org/10.1016/J.JPSYCHRES.2021.09.047>.

- [37] M.J. Bahamón, J.J. Javela, S. Vinaccia, S. Matar-Khalil, A. Cabezas-Corcione, E.E. Cuesta, Risk and protective factors in Ecuadorian adolescent survivors of suicide, *Children* 10 (2023) 549, <https://doi.org/10.3390/CHILDREN10030549>.
- [38] K. Liu, X. Yang, M. Xin, Impact of violent experiences and social support on R-NSSI behavior among middle school students in China, *Int. J. Environ. Res. Publ. Health* 18 (2021), <https://doi.org/10.3390/IJERPH18073347>.
- [39] I. Cataldo, I. De Luca, V. Giorgetti, D. Cicconcelli, F.S. Bersani, C. Imperatori, S. Abdi, A. Negri, G. Esposito, O. Corazza, Fitting in on social media: body-image and other psychopathological risks among young adults. A narrative review, *Emerg. Trends Drugs, Addict. Heal.* 1 (2021), 100010, <https://doi.org/10.1016/J.ETDAH.2021.100010>.
- [40] R. Grafiadeli, H. Glaesmer, L. Hofmann, T. Schäfer, B. Wagner, Suicide risk after suicide bereavement: the role of loss-related characteristics, mental health, and hopelessness, *J. Psychiatr. Res.* 144 (2021) 184–189, <https://doi.org/10.1016/J.JPSYCHIRES.2021.09.056>.
- [41] N. Molina, M. Viola, M. Rogers, D. Ouyang, J. Gang, H. Derry, H.G. Prigerson, Suicidal Ideation in Bereavement: A Systematic Review, vol. 9, *Behav. Sci., Basel, Switzerland*, 2019, <https://doi.org/10.3390/BS9050053>.
- [42] M.S. Andover, H.T. Schatten, B.W. Morris, C.S. Holman, I.W. Miller, An intervention for nonsuicidal self-injury in young adults: a pilot randomized controlled trial, *J. Consult. Clin. Psychol.* 85 (2017) 620–631, <https://doi.org/10.1037/CCP0000206>.
- [43] N.E. Bush, D.J. Smolenski, L.M. Denneson, H.B. Williams, E.K. Thomas, S.K. Dobscha, A virtual hope box: randomized controlled trial of a smartphone app for emotional regulation and coping with distress, *Psychiatr. Serv.* 68 (2017) 330–336, <https://doi.org/10.1176/APPI.PS.201600283>.
- [44] S. Barzilay, A. Apter, A. Snir, V. Carli, C.W. Hoven, M. Sarchiapone, G. Hadlaczky, J. Balazs, A. Keresztesy, R. Brunner, M. Kaess, J. Bobes, P.A. Saiz, D. Cosman, C. Haring, R. Banzer, E. McMahon, H. Keeley, J.P. Kahn, V. Postuvan, T. Podlogar, M. Sisask, A. Varnik, D. Wasserman, A longitudinal examination of the interpersonal theory of suicide and effects of school-based suicide prevention interventions in a multinational study of adolescents, *J. Child Psychol. Psychiatry.* 60 (2019) 1104–1111, <https://doi.org/10.1111/JCPP.13119>.
- [45] C. Esposito-Smythers, J.C. Wolff, R.T. Liu, J.I. Hunt, L. Adams, K. Kim, E.A. Frazier, S. Yen, D.P. Dickstein, A. Spirito, Family-focused cognitive behavioral treatment for depressed adolescents in suicidal crisis with co-occurring risk factors: a randomized trial, *J. Child Psychol. Psychiatry.* 60 (2019) 1133–1141, <https://doi.org/10.1111/JCPP.13095>.
- [46] M. Kaess, J. Koenig, S. Bauer, M. Moessner, G. Fischer-Waldschmidt, M. Mattern, S.C. Herpertz, F. Resch, R. Brown, T. In-Albon, M. Koelch, P.L. Plener, C. Schmahl, A. Edinger, Self-injury: treatment, Assessment, Recovery (STAR): online intervention for adolescent non-suicidal self-injury - study protocol for a randomized controlled trial, *Trials* 20 (2019), <https://doi.org/10.1186/S13063-019-3501-6>.
- [47] L. Mehlum, R.K. Ramleth, A.J. Tørmoe, E. Haga, L.M. Diep, B.H. Stanley, A.L. Miller, B. Larsson, A.M. Sund, B. Grøholt, Long term effectiveness of dialectical behavior therapy versus enhanced usual care for adolescents with self-harming and suicidal behavior, *J. Child Psychol. Psychiatry.* 60 (2019) 1112–1122, <https://doi.org/10.1111/JCPP.13077>.
- [48] M. Aldalaykeh, H. Dalky, G. Shahrour, M. Rababa, Psychometric properties of two Arabic Suicide Scales: stigma and literacy, *Heliyon* 6 (2020), e03877, <https://doi.org/10.1016/J.HELIYON.2020.E03877>.