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Development and Factorial Validation of the Inventory of Deliberate Self-Harm Behaviours for Portuguese Adolescents

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Abstract

Deliberate self-harm (DSH) is a public health problem that mainly affects adolescents and young adults. Evidence suggests that multiple methods are used with a self-aggressive intent. The present article focuses on the development and factorial validation of the Inventory of Deliberate Self-harm Behaviours for Portuguese adolescents. This instrument assesses the lifetime frequency of 13 DSH methods, with and without suicidal intent. Study 1 consisted of an exploratory factor analysis with a sample of 131 adolescents with a reported history of DSH. Results revealed a three-factor structure with acceptable internal consistency: *High Severity DSH*, *Mild Severity DSH*, and *Substance Use DSH*. After item reduction, this structure was tested in Study 2 through a confirmatory factor analysis with an independent sample of 109 adolescents also with a history of DSH. Results showed an acceptable model fit. This instrument presents a solid structure and acceptable psychometric properties, allowing its use in further research.

Keywords Deliberate self-harm · Methods · Validation · Adolescents · Factor analysis

Introduction

Deliberate self-harm (DSH) is a significant mental health issue among adolescents and young adults, and it is viewed as the result of a complex interplay of genetic, biological, psychiatric,

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psychological, social, and cultural factors [1]. The lifetime prevalence rates in population-based studies with adolescents range from 3% to 27.6% [2–5]. In Portugal, research that used convenience samples of adolescents concluded that DSH presented lifetime prevalence rates between 7.3% and 30% [6–10].

There are some divergences concerning the conceptualization of these behaviours, particularly about the presence of suicidal intent. The term DSH is frequently employed as a broad designation for self-injurious behaviours both with and without suicidal intent that have non-fatal outcomes [11]. Hence, in the present research, we follow this definition of DSH, which is in accordance with the Portuguese National Suicide Prevention Plan [12] and by other studies, namely the Child & Adolescent Self-harm in Europe (CASE) Study [3, 13].

DSH involves a multiplicity of possible methods used with self-aggressive intent. There are differences concerning the prevalence of methods, especially when comparing clinical and community samples. Research with clinical samples has shown that the most common methods include cutting, overdosing, burning, and strangulation [14]; cutting, scratching, and suffocation [15]; and banging/hitting self, cutting, scratching, and burning [16]. Studies that used community samples have concluded that the most frequent methods are cutting and overdosing [3]; cutting, scratching, and banging/hitting self [5, 17]; cutting and skin damaging through other means [2]; biting, scratching, and interfering with wound healing [18]. Some investigations carried out in Portugal concluded that the most common DSH methods are cutting, scratching, biting and banging/hitting self [6, 9, 19].

The methods used for DSH can also be categorized according to its severity. Although this categorization is not consensually described in the literature, the levels of severity are usually defined according to the degree of injury caused to the body tissue (e.g. [20–22]). Croyle and Waltz [20] described self-harm without conscious suicidal intent into two groups, namely mildly injurious self-harm behaviours (e.g. interfering with the healing of a wound, or scratching the skin severely enough to cause bleeding or scarring) and moderately injurious self-harm behaviours (e.g. burning or cutting). On the other hand, Whitlock et al. [22] defined three categories for non-suicidal self-injury (NSSI): superficial NSSI (i.e. behaviours with the potential for superficial tissue damage, such as scratching or intentionally preventing wounds from healing); moderate severity NSSI (i.e. behaviours likely to cause bruising or light tissue damage such as punching or banging oneself or other objects); and high severity NSSI (i.e. behaviours with the potential of severe tissue damage such as cutting, burning, or ingesting caustic substances). According to these categorizations, if DSH behaviours are viewed as part of a suicidal continuum [21, 23–25], we may consider suicide as the most extreme or severe DSH method.

Research has shown that the diversity and number of methods used for DSH are important factors for the assessment of this phenomenon. Studies concluded that using a large number of methods is associated with a greater psychological maladjustment of the individual [26], is positively correlated with suicidal ideation [27] and suicidal risk [22], and is also a predictor of suicide attempts [28, 29]. Furthermore, some individuals may engage in more lethal behaviours by engaging in increasingly severe DSH over time [23]. Hence, although DSH can be performed simultaneously through multiple self-aggressive methods (e.g. [30]), the categorization according to its severity is an important factor.

Some research also suggests that the DSH methods and their frequency can be associated with specific subgroups or classes of individuals that engage in self-harm [30–37]. According to Walsh [36], these individuals can be classified based on specific characteristics of DSH, including the frequency of the behaviour, methods used, and extent of damage caused by the

act. As an example, the investigation conducted by Bjärehed et al. [31] identified three subgroups of adolescents who presented NSSI: (1) a large proportion of adolescents with low-frequency NSSI and little psychological difficulties; (2) a subgroup of adolescents with frequent and multi-faceted NSSI who showed both externalizing and internalizing problems; (3) a subgroup of girls with cutting as the main form of NSSI, and primarily internalizing problems. In another study, You et al. [37] found that repetitive NSSI was associated with more emotional and impulse-control problems than episodic NSSI, and that adolescents with severe NSSI were more impulsive than adolescents with mild NSSI. The types of DSH methods, as well as its association with clinical subgroups of individuals, may imply different psychotherapeutic and treatment approaches [22, 36].

The construction of instruments to assess DSH began in the 90's and its development has accompanied the evolution of the conceptualizations and definitions of these behaviours [38]. There are several instruments which incorporate items that refer to DSH (e.g. [39, 40]) and instruments that focus exclusively on DSH (e.g. [41–43]). In Portugal, however, there is a lack of research tools exclusively dedicated to the assessment of DSH. Therefore, the objective of this research is the development of a new instrument entitled Inventory of Deliberate Self-Harm Behaviours (Inventário de Comportamentos Auto-Lesivos, ICAL).

In order to develop the ICAL, we used the first section of the Inventory of Statements About Self-Injury (ISAS, 44) as a basis, since it clearly and succinctly presents 12 methods of DSH, making it appropriate for clinical and investigation settings. Furthermore, this inventory is aimed at adolescents and young adults, has been adapted and validated for the Swedish and Turkish populations [44, 45], and has been used in numerous research that involved diverse samples (e.g. [17, 30, 32, 34, 46–52]). However, since the ISAS was designed to assess the lifetime frequency of NSSI methods (DSH without suicidal intent), further DSH methods with suicidal intent were added to the inventory. Also, the original response format of the ISAS was modified and a categorization of the answers was added. These procedures are further detailed in the Measures section.

Finally, although research has identified several degrees of severity of DSH, we found no studies that included a factorial analysis of DSH methods. Hence, the current research comprises a first study that consists of an exploratory factorial analysis of the ICAL (Study 1), and a second study, where the factorial structure of the inventory is evaluated with a new independent sample (Study 2). Both studies also tested the internal consistency of the ICAL.

Study 1: Exploratory Factor Analysis

Method

Participants

The participants of the first study consisted of 131 adolescents with a history of DSH, studying in several schools located in the district of Lisbon. These 131 participants were part of an initial sample of 620 adolescents with and without a history of DSH, corresponding to 21.1% of this total. Thus, 42 (32.1%) participants were male and 89 (67.9%) were female. Their ages ranged from 12 to 19 years, with a mean of 16.1 years (SD = 1.8). Table 1 details the socio-demographic data of the participants.

Table 1 Study 1 – socio-demographic data of the participants ($n = 131$)

		n	%
Nationality	Portuguese	125	95.4
	Brazilian	3	2.3
	Romanian	3	2.3
School Degree	7th grade	9	6.9
	8th grade	12	9.2
	9th grade	21	16
	10th grade	49	37.4
	11th grade	32	24.4
	12th grade	8	6.1
Academic Retentions	0 Retentions	67	51.1
	1 Retention	41	31.3
	> 1 Retentions	23	17.5
Siblings	No Siblings	21	16
	1 Sibling	54	41.2
	2 Siblings	32	24.4
	> 2 Siblings	24	18.4
Parents' Marital Status	Married	71	54.2
	Divorced	35	26.7
	Single	15	11.5
	Non-Marital Partnership	8	6.1
	Widowed	2	1.5

Measures

Our measures consisted of a brief socio-demographic questionnaire and the first version of the ICAL. The socio-demographic questionnaire included questions about the participants' gender, age, nationality, academic retentions, number of siblings, and the marital status of their parents.

The translation process of the first section of the ISAS [53] was carried out by three experts in the subject with knowledge of the English language. Subsequently, each of these translations was retro-translated into English by three other experts with knowledge of the English language. The final versions were compared with the original instrument and the items considered more similar were selected by the researchers. Afterwards, in order to analyse if the language of the items was easily and accurately understood, facial validation of the instrument was performed with a group of 12 adolescents.

To test the resulting version of the previous procedure, we conducted a pre-test. Results from this pre-test were discussed with researchers in the field of DSH, and some modifications were made. Regarding the original scale, several items were reformulated for better understanding by the adolescents and three items were removed from the inventory (*Pinching, Interfering with Wound Healing*, and *Rubbing Skin Against Rough Surfaces*). In order to complement the original ISAS items that focus solely on NSSI, new items were also added to the inventory to incorporate DSH methods with suicidal intent. Therefore, the first version of the instrument comprises 14 items: *cutting* (original item from the ISAS), *biting* (original item from the ISAS), *burning* (original item from the ISAS), *carving/engraving symbols or words on the skin* (reformulated item from the ISAS), *pulling hair* (original item from the ISAS), *scratching the skin to make a wound* (reformulated item from the ISAS), *consuming drugs to hurt oneself* (new item), *sticking self with needles* (original item from the ISAS), *swallowing dangerous substances to hurt oneself* (reformulated item from the ISAS), *drinking too much to*

hurt oneself (new item), *banging or hitting self* (original item from the ISAS), *ingesting medication to hurt oneself* (new item), *ingesting medication with the intention of dying* (new item), *attempting suicide* (new item).

In addition to these changes, an alternative to the original response format of the ISAS was created. The original response format asked the participant to estimate, in an open question, the number of times he/she had practiced each type of DSH method throughout his/her life. We introduced a four option response format depending on the lifetime prevalence and frequency of these behaviours: "No"; "Yes, one time"; "Yes, 2 to 10 times"; and "Yes, more than 10 times". This categorization allows the clarification and standardization of results, as well as a quicker response on the part of the participant.

Procedures

Several schools were contacted and informed regarding the goals of the investigation. After receiving the schools' administration approval, several classes were selected and the researcher delivered the consent forms to the students' parents/legal guardians, prior to the application of the questionnaire. Data collection was carried out in a single phase, where the students whose parents/legal guardians signed the consent form were asked to complete the questionnaire. The participation of each student was voluntary and their consent was previously requested. Procedures were also followed to ensure the confidentiality of the data and the anonymity of the participants.

Data Analysis

As for data analysis, since we expect factors to be correlated assuming a latent construct (i.e. DSH behaviours), we carried out Exploratory Factor Analysis (EFA), using the Principal Axis Factoring method with oblique rotation (direct oblimin). We considered eigenvalues and scree plots to determine the number of factors, as well as a threshold of .30 for minimum loading coefficient for items in each factor. Finally, we tested the internal consistency of each factor through Cronbach's alpha. All statistical analyses were carried out using SPSS software v22 (IBM SPSS, Chicago, IL).

Results

Prevalence of DSH

Participants practiced an average of 3.37 DSH methods (SD = 2.23, min. = 1, max. = 10). The most frequent methods were *cutting* (56.4%), *biting* (54.2%), and *banging or hitting self* (38.9%). The less-mentioned methods were *ingesting medication to hurt oneself* (7.6%), *ingesting medication with the intention of dying* (7.6%) and *consuming drugs to hurt oneself* (8.5%). Table 2 presents prevalence and frequency of DSH methods.

Exploratory Factor Analysis (EFA)

An EFA with the 14 items (KMO = .73, χ^2 = 535.85, p < .001) presented a 4-factor model solution with eigenvalues higher than 1. However, after analysing the scree plot, we found that a 3-factor model would better fit these results (Fig. 1). The EFA forced to extract 3

Table 2 Study 1 – prevalence and frequency of DSH methods (*n* = 131)

DSH method	DSH %	DSH frequency %		
		Once	2–10 times	> 10 times
1. Cutting	56.4	19.8	29	7.6
2. Biting	54.2	22.1	21.4	10.7
3. Burning	21.4	12.2	4.6	4.6
4. Carving/engraving symbols or words on the skin	25.3	9.2	11.5	4.6
5. Pulling hair	32.8	14.5	13.7	4.6
6. Scratching the skin to make a wound	29	12.2	9.2	7.6
7. Consuming drugs to hurt oneself	8.5	3.1	2.3	3.1
8. Sticking self with needles	13	8.4	3.8	0.8
9. Swallowing dangerous substances to hurt oneself	9.2	6.1	2.3	0.8
10. Drinking too much to hurt oneself	20.6	10.7	7.6	2.3
11. Banging or hitting self	38.9	13.7	20.6	4.6
12. Ingesting medication to hurt oneself	7.6	5.3	2.3	–
13. Ingesting medication with the intention of dying	7.6	6.1	1.5	–
14. Attempting suicide	12.3	9.2	3.1	–

factors which explained 51.64% of variance revealed that item 4 presented very low loadings, failing to load > .30 in any factor. From a theoretical perspective, and taking into account that this item refers to the carving of words or symbols on the skin (i.e. *Carving/engraving symbols or words on the skin*), we hypothesized that the content of this item could have been considered as a behaviour that does not cause damage to body tissue (such as writing words), or as a behaviour related to body modification practices such as scarification (that are not included in the spectrum of DSH). Therefore, based on these results, we decided to remove item 4 from the inventory.
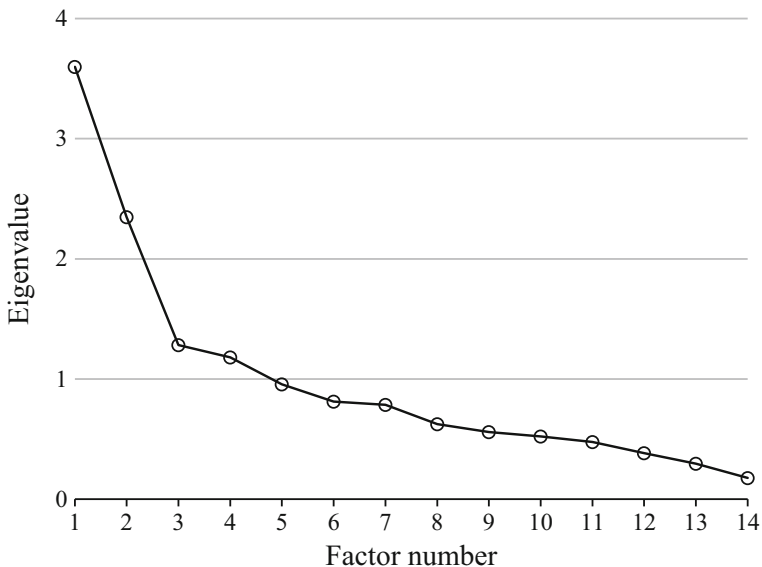
Fig. 1 Scree plot for the EFA in Study 1

A second EFA without item 4 was conducted (KMO = .73, χ^2 = 528.05, $p < .001$), where the 3-factor solution explained 55.20% of the variance. Items 13, 12, 14, and 1 loaded >.30 exclusively on factor 1; items 2, 6, 5, 11, and 8 on factor 2; and items 10, 7 on factor 3. Items 3 and 9 presented factor loadings >.30 on both factor 1 (.375 and .361) and factor 2 (.361 and .302), though loadings were higher in the first factor (see Table 3). Therefore, factor 1 explained 27.48% of the variance and includes the following items: item 1 (*cutting*), item 3 (*burning*), item 9 (*swallowing dangerous substances to hurt oneself*), item 12 (*ingesting medication to hurt oneself*), item 13 (*ingesting medication with the intention of dying*), and item 14 (*attempting suicide*). Factor 2 explained 17.97% of the variance and included item 2 (*biting*), item 5 (*pulling hair*), item 6 (*scratching the skin to make a wound*), item 8 (*sticking self with needles*), and item 11 (*banging or hitting self*). Finally, factor 3 explained 9.76% of the variance and is composed of item 7 (*consuming drugs to hurt oneself*) and item 10 (*drinking too much to hurt oneself*).

An analysis of the internal consistency of the inventory revealed that factor 2 (*Mild Severity DSH*; α = .72) and factor 3 (*Substance Use DSH*; α = .74) showed acceptable Cronbach's alphas, while factor 1 (*High Severity DSH*; α = .66) showed slightly lower internal consistency.

Study 2: Confirmatory Factor Analysis

Method

Participants

The sample for Study 2 was comprised of 109 adolescents with a history of DSH, from schools located in the district of Leiria, Portugal. These 109 participants integrated an initial sample of 411 adolescents with and without a history of DSH, corresponding to 26.5% of the initial

Table 3 Exploratory factor analysis for the three-factor model

Items	Factor 1	Factor 2	Factor 3
13. Ingesting medication with the intention of dying	**.924**	−.036	.018
12. Ingesting medication to hurt oneself	**.757**	−.016	−.149
14. Attempting suicide	**.562**	−.224	.015
3. Burning	**.375**	.361	−.093
9. Swallowing dangerous substances to hurt oneself	**.361**	.302	−.069
1. Cutting	**.350**	.094	−.019
2. Biting	−.067	**.752**	.093
6. Scratching the skin to make a wound	.092	**.693**	−.002
5. Pulling hair	.016	**.614**	.140
11. Banging or hitting self	−.072	**.499**	−.217
8. Sticking self with needles	−.045	**.305**	−.212
7. Consuming drugs to hurt oneself	.108	−.105	**−.934**
10. Drinking too much to hurt oneself	.042	−.017	**−.597**
Eigenvalue	3.57	2.34	1.27
% Variance	27.48	17.97	9.76
Cronbach's *Alpha*	.66	.72	.74

Factor I – High Severity DSH; Factor 2 – Mild Severity DSH; Factor 3 – Substance Use DSH
Items' loading coefficients are shown in bold for the corresponding factor

sample. Therefore, 35 (32.1%) participants were male and 74 (67.9%) were female, aged from 12 to 19 years, with an average of 15.4 years (SD = 1.8). As described in Table 4, the socio-demographic data were similar to the sample used in Study 1.

Measures

The measures for this study consisted of a brief socio-demographic questionnaire and the final 13-item version of the ICAL, adapted in Study 1. The socio-demographic questionnaire comprised questions about the participants' gender, age, nationality, number of academic retentions, number of siblings, and the marital status of their parents.

Procedures

In this study, we followed the same procedures described in Study 1.

Data Analysis

As for data analysis, in Study 2 we developed a Confirmatory Factor Analysis (CFA). Considering that these variables are ordinal and presented a non-normal distribution (kuMult = 176.60), CFA was carried out using the unweighted least squares method [54, 55]. The overall adjustment of the model was estimated through the analysis of factorial weights and several adjustment indicators, namely the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Parsimony Goodness-of-Fit Index (PGFI), Normal Fit Index (NFI) and Root Mean Square Residual (RMR) [56–60]. Internal consistency was estimated through Cronbach's alpha. All statistical analyses were carried out using SPSS v22 software and Amos Version 22.0 (IBM SPSS, Chicago, IL).

Table 4 Study 2 – socio-demographic data of the participants ($n = 109$)

		n	$\%$
Nationality	Portuguese	108	99.1
	Ukrainian	1	0.9
School Degree	7th grade	20	18.3
	8th grade	13	11.9
	9th grade	12	11
	10th grade	18	16.5
	11th grade	26	23.9
	12th grade	20	18.3
Academic Retentions	0 Retentions	90	82.6
	1 Retention	13	11.9
	> 1 Retentions	6	5.5
Siblings	No Siblings	19	17.4
	1 Sibling	53	48.6
	2 Siblings	25	22.9
	> 2 Siblings	12	11
Parents' Marital Status	Married	63	57.8
	Divorced	32	29.4
	Single	9	8.3
	Non-Marital Partnership	2	1.8
	Widowed	3	2.8

Results

Prevalence of DSH

Results obtained in this second data collection are similar to those found in Study 1 (Table 5). These participants reported an average of 3.30 DSH methods (SD = 2.15, min. = 1, max. = 12). The most mentioned methods were *banging or hitting self* (57.8%), *biting* (54.1%) and *cutting* (45.9%). On the other hand, the less frequent methods were *swallowing dangerous substances to hurt oneself* (5.5%), *ingesting medication with the intention of dying* (5.5%), and *attempting suicide* (7.3%).

Confirmatory Factor Analysis (CFA)

As illustrated in Fig. 2, the CFA for the factorial model developed in Study 1 showed that, with the exception of item 7 (λ = .44), all items presented high factorial weights (> .50). Also, the indices revealed a good model fit (GFI = .954, PGFI = .650, NFI = .857, and RMR = .050). NFI score was slightly lower than usually recommended for a good fit (> .90) but still acceptable [59, 61].

Table 5 Study 2 – prevalence and frequency of DSH methods (*n* = 109)

| DSH method	DSH %	Frequency %		
		Once	2–10 times	> 10 times
1. Cutting	45.9	11.0	26.6	8.3
(1. Cortei-me)				
2. Biting	54.1	11.9	27.5	14.7
(2. Mordi-me)				
3. Burning	24.8	15.6	9.2	–
(3. Queimei-me)				
4. Pulling hair	40.3	18.3	15.6	6.4
(4. Puxei/arranquei o cabelo)				
5. Scratching the skin to make a wound	36.6	18.3	12.8	5.5
(5. Cocei/Arranhei-me até fazer uma ferida sem ser por causa de comichão)				
6. Consuming drugs to hurt oneself	12.8	7.3	4.6	0.9
(6. Consumi drogas com a intenção de me magoar)				
7. Sticking self with needles	14.7	9.2	4.6	0.9
(7. Espetei-me com agulhas)				
8. Swallowing dangerous substances to hurt oneself	5.5	1.8	3.7	–
(8. Engoli substâncias perigosas com a intenção de me magoar)				
9. Drinking too much to hurt oneself	13.7	2.6	8.3	2.8
(9. Bebi em excesso com a intenção de me magoar)				
10. Banging or hitting self	57.8	10.1	39.4	8.3
(10. Bati com o corpo ou bati em mim próprio)				
11. Ingesting medication to hurt oneself	11	3.7	7.3	–
(11. Ingeri em demasia um medicamento com a intenção de me magoar)				
12. Ingesting medication with the intention of dying	5.5	5.5	–	–
(12. Ingeri em demasia um medicamento com a intenção de morrer)				
13. Attempting suicide	7.3	6.4	0.9	–
(13. Tentei suicidar-me)				
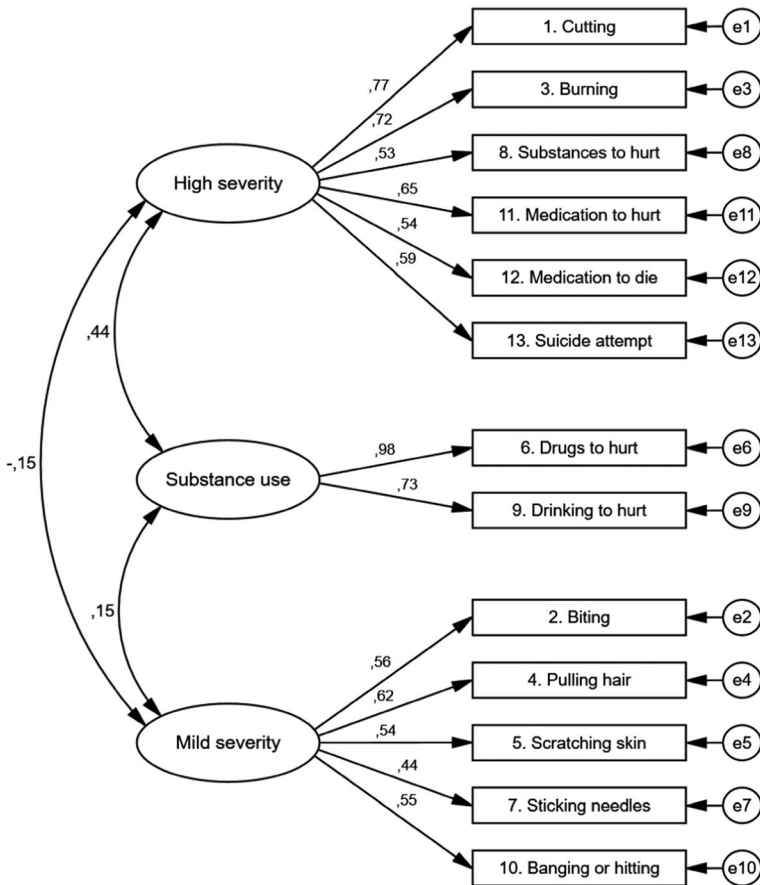
Fig. 2 Confirmatory factor analysis

Considering the correlations between the three latent variables (Fig. 2), results showed that *Substance Use DSH* factor presented a small positive correlation with *Mild Severity DSH* and a medium positive correlation with *High Severity DSH*. On the other hand, *High Severity DSH* and *Mild Severity DSH* showed a small negative correlation.

Reliability analysis for Study 2 revealed acceptable to good internal consistency for the *High Severity DSH* factor ($\alpha = .76$) and *Substance Use DSH* factor ($\alpha = .82$). *Mild Severity DSH* showed slightly lower Cronbach's alpha ($\alpha = .67$).

General Discussion

The purpose of the present investigation was to develop and validate the ICAL, an instrument dedicated to the assessment of DSH in Portuguese adolescents. We utilized the first section of the ISAS [53] as a basis for this instrument and complemented the inventory with other DSH methods according to the results of a pre-test, to discussion with experts, and to our conceptual frame. To analyse the factorial structure of the ICAL we conducted two studies: Study 1

consisted of an EFA that also contributed to item reduction, and Study 2 tested the stability of the factorial structure of the inventory through a CFA.

Both studies used independent community samples of adolescents with a history of DSH, which also allowed us to contribute to the understanding of the prevalence of DSH in Portuguese adolescents and to characterize its various methods. In both studies, which involved adolescents aged 12 to 19 years, results revealed that 21.1% (131 participants in Study 1) and 26.5% (109 participants in Study 2) of participants from the initial samples reported having practiced at least one DSH behaviour during their lifetime. These prevalence rates are in line with those previously found in national [6, 9] and international research [2, 11] with identical samples. Focusing on the participants who reported a history of DSH, results showed that the most common methods consisted of *cutting* (56.4% in Study 1 and 45.9% in Study 2), *biting* (54.2% in Study 1 and 54.1% in Study 2), and *banging or hitting self* (38.9% in Study 1 and 57.8% in Study 2). These findings are similar to the results of several investigations that also studied community samples [2, 3, 5, 9, 18].

One of the main goals of this investigation was to analyse the ICAL factorial structure through an EFA and a CFA. The results obtained in the first study presented a three-dimensional structure. This 3-factor arrangement of items seemed to be in agreement with the literature that has proposed a categorization according to the severity of DSH behaviours (e.g. [20–22]). Factor 1 is comprised of severe DSH methods (including both items referring to suicide attempts), thus we designated it as *High severity DSH*. Similarly, items in factor 2 showed mild and moderate forms of DSH. Thus, we assigned the designation of *Mild severity DSH* to this dimension. Finally, both items in factor 3 refer to the use of psychoactive substances with self-aggressive intent, thus we designated it as *Substance use DSH*. In Study 2, the CFA tested this factorial structure, revealing an overall good model with a stable three-factor structure. As for the analysis of internal consistency, despite the majority of factors showed acceptable levels of reliability in both studies, the *High Severity Self-Harm* factor in Study 1 ($\alpha = .66$) and the *Mild Severity Self-Harm* in Study 2 ($\alpha = .67$) showed slightly lower Cronbach's alpha scores. However, some researchers have pointed out that a threshold as low as .60 can be acceptable in early stages of psychological research (e.g. [62, 63]). Therefore, in general, we can conclude that these studies revealed acceptable values of Cronbach's *alpha* for the three factors.

The three factors are consistent with the existing literature since they group items referring to similar typologies of DSH methods according to its severity [20–22]. If we consider DSH to be part of a suicidal continuum that is organized according to the severity of the behaviours [21, 24, 25], it is possible to position Factor 2 (*Mild Severity DSH*) at the beginning/middle section of this continuum, while Factor 1 (*High Severity DSH*) can be located at a more extreme point. In addition, the CFA revealed that these factors had a minor negative correlation, which may imply that these two types of DSH methods are independent. Considering that we asked the participants to report their lifetime experience of DSH, we question if the adolescents who reported less severe DSH methods might still be far from engaging in more severe DSH since they are still "positioned" at the beginning of the suicidal continuum.

Factor 3 (*Substance Use DSH*) encompasses behaviours that can be considered as socially accepted and typical of adolescence (e.g. [64–66]). However, in the context of DSH, the consumption of alcohol and other psychoactive substances is characterized by a self-aggressive intent that distinguishes these behaviours from the consumptions considered "normal" during adolescence. Nonetheless, it is difficult to argue where this factor can be

positioned on the suicidal continuum in terms of severity. It is known that substance use is associated with DSH (e.g. [10, 67, 68]). Some authors argue that DSH should be viewed within an addictions framework and that, since it has an addictive component, it is understandable that DSH often co-exists with other addictions (e.g. [69, 70]). On the other hand, both DSH and substance use cause physiological damage to the body, so the psychological processes underlying both may be similar [71]. Therefore, since our results revealed positive correlations between this factor and factors 1 and 2, we question if the consumption of psychoactive substances with self-aggressive intent accompanies other DSH methods, if adolescents who engage in DSH consume psychoactive substances during the DSH episodes, or if substance use can act as a "gateway" to other DSH behaviours.

Our findings may have relevant implications for clinical settings, as well as for future research. Firstly, the factorial organization of DSH methods may contribute to create awareness regarding the suicidal continuum in which less severe behaviours may lead to more severe behaviours and, eventually, suicide. The application of the ICAL in clinical settings may, for example, be relevant for the signalling of adolescents at risk of engaging in more severe DSH methods such as suicide attempts, or of adolescents with potential psychopathologies associated with more severe methods [22]. Factor 2, specifically, may also contribute to a new approach concerning the adolescents who present consumptions of psychoactive substances. It might be important to explore if these adolescents' behaviours have an underlying self-aggressive intent and if they can be situated in the suicidal continuum. In addition, understanding this categorization of DSH methods may be relevant in terms of broad clinical assessment and psychotherapeutic interventions, since different treatment approaches may be required for each DSH typology [22].

In terms of research, the ICAL may be an important tool for the study of DSH in adolescents, mainly because it is a simple tool that assesses multiple DSH methods, categorizes their frequency, and presents three groups/factors of methods. However, although the ICAL has revealed acceptable psychometric properties, some limitations should be noted, including the use of community samples with similar socio-demographic characteristics and the use of self-report measures regarding DSH. Also, the ICAL was not tested regarding its divergent and convergent validity with other variables. These limitations could be overcome with further research that might simultaneously allow more rigorous testing of constructs and of the factorial structure of the inventory.

Overall, we believe that the ICAL can be useful both in research and clinical settings, contributing to subsequent investigations focused on adolescents and for the understanding of the complex phenomenon of DSH.

Compliance with Ethical Standards

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