



# Exploring the suicidal continuum: Deliberate self-harm diversity and severity as predictors of suicidal ideation and suicide attempts

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## ARTICLE INFO

### Keywords:

Suicidal thoughts and behaviors  
Adolescents  
Suicidality

## ABSTRACT

Deliberate self-harm (DSH) in adolescence is a predictor of suicidal thoughts and behaviors (STBs). However, there is still a lack of research systematizing the association between DSH and STBs. Therefore, our main goal was to analyze if DSH diversity and severity predicted suicidal ideation and suicide attempts.

Our sample comprised 237 Portuguese adolescents and young adults with a history of DSH, from community (80.2%,  $n = 190$ ) and clinical (19.8%,  $n = 47$ ) settings, aged between 14 and 23 years ( $M = 17.31$ ,  $SD = 1.36$ ).

Results showed that DSH diversity and severity were significant predictors of suicidal ideation and suicide attempts.

These results were further discussed, underlining the impact that DSH has for suicide risk and highlighting the need to address further variables to understand these suicidality trajectories.

## 1. Introduction

Deliberate self-harm (DSH) and suicidal thoughts and behaviors (STBs) are significant public health concerns in adolescence. DSH are non-fatal behaviors in which the individual initiates behaviors with the intention of causing injury, regardless of suicidal intent (Madge et al., 2008). Considering the objectives of the present research and the need for conceptual clarity, in this study we have distinguished between self-injurious behavior with suicidal intent (i.e., SA) and self-injurious behaviors without suicidal intent (i.e., DSH).

STBs comprise suicidal ideation (SI), which can be defined as thoughts or willingness to commit suicide; suicide attempts (SAs); and consummated suicide. In Portugal, where this study was conducted, the prevalence of DSH in adolescence ranges from 7% to 40% in community samples (Carvalho et al., 2013; Duarte et al., 2020; Gonçalves et al., 2012; Guerreiro et al., 2017; Nobre-Lima et al., 2017) and from 30% to 84% in clinical samples (Duarte et al., 2020; Guerreiro et al., 2009; Trinco and Santos, 2017). Similarly, SI and SAs have worrying prevalence rates among Portuguese adolescents in both community and clinical contexts (Azevedo and Matos, 2014; Carvalho et al., 2013;

Duarte et al., 2020; Guerreiro et al., 2009; Sampaio et al., 2000; Saraiva et al., 2014; Santos et al., 2009).

Despite being distinct phenomena and not always co-occurring, DSH and STBs are closely linked. DSH is often conceptualized within the wider spectrum of STBs (Klonsky et al., 2013; Wilkinson et al., 2011). The Gateway Theory proposes that DSH precedes the development of STBs and may be a gateway to suicidality (Grandclerc et al., 2016; Hamza et al., 2012). However, these trajectories are not clear and other studies found that DSH may serve as a "stepping stone" from SI to SA (Bryan et al., 2015), which is in accordance with Joiner's (2005) idea that DSH facilitates the acquisition of the capability for suicide among individuals with SI.

In this context, the diversity and severity of DSH have been previously investigated as specific risk factors for STBs. Since DSH involves multiple types of self-aggressive behavior, the actual physical harm caused by DSH can vary significantly (Muehlenkamp et al., 2012). DSH diversity refers to the number of methods or behaviors employed for DSH, while DSH severity refers to the degree of physical damage caused by each DSH method or behavior and is usually categorized according to its levels of severity (Croyle and Waltz, 2007; Duarte et al., 2019; Skegg,

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<https://doi.org/10.1016/j.psychres.2022.114400>

Received 16 April 2021; Received in revised form 8 January 2022; Accepted 14 January 2022

Available online 20 January 2022

0165-1781/© 2022 Published by Elsevier B.V.

2005). It is known that DSH diversity and STBs are associated (Andover et al., 2012; Duarte et al., 2020; Kiekens et al., 2018; Stewart et al., 2017). As for severity, there is evidence that most adolescents with DSH tend to shift from a first less severe behavior towards more severe behaviors (Wang et al., 2015; Witt et al., 2018) and that adolescents with moderate/severe DSH report more STBs than those with less severe behaviors (Lloyd-Richardson et al., 2007).

### 1.1. The current study

Although DSH is a robust predictor of STBs, there is a lack of information regarding specific behavioral and psychological features of DSH that may influence, or serve as drivers, of these relationships (O'Loughlin et al., 2020). Also, research that clearly systematizes the predictive associations between DSH diversity and severity simultaneously and STBs is scarce, especially in Portugal.

Thus, in the current study, we have two main goals: a) to characterize DSH diversity and severity, SI and SAs, and how these variables relate in a clinical and community sample of Portuguese adolescents with a history of DSH; and b) to analyze how impactful is the diversity and severity of DSH on SI and SAs. Since previous research has concluded that DSH diversity is associated with SI and SAs, we hypothesize that DSH diversity will predict SI and SAs (Duarte et al., 2020; Hamza and Willoughby, 2013; Samari et al., 2020; Wester et al., 2016). There is also evidence that individuals who have SAs engage in more severe DSH (Stewart et al., 2017). Therefore, we hypothesize that DSH severity will predict SI and SAs, with more severe behaviors revealing a stronger association with SI and SAs. These hypotheses are also consistent with the idea that DSH might be the gateway to a wider spectrum of STBs (Hamza et al., 2012; Victor and Klonsky, 2014).

## 2. Methods

### 2.1. Participants

The total initial sample included 628 adolescents and young adults, mostly females (59.2%,  $n = 372$ ) aged between 13 and 23 years ( $M = 17.22$ ,  $SD = 1.28$ ). Two groups were included in this sample, i.e. a community and a clinical sample. The community sample was composed of 564 students from Portuguese public schools and the clinical sample comprised 64 adolescents attending consultations in a multidisciplinary team-based approach directed to adolescents with mental health disorders at a public hospital in Lisbon.

As for the prevalence of DSH and SAs, the total sample presented 38% ( $n = 237$ ) of participants with at least one DSH behavior or one SA, which represented 33.9% ( $n = 190$ ) of the community sample and 73.4% ( $n = 47$ ) of the clinical sample ( $\chi^2_{(1)} = 38.061$ ,  $p < .001$ ).

Since the objective of the present article was to study participants with DSH and SAs, we have excluded the 391 subjects without reports of these behaviors. This resulted in a final sample of 237 participants from the community (80.2%,  $n = 190$ ) and the clinical (19.8%,  $n = 47$ ) groups. The final sample was comprised by 162 (68.4%) females and 75 (31.6%) males, aged between 14 and 23 years ( $M = 17.31$ ,  $SD = 1.36$ ). Participants were mostly Portuguese nationals (94.5%,  $n = 224$ ), studied from the 7th grade to undergraduate university levels and 37.9% ( $n = 89$ ) reported school retentions. Comparisons between the community and clinical groups showed no statistically significant differences of gender proportions ( $\chi^2_{(1)} = 0.43$ ,  $p = .512$ ) and participants' age ( $t_{(51.12)} = 1.141$ ,  $p = .259$ ).

### 2.2. Measures

#### 2.2.1. Deliberate self-harm (DSH)

To assess DSH, we selected the Inventory of Deliberate Self-Harm Behaviors (ICAL, Duarte et al., 2019), since it is validated for Portuguese adolescents, it comprises a variety of DSH methods, and it allows

the categorization of these methods according to their severity. This is a self-report inventory asking participants about the lifetime frequency of 13 different deliberate self-harm (DSH) behaviors, with a four-option response format ("No", "Yes – 1 Time", "Yes, 2–10 Times", "Yes, More than 10 Times"). Since the present study focuses on predictors of SAs, the DSH behaviors which implied clear suicidal intent were excluded in order to avoid tautological effects (i.e., ingesting medication with a suicidal intent, and attempting suicide), resulting in an 11-item assessment of DSH behavior. These two items that refer to SAs were used to assess this variable separately.

This inventory also allows the creation of three subscales with different DSH levels of severity, namely Substance Use DSH (i.e., consuming drugs with a self-aggressive intent and drinking alcohol with a self-aggressive intent), Mild DSH (i.e., biting, pulling hair, scratching until the skin is wounded, sticking self with needles, banging/hitting), and High severity DSH (i.e., cutting, burning, ingesting dangerous substances with a self-aggressive intent, ingesting medication with a self-aggressive intent). This factorial solution for the DSH items revealed acceptable fit and internal consistency scores ( $\chi^2_{df} = 2.34$ ,  $GFI = 0.93$ ,  $RMSEA = 0.075$ ,  $\alpha = 0.79$ ) (Arbuckle, 2013; Field, 2013).

#### 2.2.2. Suicidal ideation (SI)

The Suicidal Ideation Questionnaire (SIQ, Reynolds, 1988) is a self-report measure comprising 30 items that evaluate the frequency of suicidal thoughts on a 7-point scale. Responses range from 0 ("I never had the thought") to 6 ("almost every day"), creating a range of scores from 0 to 180, where higher scores correspond to higher levels of SI. In the Portuguese adaptation, the SIQ revealed a Cronbach's alpha of 0.96 and an alpha of 0.76 in the test-retest reliability (Ferreira and Castela, 1999). In the current study, the SIQ presented a Cronbach's alpha of 0.98, with a mean of 55.13 ( $SD = 48.18$ ). We have followed the Reynolds criterion and dichotomized this variable, taking into consideration the threshold for suicide risk equal to 41 points. Hence, participants with a SIQ score equal to or higher than 41 were grouped in the suicide risk group (Reynolds, 1988).

#### 2.2.3. Socio-demographic questionnaire

Participants were also asked to complete a socio-demographic questionnaire which included questions concerning their age, sex, nationality, and education (number of academic retentions and school grade).

### 2.3. Procedures

This study integrates a wider project about STBs in Portuguese adolescents, which was approved by the General Education Directorate of the Ministry of Education and Science.

Regarding the community sample, the schools were contacted and informed about the objectives of this investigation. After the schools' approval, different classes were selected. Firstly, parent's authorizations were requested and consent forms were delivered to students. Once authorizations and consents were obtained, the questionnaires were distributed by the researchers and completed by the participants. This procedure was similar in the clinical context. The participants from the clinical group were randomly selected from outpatient settings for a period of three months. All participants were informed about their collaboration being voluntary and the anonymity of the gathered data was guaranteed.

## 3. Results

### 3.1. Descriptive statistics

#### 3.1.1. Deliberate self-harm (DSH) diversity

Our sample presented a mean diversity of DSH behaviors of 3.15 ( $SD = 2.24$ ), in which 27.8% ( $n = 66$ ) of the sample practiced only one

DSH behavior and two participants reported engaging in all 11 types of behavior. Comparisons between participants' gender revealed a higher DSH diversity within females ( $M = 3.40$ ,  $SD=2.40$ ) than male participants ( $M = 2.60$ ,  $SD=1.76$ ) ( $t_{(191.359)} = -2.90$ ,  $p < .01$ ). Table 1 illustrates the prevalence of the different DSH behaviors according to the participants' gender.

DSH diversity showed non-significant correlation with participants' age. Regarding the sample groups, participants within the clinical group ( $M = 5.17$ ,  $SD=2.61$ ) reported significantly higher DSH diversity than within the community sample ( $M = 2.65$ ,  $SD=1.83$ ) ( $t_{(57.70)}=6.26$ ,  $p < .001$ ).

### 3.1.2. Suicidal ideation (SI)

As for SI, data showed no significant association with participants' gender, with slightly above half of female participants (52.5%,  $n = 84$ ) showing SI, compared to nearly half of male participants (42.7%,  $n = 32$ ) ( $\chi^2_{(1)} = 1.98$ ,  $p = .160$ ). Likewise, no significant differences were found between SI and participants' age ( $t_{(233)}=0.72$ ,  $p = .471$ ). On the other hand, while most participants within the clinical group (84.5%,  $n = 39$ ) reported SI, only 40.7% ( $n = 77$ ) of participants in the community sample reported SI, demonstrating significant differences ( $\chi^2_{(1)}=28.71$ ,  $p < .001$ ). Furthermore, while participants without SI revealed a mean of 2.03 ( $SD=1.21$ ) DSH behaviors, participants with SI reported a mean 4.28 ( $SD=2.48$ ) DSH diversity ( $t_{(165.91)} = -8.81$ ,  $p < .001$ ).

### 3.1.3. Suicide attempts (SAs)

Focusing on SAs, 32.7% of female participants ( $n = 53$ ) and 22.7% of male participants ( $n = 17$ ) reported previous SAs. There was no significant association between SAs and participants' gender ( $\chi^2_{(1)}=2.49$ ,  $p = .115$ ). Further, no significant differences were found between SAs and participants' age ( $t_{(94.924)} = -0.295$ ,  $p = .769$ ). On the other hand, significantly more participants within the clinical group (61.7%,  $n = 29$ ) reported SAs when compared with participants from the community sample (21.6%,  $n = 41$ ) ( $\chi^2_{(1)}=29.15$ ,  $p < .001$ ).

As for the relation between DSH diversity and SAs, as seen in Table 2, participants without SA presented a mean of DSH diversity of 2.42 ( $SD=1.62$ ), significantly lower than the mean of 4.89 ( $SD=2.55$ ) of participants reporting previous SAs ( $t_{(93.25)} = -7.48$ ,  $p < .001$ ). In the same manner, data showed an association between SAs and SI, where

**Table 1**  
Gender differences for prevalence of DSH behaviors.

Subscales	Gender		
	Male	Female	$\chi^2$
Cutting	22 (29.3%)	92 (56.8%)	15.48***
Biting	40 (53.3%)	84 (52.4%)	n.s.
Burning	5 (6.8%)	15 (9.4%)	n.s.
Pulling hair	22 (29.3%)	70 (43.5%)	4.30*
Scratching until the skin is wounded	20 (26.7%)	69 (43.1%)	5.88*
Consuming drugs with a self-aggressive intent	4 (14.3%)	24 (15.0%)	4.54*
Sticking self with needles	6 (8.0%)	16 (9.9%)	n.s.
Ingesting dangerous substances with a self-aggressive intent	7 (9.3%)	21 (13.1%)	n.s.
Drinking alcohol with a self-aggressive intent	16 (21.3%)	36 (22.6%)	n.s.
Banging/hitting	44 (58.7%)	85 (52.8%)	n.s.
Ingesting medication with a self-aggressive intent	9 (12.2%)	39 (24.2%)	4.54*

Note: DSH deliberate self-harm; n.s. Non-significant.

\*\*Significant at the 0.01 level.

\* Significant at the 0.05 level.

\*\*\* Significant at the 0.001 level.

**Table 2**

Mean comparisons of DSH Diversity and SI by SAs.

Subscales	SAs		t
	No ( $n = 167$ )	Yes ( $n = 70$ )	
DSH Diversity	$M = 2.42$ ( $SD=1.62$ )	$M = 4.89$ ( $SD=2.55$ )	-7.48***
SI	$M = 35.72$ ( $SD=36.87$ )	$M = 101.83$ ( $SD=39.46$ )	-12.26***

Note: DSH deliberate self-harm; SI suicidal ideation; SAs suicide attempts.

\*\*\* Significant at the 0.001 level.

32.5% ( $n = 54$ ) of participants without a history of SAs presented SI and almost 90% (89.9%,  $n = 62$ ) of participants with previous SAs reported SI ( $\chi^2_{(1)} = 64.08$ ,  $p < .001$ ).

### 3.1.4. Deliberate self-harm (DSH) severity

Regarding DSH severity, 25.3% ( $n = 60$ ) of participants reported previous DSH within the Substance Use dimension, 86.9% ( $n = 206$ ) within Mild severity, and 57% ( $n = 135$ ) within High Severity. Seeing that all participants practiced, at least, one type of DSH behavior from either Mild and/or High severity, three severity groups were considered, i.e., 1. Only mild severity (41.8%,  $n = 99$ ); 2. Only high severity (13.1%,  $n = 31$ ); and 3. Mild and High severity (45.1%,  $n = 107$ ).

Descriptive results showed an association between DSH severity groups and participants' gender (Table 3), where most male participants practiced Mild DSH (57.3%,  $n = 43$ ) and most females practiced types of behavior grouped in both Mild & High severity (50.6%,  $n = 82$ ) ( $\chi^2_{(2)}=10.93$ ,  $p < .01$ ). Further, present findings showed a statistically significant association between DSH severity groups and SAs, where most participants without SAs practiced Mild DSH (56.3%,  $n = 94$ ) and the large majority of the participants with previous SAs practiced Mild & High severity DSH (81.4%,  $n = 57$ ) ( $\chi^2_{(2)}=10.93$ ,  $p < .001$ ).

As for participants age, there was no statistically significant differences between the three severity groups ( $F_{(2)}=1.01$ ,  $p = .762$ ) (Table 4). DSH diversity analysis showed that the two groups of Mild severity and High severity presented similar DSH diversity, while the Mild & High severity group reported significantly higher DSH diversity ( $F_{(2)}=101.44$ ,  $p < .001$ ).

Similarly, participants in the Mild severity and High severity groups showed similar scores on SI, whereas the Mild & High severity group reported significantly higher scores of SI ( $F_{(2)}=53.49$ ,  $p < .001$ ).

## 3.2. DSH diversity and severity as predictors of SI and SAs

Table 5 describes results for the prediction of SI. Model 1 shows that DSH diversity significantly predicts SI. As for the DSH severity as a predictor of SI, Model 2 shows that the practice of High severity does not predict SI. On the other hand, the practice of Mild & High severity behaviors is a strong predictor of SI. Model 3 includes both DSH variables

**Table 3**

Crosstabs between DSH severity, sex, and SAs.

	DSH severity			$\chi^2$
	Mild( $n = 99$ )	High( $n = 31$ )	Mild & High ( $n = 107$ )	
Gender				
Male	57.3% <sub>a</sub> ( $n = 43$ )	9.3% <sub>a, b</sub> ( $n = 7$ )	33.3% <sub>b</sub> ( $n = 25$ )	10.93**
Female	34.6% <sub>a</sub> ( $n = 56$ )	14.8% <sub>a, b</sub> ( $n = 24$ )	50.6% <sub>b</sub> ( $n = 82$ )	
SAs				
No	56.3% <sub>a</sub> ( $n = 94$ )	13.8% <sub>b</sub> ( $n = 23$ )	29.9% <sub>c</sub> ( $n = 50$ )	57.69***
Yes	7.1% <sub>a</sub> ( $n = 5$ )	11.4% <sub>b</sub> ( $n = 8$ )	81.4% <sub>c</sub> ( $n = 57$ )	

Note: DSH deliberate self-harm; SAs suicide attempts.

\*\* Significant at the 0.01 level.

\*\*\* Significant at the 0.001 level.

**Table 4**

Mean comparisons of age, DSH diversity and SI by DSH severity.

	DSH severity			F
	Mild(n = 99)	High(n = 31)	Mild & High (n = 107)	
Age	M = 17.24 <sub>a</sub> (SD=1.24)	M = 17.42 <sub>a</sub> (SD=1.09)	M = 17.35 <sub>a</sub> (SD=1.53)	n.s
DSH diversity	M = 1.93 <sub>a</sub> (SD=1.05)	M = 1.29 <sub>a</sub> (SD=0.53)	M = 4.81 <sub>b</sub> (SD=2.21)	101.44***
SI	M = 29.76 <sub>a</sub> (SD=30.06)	M = 34.52 <sub>a</sub> (SD=37.52)	M = 85.13 <sub>b</sub> (SD=48.04)	53.49***

Note: DSH deliberate self-harm; SI suicidal ideation; n.s. Non-significant.

\*\*\* Significant at the 0.001 level.

**Table 5**

Regression analyses between DSH Diversity and Severity with SI.

Predictors	B	95% CI	$\beta$	t	R <sup>2</sup> <sub>adj</sub>
Dependent variable – SI					
Model 1 (Predictor - DSH diversity)					
Diversity	13.33	[11.630, 15.383]	.621	12.088***	.38
Model 2 (Predictor – DSH severity)					
High severity	4.76	[−0.925, 20.057]	.033	n.s.	.31
Mild & High severity	55.38	[44.931, 66.106]	.573	9.87***	
Model 3 (Predictors - DSH diversity and severity)					
Diversity	9.817	[7.129, 12.743]	.457	6.718***	.42
High severity	11.031	[−1.712, 26.138]	.078	n.s.	
Mild & High severity	27.007	[12.703, 41.633]	.279	4.060***	

Note: DSH deliberate self-harm; SI suicidal ideation; n.s. Non-significant.

\*Significant at the 0.05 level.

\*\*\* Significant at the 0.001 level.

in order to put in concurrence both diversity and severity. Findings showed, on the one hand, that for the increment of a unit in the DSH diversity (i.e. a practice of a different type of DSH behavior) the probability of SI increased by 9.817, holding DSH severity constant. On the other hand, even when holding DSH diversity constant, the practice of Mild & High severity behaviors predicts SI.

Finally, Table 6 describes the results for the prediction of SAs. Model 1 shows that DSH diversity significantly predicts SAs. As for DSH severity as a predictor of SA, Model 2 shows that both the practice of High severity and Mild & High severity DSH strongly predicts SAs. In Model 3, we have included both DSH variables and 1) this model predicts for an increase a unit in DSH diversity the odds for SA increase by 56%, holding the other predictors constant; 2) also, holding diversity

**Table 6**

Logistic Regressions between DSH Diversity and Severity with SAs.

Predictors	B	SE	Wald	Exp(B)	95% CI	R <sup>2</sup>
Model 1 (DSH diversity predicting SAs)						
Diversity	.57	.087	42.78***	1.770	[1.492, 2.100]	.33
Model 2 (DSH severity predicting SAs)						
High severity	1.88	.616	9.30**	6.539	[1.956, 21.859]	.34
Mild & High severity	3.07	.499	37.80***	21.486	[8.081, 57.124]	
Model 3 (DSH diversity and severity predicting SAs)						
Diversity	.441	.112	15.472***	1.555	[1.248, 1.937]	.43
High severity	2.254	.632	12.728***	9.530	[2.762, 32.882]	
Mild & High severity	1.970	.558	12.446***	7.168	[2.400, 21.409]	

Note: DSH deliberate self-harm; SAs suicide attempts.

\*\* Significant at the 0.01 level.

\*\*\* Significant at the 0.001 level.

constant, the practice of High severity DSH increases the likelihood of SAs by a factor of 9.53; and 3) the practice of Mild & High severity DSH behaviors increased 7.168 times the chances of attempting suicide.

#### 4. Discussion

This study explored the association between the severity and diversity of DSH, SI, and SAs in a community and clinical sample of adolescents and young adults with a history of DSH. Prior to analyzing the prediction models, we will briefly discuss the descriptive statistics concerning DSH, SI, and SAs.

##### 4.1. Descriptive statistics

The prevalence and diversity of DSH were in accordance with other national (Duarte et al., 2019, 2020) and international studies (e.g., Calvete et al., 2015; Muehlenkamp et al., 2012). Females showed higher prevalence and diversity of DSH than males, which is also consistent with previous studies (Bresin and Schoenleber, 2015; Laye-Gindhu and Schonert-Reichl, 2005; Plener et al., 2009). Results also revealed effects of gender on DSH behaviors, with female participants reporting higher means in cutting, pulling hair, scratching until the skin is wounded, consuming drugs, and ingesting medication. These differences may be linked to gender disparities in the expression of emotional aversive states or emotions, reflecting the idea that females tend to engage in less public DSH, while males may act more impulsively and use DSH as a test of power/superiority in social contexts (You et al., 2011).

In the present study, the clinical group showed higher prevalence and diversity of DSH, as well as higher SI and more SAs when compared with the community sample, which is consistent with previous studies (Carvalho et al., 2017; Duarte et al., 2020; Guerreiro et al., 2017) and could be explained by the psychopathological comorbidities of these participants (Bentley et al., 2015; Guerreiro et al., 2009; Sevecke et al., 2017; Victor and Klonsky, 2014). Likewise, our results also showed that most participants with DSH presented SI and SAs, which is consistent with the idea that these phenomena are closely linked (Andover et al., 2012; Grandclerc et al., 2016; Hamza et al., 2012; Sevecke et al., 2017).

##### 4.2. DSH diversity and severity as predictors of SI and SA

According to our initial hypothesis, the diversity of DSH behaviors was a predictor of SI and SAs, which remained significant when controlling for the effect of DSH severity. These results are similar to those found in previous studies (Hamza and Willoughby, 2013; Samari et al., 2020; Wester et al., 2016). However, in our study, diversity was a stronger predictor of SAs than in the study of Duarte and colleagues (2020), which highlights the importance of DSH diversity both for clinical and research settings.

As Victor and Klonsky (2014) summarized, a greater number of DSH behaviors may suggest a) greater exposure to different types of painful experiences, which could decrease barriers to suicide and, hence, contribute to the association between DSH and STBs; b) greater perceived need to engage in DSH, regardless of whether an individual's preferred DSH behavior is attainable at a specific time/setting; c) versatility in the ways one is willing and able to engage in DSH despite the drawbacks associated with the associated pain or fear, which might indicate a greater ability to engage in STBs.

Furthermore, since the engagement in DSH functions as a way of communicating suffering and regulating emotions and thoughts (Nock, 2009), the amount of different DSH behaviors used by an individual might be representative of the numerous attempts to regulate their emotions and thoughts (Wester et al., 2016). Researchers have found that participants with more DSH behaviors have increased levels of psychopathological symptoms (Klonsky and Olino, 2008; Ammerman et al., 2019), which may be a sign that these individuals' mental state is worsening, therefore contributing to an increase in SI and leading them



to consider suicide (Wester et al., 2016). Also, the engagement in DSH might desensitize adolescents and young adults regarding the pain and fear linked to suicide (Franklin et al., 2011; Muehlenkamp and Gutierrez, 2007), consequently contributing to a greater capability or receptiveness to engage in STBs (Klonsky and May 2015; Samari et al., 2020).

Focusing on the severity of DSH behaviors, our results were not totally in line with our theoretical predictions. Although previous research has shown that individuals who attempted suicide engage in more severe DSH behaviors (Stewart et al., 2017) and that SI is strongly associated with SAs (Castellví et al., 2017), results revealed that High severity DSH only predicted SAs, while Mild & High severity DSH behaviors predicted both SI and SAs. Since our descriptive results showed that the Mild & High severity group presented significantly more DSH diversity than the other severity groups, we question if diversity is, in fact, more relevant for further STBs than DSH severity, or if these results might be the consequence of a study limitation.

In this context, a study has found that low severity DSH was more strongly associated with SI than high severity DSH and that SI was associated with intrapersonal DSH functions (Victor et al., 2015). Other investigation concluded that patients' history of DSH (presence and frequency) was as strongly associated with SA history as current levels of SI (Andover and Gibb, 2010). In addition, a recent study indicated that the intrapersonal functions of DSH are influential mechanisms in the association between DSH frequency and SI (O'Loughlin et al., 2020). Although differently, these studies suggest that the link between DSH and SI might not be as linear as previous research conceived, with variables such as DSH frequency or DSH functions playing a determinant role.

Overall, our results can be contextualized through the Gateway Theory, which proposes that DSH precedes further STBs (Hamza et al., 2012) and that the engagement in diverse DSH behaviors exposes the adolescents to different risk experiences and gradually reduces the barriers in direction to suicide (Victor and Klonsky, 2014). Specifically, our findings that the increase in DSH diversity strongly predicts SI and SAs, that High severity DSH predicts SAs, and that High & Mild severity DSH predicts SI and SAs underline the clear impact that these behaviors have for suicide risk.

#### 4.3. Limitations and directions for future research

This study has several limitations, namely its cross-sectional design, the use of self-reported measures to assess sensitive behaviors, and the assessment of DSH behaviors, since the measurement methods chosen appear to heavily influence data (Cipriano et al., 2017). Moreover, it was not possible to study variables that could be of interest to better understand our results, such as participants' psychopathological comorbidities, risk factors for STBs and DSH, or DSH functions. These variables could be addressed in future studies, contributing to the comprehension of the role of DSH diversity and severity in STBs and in the suicidal continuum.

Nonetheless, this study brings additional knowledge regarding the association of DSH with SI and SAs, and its role in the context of these suicidality trajectories. Furthermore, it also highlights the role that these behaviors' diversity and severity may play in the context of clinical intervention.

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