Current Psychology (2026) 45:22
https://doi.org/10.1007/s12144-025-08891-9

Adolescent deliberate Self-Harm: predictors of family and personal risk

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Received: 20 September 2024 / Accepted: 3 September 2025

Abstract
Deliberate self-harm in adolescents is a significant public health problem, associated with a range of psychiatric comorbidities, and with serious consequences for the individual and their family. This study aimed to examine the impact of demographic (gender and age), interpersonal (family functioning) and intrapersonal (borderline personality disorder, suicidal ideation and impulsivity) factors on deliberate self-harm. Method: A cross-sectional study was employed to collect data from 744 secondary school-based adolescents. The data were collected using valid self-report measures, specifically the Family Adaptability and Cohesion Evaluation Scale IV, the Borderline Personality Features Scale for Children, the Suicidal Ideation Questionnaire, the Inventory of Deliberate Self-Harm Behaviours and the Barrat Impulsivity Scale. Hierarchical multiple linear regression was employed for data analysis. Results: The results showed that gender, age and family functioning, were significant in dependent predictors of deliberate self-harm. However, when intrapersonal factors such as borderline personality disorder and suicidal ideation were included in the equation model, the effect was reduced. Among these factors, suicidal ideation emerged as the most significant predictor, followed by borderline personality disorder, whereas impulsivity was not an effective direct predictor. Conclusions: Findings suggest that intrapersonal factors, particularly suicidal ideation and borderline personality disorder, have a stronger effect on deliberate self-harm than demographic and interpersonal factors. This highlights the fundamental need for prevention and intervention strategies that integrate mental health treatment and family support. These findings have significant implications for clinical practice and provide a robust foundation for future research on effective interventions for at-risk adolescents.

Keywords Deliberate self-harm · Family functioning · Borderline personality disorder · Suicidal ideation · Impulsivity · Adolescents

Introduction

Deliberate self-harm (DSH) in adolescence represents a pressing global public health concern, as highlighted by the World Health Organization (2020). The impact of such behaviours is profound, affecting not only individuals but also their families. DSH encompasses intentional self-injurious behaviours, regardless of suicidal intent, including behaviours such as jumping from heights, overdosing, cutting, hitting oneself, and ingesting non-edible substances (Duarte et al., 2019). DSH is considered a strong risk factor for suicide (e.g. Duarte et al., 2020; Fuschini et al., 2024b; Westers, 2023), particularly among adolescents with other psychiatric comorbidities such as borderline personality disorder (BPD), suicidal ideation (Plener et al., 2018; Westers, 2019) and high impulsivity (de Cates et al., 2019; Westers, 2023).

A recent meta-analysis conducted by Xiao et al. (2022), drawing on 62 studies conducted between 2010 and 2021 and comprising approximately 690,000 community adolescents from diverse countries, estimated a global lifetime prevalence of DSH at 22%. A Portuguese study by Gaspar et al. (2019), involving 3,262 community adolescents, reported a lifetime prevalence of 20.3%. Another Portuguese study by Duarte et al. (2020) reported a lifetime prevalence of 41% in community samples, with rates as high as 83% in clinical populations.

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Published online: 18 December 2025

DSH typically emerges in early adolescence, particularly among girls, with incidence peaking between the ages of 13 and 15, followed by a marked decline (Gaspar et al., 2019; Steinhoff et al., 2021; Xiao et al., 2022). Both age and gender have consistently been identified as significant predictive risk factors for DSH (Fuschini et al., 2024a; Klonsky et al., 2016; Steinhoff et al., 2021). While international longitudinal studies support this developmental trajectory, a Portuguese school-based survey by Guerreiro et al. (2017), involving 1,713 adolescents aged 12 to 20, did not find a statistically significant association between age and DSH. This discrepancy may reflect methodological differences, including the broader age range, the categorisation of age groups, and the cross-sectional design of the study. Nonetheless, the study confirmed gender as a significant factor, with girls being approximately three times more likely than boys to engage in DSH.

The high prevalence and the severity of DSH emphasise the importance of addressing both interpersonal and intrapersonal factors that contribute to these behaviours, in order to strengthen prevention and early intervention strategies (Gillies et al., 2018; Gouveia-Pereira et al., 2022; Jong & Chou, 2021; World Health Organization, 2020). Linehan's (1993) biosocial theory provides a relevant framework for understanding the development of DSH, conceptualising it as a maladaptive developmental pathway arising from the interaction of biological vulnerability, emotional dysregulation, and invalidating family environments. This viewpoint is corroborated by studies such as Wang et al. (2017), which demonstrate that interpersonal (e.g. negative parental relationships) and intrapersonal (e.g. impulsivity) factors are central to the emergence of DSH.

It is widely recognised that family dynamics play a significant role in the development of adolescents. The quality of interpersonal relationships within families is a determining factor in the social-emotional wellbeing of adolescents (Brofenbrenner, 1994). Research has consistently highlighted the importance of family functioning in relation to DSH, demonstrating how family interactions influence these outcomes (e.g. Bahr, 2019; Chen et al., 2023; Fuschini et al., 2024b; Zhou et al., 2024). The concept of "family functioning" encompasses the quality of bonds and interactions among family members, including communication patterns, expressions of affection, adaptability to change, and their respective strengths, weaknesses and daily routines (Bahr, 2019; Gouveia-Pereira et al., 2020; Olson, 2011). The Circumplex Model (Olson, 2011), which analyses these interactions through the dimensions of family cohesion and flexibility, significantly enhances our understanding of family dynamics. The concept of family cohesion encompasses the emotional closeness, relational connectedness, and mutual respect among family members (Bahr, 2019; Gouveia-Pereira et al., 2020; Olson, 2011). Research has indicated that low family cohesion is associated with feelings of isolation and frustration, which may increase the risk of DSH (Bahr, 2019; Gouveia-Pereira et al., 2020). The concept of family flexibility encompasses the capacity to adapt roles and interaction patterns in response to stress or developmental changes. Families characterised by low flexibility frequently implement rigid rules and fixed authority structures (Bahr, 2019; Gouveia-Pereira et al., 2020; Halstead et al., 2014). Empirical studies have consistently shown that unbalanced family functioning - characterised by low cohesion, low flexibility and inadequate emotional responsiveness - is associated with an elevated risk of DSH (e.g. Baetens et al., 2014; Chen et al., 2023; Halstead et al., 2014). For instance, the longitudinal study by Chen et al. (2023) involving 7,554 Chinese adolescents demonstrated that poor family functioning was positively associated with an DSH incidence, while a supportive family environment served as a protective factor.

Furthermore, several studies suggest that family functioning may be differentially associated with DSH in the presence of other intrapersonal factors (Chen et al., 2023; Hasking et al., 2020; Shao et al., 2021; Wang et al., 2017; Wang et al., 2022), such as BPD, (e.g. Linehan, 1993; Richardson et al., 2024; Sekowski et al., 2022), suicidal ideation (e.g. Aqeel et al., 2021; Klonsky & May, 2015; Klonsky et al., 2016), and impulsivity (e.g. Hamza & Willoughby, 2019; Lockwood et al., 2020; Westers, 2023). Although each factor has been shown to significantly influence DSH when considered independently, their interaction with family dynamics provides valuable insight into the multifactorial nature of these behaviours.

Among these factors, the relationship between BPD and DSH has been widely investigated, with numerous studies demonstrating the significant impact of BPD on self-harming behaviours. BPD is a complex psychiatric condition that typically manifests during adolescence and is characterised by emotional dysregulation, instability in interpersonal relationships, identity disturbances, and pronounced impulsivity (Zanarini et al., 2017). Epidemiological studies estimate the prevalence of BPD in the general adolescent population to be around 3% (Zanarini et al., 2017), while in clinical settings, it is considerably higher, at approximately 11% (Guilé et al., 2018). In a longitudinal study of 4,782 Chinese secondary school students, You et al. (2012) found that BPD symptoms were significantly associated with the initiation, recurrence and persistence of DSH across a two-year follow-up period. Similarly, Glenn and Klonsky (2013) reported that 52% of those of adolescents who were diagnosed with DSH also met the criteria for BPD and Sekowski et al. (2022) found that greater severity of BPD symptoms was positively associated with DSH, even after controlling

for confounding variables such as age, gender, and depressive symptom severity.

Another intrapersonal factor strongly associated with DSH is suicidal ideation. A substantial body of research indicates that adolescents who engage in DSH are at greater risk of experiencing suicidal ideation than their peers who do not (e.g. Aqeel et al., 2021; Duarte et al., 2020; Gouveia-Pereira et al., 2022; Shao et al., 2021; Whitlock & Knox, 2007). A comprehensive meta-analysis by Gillies et al. (2018), involving nearly 600,000 adolescents from 41 countries, found that young people with a history of DSH were five times more likely to report suicidal ideation.

In their Three-Step Theory, Klonsky and May (2015) explain the progression of suicidal behaviour through an ideation-to-action framework, positing that suicidal thoughts precede attempts. Although this theory focuses primarily on the transition from ideation to attempts, it has been suggested that DSH may represent an extension of this continuum, bridging ideation and suicidal acts (e.g., Duarte et al., 2020; Gouveia-Pereira et al., 2022; Grandclerc et al., 2016). This hypothesis is supported by a systematic review and meta-analysis conducted by Miranda-Mendizabal et al. (2019), alongside by Castellví et al. (2017), both of which highlighted previous suicidal ideation as a significant risk factor for DSH among more than 1.1 million adolescents, underscoring its role in the escalation towards more severe self-harm.

Alongside suicidal ideation, impulsivity is widely recognised as another key intrapersonal factor associated with DSH. According to Patton et al. (1995), impulsivity is a multidimensional construct comprising cognitive impulsivity, motor impulsivity, and lack of planning. The literature consistently identifies it as a significant risk factor for both the occurrence and severity of DSH, with increasing attention being given to the mechanisms underlying this association (Guerreiro et al., 2017; Hamza & Willoughby, 2019). In a large study of nearly 30,000 adolescents aged 14 to 17, Madge et al. (2011) found that impulsivity distinguished adolescents with a history of DSH from those without and was significantly correlated with the repetition and severity of self-harm. Likewise, de Cates et al. (2019), in an 18-month study of 8,580 participants, identified impulsivity as an important predictor of new DSH incidents, even after adjusting for other variables. Additionally, Hamza and Willoughby (2019), in a three-year longitudinal study of 782 young adults, observed a reciprocal relationship : higher levels of impulsivity increased the risk of DSH, while repeated self-harm appeared to intensify impulsivity, underscoring their dynamic interplay.

While most of these studies examined impulsivity as a global construct (de Cates et al., 2019; Guerreiro et al., 2017; Hamza & Willoughby, 2019; Madge et al., 2011), some research has explored the differential impact of its specific dimensions (e.g. Lockwood et al., 2020; You et al., 2012). For example, You et al. (2012), in a study of approximately 4,800 community adolescents, reported that motor impulsivity was strongly associated with DSH frequency, accounting for 34% of the variance. Similarly, Lockwood et al. (2020) identified deficits in premeditation as significant predictors of both the onset and recurrence of DSH.

The current study

The existing literature suggests a strong correlation between age, gender, family functioning, BPD symptoms, suicidal thoughts, impulsivity and DSH. However, the precise contributions of these factors and how they interact remain unclear. To date, no study has examined the independent and hierarchical contributions of these factors to DSH in adolescents in a comprehensive manner.

In this study, a series of hypotheses were tested using a hierarchical multiple linear regression model. The initial hypothesis of this study postulated that demographic variables would significantly predict DSH, with older age and female gender being associated with higher prevalence. It was hypothesised that the inclusion of interpersonal variables would enhance the explanatory power of the model, with diminished family functionality increasing the probability of DSH. Finally, we predicted that intrapersonal variables would provide significant incremental validity beyond demographic and interpersonal factors. It was hypothesised that higher levels of BPD symptoms, suicidal ideation, and impulsivity would be the strongest predictors. The regression model was structured so that variables were entered sequentially- demographic first, followed by interpersonal, and finally intrapersonal – in order to examine both their individual and combined contributions to DSH.

This study makes a novel contribution by being the first to comprehensively examine, in a large community-based sample of Portuguese adolescents, the simultaneous and hierarchical effects of demographic, interpersonal, and intrapersonal factors on DSH. Unlike previous research, which has mainly focussed on clinical samples or single domains of risk, this integrative approach offers a more nuanced understanding of the multifactorial nature of DSH.

Method

Participants

The initial sample comprised 890 adolescents from two Portuguese public schools, spanning grades 7 to 12. Of these,

13.7% (n=118) did not complete the questionnaire, and 3.1% (n=28) were identified as outliers and excluded from analysis. The final sample consisted of 744 adolescents aged between 11 and 19 years (M=15.0, SD=1.6), of whom 671 (90.1%) were Portuguese and 378 (50.8%) were female. Regarding household composition, 466 (62.7%) of the adolescents lived with both parents, 162 (21.8%) lived with a single mother, 4 (0.5%) lived with a single father, 50 (6.7%) lived in blended families, 43 (5.8%) lived with grandparents, and 18 (2.4%) lived with other individuals.

Measures

Family functioning

Family functioning was measured with the Portuguese version of the Family Adaptability and Cohesion Evaluation Scale (FACES-IV, Gouveia-Pereira et al., 2020). This scale is a self-report measure that assesses family functioning based on Olson's Circumplex model (2011) through two dimensions: family adaptability and family cohesion. The scale consists of 24 items that are evaluated using a 5-point Likert scale (1=*Strongly Disagree*; 5=*Strongly Agree*) distributed across six sub-scales. In previous research, the FACES-IV scale has demonstrated good validity, reliability, and the ability to discriminate between problematic and non-problematic families, with reliability scores ranging from 0.78 to 0.90 across the six subscales (Olson, 2011). This supports their use in both research and family assessments. Specifically, one of the subscales assesses cohesion, and another assesses balanced flexibility. Higher scores on the scales of cohesion and flexibility indicated balanced systems, while low scores reflected unbalanced systems. As posited by Olson (2011), the scores are converted into ratios (i.e. family cohesion ratio, family flexibility ratio and total circumplex ratio), in order to classify family systems along a continuum ranging from maximum dysfunction to maximum functionality. In the present study, only the total circumplex ratio was utilised, yielding a mean score of 2.7 (SD=1.2) with a Cronbach's α of 0.80.

Borderline Personality Disorder

The Portuguese version of the Borderline Personality Features Scale for Children (BPFSC-12, Candeias et al., 2024) was employed to assess symptoms of BPD. The BPFSC-12 is a unidimensional scale comprising 12 items distributed across four dimensions: affective instability, identity problems, negative relationships and self-harm. The items are designed to assess how participants feel about themselves or others on a 5-point Likert scale, ranging from 1 (*never true*) to 5 (*always true*). The total score is calculated by summing the responses to all 12 items, with higher scores indicating greater levels of borderline features. The Portuguese adaptation of the scale demonstrated excellent reliability, with a Cronbach's α of 0.93, robust convergent validity, as well as invariance across gender (Candeias et al., 2024). In the current study the mean score was 2.2 (SD=0.7) with a Cronbach's α of 0.86.

Suicidal Ideation

Suicidal ideation was measured through the Portuguese version of the Suicidal Ideation Questionnaire (SIQ; Ferreira & Castela, 1999). The SIQ is a unidimensional self-report measure designed to assess the severity of suicidal thoughts in adolescents and adults. The scale comprises 30 items, such as "I thought about committing suicide" or "I thought about death" evaluated on a 7-point Likert response scale ranging from 0 (*I never thought about it*) to 6 (*almost every day*) with higher scores indicating greater severity of suicidal ideation, with a maximum possible score of 180, indicating suicidal ideation occurring almost daily. The Portuguese adaptation of the questionnaire demonstrated excellent reliability, with a Cronbach's α of 0.96 and a test-retest reliability of 0.76 (Ferreira & Castela, 1999). In the current study, the mean score was 46.74 (SD=28.91), with excellent internal consistency (Cronbach's α=0.97).

Impulsivity

Impulsivity was measured using the short form of the Barrat Impulsiveness Scale (BIS-15, Spinella, 2007), which assesses three dimensions of impulsive behaviour—motor impulsivity, cognitive impulsivity, and non-planning. In the present study, we chose to use the global score as a comprehensive index of impulsivity, a procedure frequently adopted in adolescent research (de Cates et al., 2019; Guerreiro et al., 2017; Hamza & Willoughby, 2019; Madge et al., 2011). This decision was made to ensure parsimony in the regression models and reduce the risk of multicollinearity, given the strong intercorrelations among the subscales. While this approach provides a robust overall measure of impulsivity, it does not permit the examination of the unique contributions of each dimension. Higher scores reflect greater levels of global impulsivity. The BIS 15 consists of 15 items rated on a 4-point Likert scale (1=*rarely/never*, 4=*almost/always*). In the original validation, the BIS-15 demonstrated good reliability and validity, with a Cronbach's α of 0.79 (Spinella, 2007). In the present study, the mean score was 31.4 (SD=7.3) with a Cronbach's α of 0.81, indicating good internal consistency.

Deliberate Self-Harm

Deliberate self-harm was measured using the Inventory of Deliberate Self-Harm Behaviours (ICAL), which was developed and validated by Duarte et al. (2019). The Portuguese version of the ICAL demonstrated good internal consistency (Cronbach's α = 0.91) and yielded a mean score of 1.96 (SD = 2.95). This self-report inventory evaluates the lifetime frequency of 13 DSH behaviours, with and without suicidal intent, such as 'cutting' or 'biting', assessed through a four-option response: "*No*"; "*Yes*, *one time*"; "*Yes*, *2 to 10 times*"; and "*Yes*, *more than 10 times*". Higher scores reflect a greater frequency and diversity of self-harm behaviours. In the current study, the mean score was 1.3 (*SD* = 2.6) with a Cronbach's α of 0.74.

Procedures and ethical issues

This research received ethical approval from the ISPA - University Institute Ethics Committee on January 2022, under the reference number D-047-1−22. It was also registered with the National Data Protection Commission (CNPD) and the School Survey Monitoring Office (MIME) under the General Directorate of Education of the Ministry of Education. In collaboration with the school's administration, teachers were informed of the study's goals and methods, and 22 convenient classes were selected. Parents and guardians of the students were provided with an active informed consent form through the schools, which was also signed by the students themselves. Participants were guaranteed anonymity, data confidentiality, the voluntary nature of their participation, and the right to seek clarifications or withdraw from the study at any time without any repercussions. Data collection was carried out by the researcher in the classroom, Given the study's sensitive nature, extensive ethical precautions were implemented. A network of collaborators, including the school's counselling and psychological service (SPG), was set up before the project's initiation. This network also focussed on educating parents and guardians to ensure that any adolescent at risk could be monitored and referred to specialist services if needed, adhering to the principle of "do no harm".

Data analysis

Prior to the primary analyses, the assumptions of multiple regression were evaluated, including normality of residuals, homoscedasticity, independence of errors, and the absence of multicollinearity (Marôco, 2011). Outliers and influential cases were identified using Cook's Distance (values > 1.0), studentised residuals (|>3.0|), and leverage values (Marôco, 2011). Based on these criteria, 28 participants were excluded to reduce undue influence on the model while minimising data loss. Subsequently, bivariate Pearson correlation analysis was conducted to examine the associations between variables prior to regression modelling. Pearson's correlation coefficients were considered weak if $|r| < 0.25$; moderate if $0.25 \leq |r| < 0.5$; strong if $0.5 \leq |r| < 0.75$ and very strong if $|r| \geq 0.75$ (Marôco, 2011). Hierarchical multiple regression analyses were then performed to assess the contributions of gender, age, family functioning, BPD symptoms, suicidal ideation, and impulsivity to DSH. Predictors were entered in three blocks, namely: demographic variables (Block 1: gender and age), family functioning (Block 2) and intrapersonal variables (Block 3: BPD symptoms, suicidal ideation and impulsivity), in accordance with theoretical rationale for the evaluation of their incremental predictive validity.The regression results were interpreted using unstandardised coefficients (*B*), standardised coefficients (β), *t*-values, 95% confidence intervals (CI's), and *p*-values (significance set at $p < .05$). Standardised coefficients indicated the relative strength of predictors, and the model's fit and explanatory power were evaluated using R^2 and ΔR^2. Effect sizes were interpreted using Cohen's f^2, with thresholds of 0.02 (small), 0.15 (medium), and 0.35 (large) (Marôco, 2011). All statistical analyses were conducted in IBM SPSS Statistics (Version 29).

Results

In total, 193 participants (26%) reported engaging in DSH. Of these, 65% were girls ($n = 125$), aged 13 to 19 years ($M = 14.8$, $SD = 1.6$). Table 1 presents the bivariate Pearson correlation coefficients for the study variables. As shown in

Table 1 Pearson Correlations(r) among DSH, Age, Gender, family Functioning, BPD symptoms, suicidal ideation and impulsivity

Variables	DSH	Age	Gender	FF	BPD	SI
Age	−0.09**					
Gender	0.12***	−.04n.s.				
Family Functioning (FF)	−0.20***	0.07**	−.02n.s.			
BPD Symptoms	0.32***	0.12***	−.06n.s.	−0.31***		
Suicidal Ideation (SI)	0.61***	0.08**	−0.26***	−0.24***	0.36***	
Impulsivity	0.21***	0.09**	.01n.s.	−0.29***	0.60***	0.23***

N = *743*.

** $p < .01$, *** $p < .001$, ns - non significant

Table 1, all variables under investigation were significantly correlated with DSH. The correlations between DSH and the other variables ranged in effect size, with the strongest statistically significant positive association observed between DSH and suicidal ideation (r=.61, p<.001), followed by DSH and BPD symptoms (r=.32, p<.001). Gender was also significantly correlated with DSH.

The results of the hierarchical multiple regression analysis with DSH as outcome are shown in Table 2. The first block included age and gender as predictors of DSH. Results indicated that the regression model was statistically significant, explaining 2.3% of the variance in DSH (R^2 = 0.02, F (2, 740)=8.71, p<.001, Cohen's f^2=0.02), demonstrating that both age and gender were significant predictors, and that DSH tends to increase with age and is more prevalent in girls.

In the second block, the predictor family functioning was added. This model was also statistically significant (R^2 = 0.06, F (3, 739)=15.68, p<.001, Cohen's f^2=0.04), accounting for an additional 3.7% of the explained variance in *DSH*. Family functioning emerged as a significant predictor of DSH (B = −0.43, β = −0.19, t = −5.38, p<.001, 95% CI [−1.01, −0.28]), indicating that higher family functioning scores were associated with lower levels of DSH. Both gender (B = −0.64, β = −0.12, t = −3.46, p=.001, 95% CI [−1.01, −0.28]) and age (B=0.13, β=0.08, t=2.28, p=.023, 95% CI [0.02, 0.24]) remained statistically significant, suggesting that DSH is more prevalent among girls and tends to increase with age.

In the third block, the inclusion of BPD symptoms, suicidal ideation and impulsivity resulted in a substantial increase in the amount of variance explained, reaching 39.0% (R^2 = 0.39, F(6, 736)=134.29, p<.001, Cohen's f^2=0.55), contributing an additional 33.3% to the explained variance. When these variables were included, family functioning is no longer a significant independent predictor (p=.542, 95% CI [−0.18, 0.09]), nor were gender (p=.188, 95% CI [−0.10, 0.51]) or age (p=.275, 95% CI [−0.04, 0.14]). Notably, impulsivity did not emerge as a significant predictor of DSH. (p=.844, 95% CI [−0.03, 0.02]). Conversely, BPD symptoms were a significant predictor (p=.002, 95% CI [0.18, 0.77]), as well as suicidal ideation (p<.001, 95% CI [0.05, 0.06]).

Table 2 Hierarchical multiple linear regression models with DSH as the outcome

Models	B	B	t	*p*	95% CI
Block 1: R^2=0.02					
Constant	−0.11		−0.10	0.907	[−1.90, 1.68]
Age	0.15	0.10	2.63	0.009	[0.04, 0.27]
Gender	−0.63	−0.12	−3.34	0.001	[−1.00, −0.26]
Block 2: R^2=0.06; ΔR^2= 0.04					
Constant	1.43		1.52	0.130	[−0.42, 3.27]
Age	0.13	0.08	2.28	0.023	[0.02, 0.24]
Gender	−0.64	−0.12	−3.46	0.001	[−1.01, −0.28]
Family Functioning	−0.43	−0.19	−5.38	<0.001	[−0.59, −0.27]
Block 3: R^2=0.39; ΔR^2= 0.33					
Constant	−1.58		−1.89	0.059	[−3.21, 0.06]
Age	0.05	0.03	1.09	0.275	[−0.04, 0.14]
Gender	0.21	0.04	1.32	0.188	[−0.10, 0.51]
Family Functioning	−0.04	−0.02	−0.61	0.542	[−0.18, 0.09]
BPD symptoms	0.48	0.12	3.18	0.002	[0.18, 0.77]
Suicidal ideation	0.05	0.58	18.01	<0.001	[0.05, 0.06]
Impulsivity	−0.003	−0.007	−0.20	0.844	[−0.03, 0.02]

B = unstandardised coefficient; β = standardised coefficient; CI = confidence interval

Discussion

Given the rising prevalence of DSH among adolescents and its profound consequences for both adolescents and their families, it is essential to examine the associated risk factors with these behaviours. In accordance with extant evidence, this study examined the independent and hierarchical contributions of socio-demographic variables (gender and age), interpersonal variables (family functioning), and intrapersonal variables (BPD symptoms, suicidal ideation, and impulsivity) to DSH in a large community-based sample of Portuguese adolescents. Approximately one-quarter of the participants reported engaging in DSH, a rate consistent with previous findings in both Portuguese and international samples (Fuschini et al., 2024a; Gaspar et al., 2019; Xiao et al., 2022). The results highlighted the dominant role of intrapersonal factors, particularly suicidal ideation and BPD symptoms, in explaining DSH. Their impact significantly outweighing that of socio-demographic and interpersonal variables, in line with previous studies by You et al. (2012), Sekowski et al. (2022) and Fuschini et al. (2024).

The results suggest that adolescents exhibiting symptoms of BPD are more likely to engage in DSH, possibly due to difficulties in emotional regulation, and impulse control frequently observed in individuals with this disorder (Sturrock & Mellor, 2014). Moreover, suicidal ideation emerged as the strongest predictor, accounting for a substantial proportion of the variance, corroborating systematic reviews and meta-analyses by Miranda-Mendizabal et al. (2019) and the work of Klonsky et al. (2016), both of which emphasise the prominent role of suicidal ideation in predicting DSH. Klonsky and May's (2015) Three-Step Theory further supports this view, suggesting that suicidal ideation frequently precedes self-harming behaviours. However, these findings appear to

contrast with those of Gouveia-Pereira et al. (2022), who argued that the severity and diversity of DSH may, in turn, predict suicidal ideation. Rather than representing a contradiction, this apparent inconsistency may reflect a reciprocal dynamic, in which suicidal ideation initially triggers DSH, which subsequently exacerbates suicidal thoughts. This complex bidirectional relationship underscores the need for further research to clarify these dynamics and to inform the development of targeted interventions and therapeutic strategies.

Impulsivity, although widely recognised as a risk factor for DSH (de Cates et al., 2019; Guerreiro et al., 2017; Hamza & Willoughby, 2019; Madge et al., 2011), did not emerge as an independent predictor in this study once suicidal ideation and BPD symptoms were included in the model. While impulsivity showed a significant bivariate correlation with DSH, its effect was attenuated once BPD symptoms and suicidal ideation were accounted for, indicating that impulsivity may operate indirectly through these proximal factors, rather than functioning as an independent predictor. This is consistent with the conceptual and statistical overlap between impulsivity and BPD, given that impulsivity is a core diagnostic feature of the disorder (American Psychiatric Association, 2013; Zanarini et al., 2017). Moreover, although the BIS-15 measures three facets of impulsivity—motor, cognitive, and non-planning—this study utilised the global score for parsimony and to reduce multicollinearity. Previous research, however, indicates that specific dimensions, particularly motor impulsivity (You et al., 2012) and lack of premeditation (Lockwood et al., 2020), may have stronger associations with DSH. Consequently, the use of a global score may have obscured the unique contributions of these dimensions and may partly explain the absence of an independent effect in this study.

Taken together, these findings suggest that although impulsivity is an important component of the risk profile for DSH, its role may be more indirect, operating through or being overshadowed by BPD symptoms and suicidal ideation. Future research would benefit from employing multidimensional measures of impulsivity and longitudinal designs to clarify the specific and combined contributions of its facets to the onset and persistence of DSH.

Initially, demographic variables such as gender and age, together with interpersonal factors like family functioning, made a significant contribution to the explanatory model. Gender and age emerged as significant predictors, with DSH being more prevalent among girls than boys, supporting the findings of Guerreiro et al. (2017), who reported that girls were approximately three times more likely to engage in DSH. This disparity is often attributed to evidence that adolescent girls are more vulnerable to difficulties in emotional regulation and stress responses, factors strongly linked to higher rates of DSH (e.g., Crowell et al., 2009; Sturrock & Mellor, 2014). Age also appeared as a relevant factor, with prevalence increasing during adolescence, particularly between 13 and 15 years of age, as highlighted by previous research (Fuschini et al., 2024a; Gaspar et al., 2019; Guerreiro et al., 2017). However, these effects were ultimately overshadowed by the stronger influence of BPD symptoms and suicidal ideation, although demographic and interpersonal variables continue to provide important insights into the broader understanding of DSH.

The role of family functioning in this context warrants careful consideration. Initially, when added alongside demographic variables, family functioning made a meaningful contribution to the model. However, its significance as an independent predictor diminished once the more influential intrapersonal factors were included. This pattern suggests that family dynamics, although important, may exert a more indirect or mediated influence on DSH. The relevance of family processes remains evident, consistent with earlier research showing that adolescents from families characterised by low cohesion and flexibility are more likely to engage in DSH (Chen et al., 2023; Wang et al., 2022). Halstead et al. (2014) further argued that adolescents raised in rigid or emotionally disengaged family systems may have limited opportunities for emotional expression and support, leading them to adopt self-harming behaviours as a maladaptive coping strategy. It is also important to consider whether the characteristics of the present sample may have influenced these findings. As this was a school-based community sample rather than a clinical population, the overall level of family dysfunction may have been relatively low, potentially attenuating the strength of the associations observed. In addition, although socio-economic status was not formally assessed, the participating schools were in predominantly urban, middle-income areas. This relative homogeneity may have reduced variability in family-related adversity, thereby limiting the ability to detect stronger effects. Future research would benefit from including more socioeconomically and clinically diverse samples to clarify how contextual factors shape the relationship between family functioning and DSH in adolescence.

Overall, these findings emphasise the complex interplay between intrapersonal vulnerabilities and family dynamics in adolescent DSH, consistent with Linehan's (1993) biosocial theory and subsequent refinements (Sturrock & Mellor, 2014; Wang et al., 2017). Within this framework, suicidal ideation and BPD symptoms emerged as the most salient correlates of DSH, while demographic variables and family functioning, though less influential, remain important components of a multifactorial risk profile. This perspective underscores that self-harming behaviours cannot be understood through a single lens but rather result from the

interaction of individual vulnerabilities and environmental contexts. By highlighting the relative weight of different domains of risk, the present study contributes to a more integrated understanding of adolescent DSH, offering valuable directions for both clinical practice and future research.

These findings have important implications for both clinical practice and policy. For practitioners, the high prevalence of DSH among Portuguese adolescents underscores the need for systematic, school-based screening to identify at-risk adolescents, with particular attention to suicidal ideation and borderline personality features. Early detection in community settings, before contact with specialised services, can enable timely referral and intervention. Integrated treatment approaches that combine individual therapy with family-based interventions are especially recommended, as they address intrapersonal vulnerabilities while strengthening family support systems. At the policy level, the results highlight the urgency of implementing universal, school-based prevention programmes that promote mental health literacy, reduce stigma surrounding self-harm, and ensure equitable access to evidence-based care. Embedding systematic screening and multidimensional support within national mental health strategies could play a decisive role in reducing the incidence and impact of self-harm and suicide among adolescents.

Strengths, Limitations and Future directions

This study contributes meaningfully to the understanding of DSH in adolescence by highlighting the predominant role of intrapersonal factors—specifically BPD symptoms and suicidal ideation—in predicting self-harming behaviours. By utilising a substantial community-based sample, it expands DSH research beyond clinical populations, drawing attention to psychological vulnerabilities that might otherwise remain unidentified among adolescents. These findings carry important implications for early intervention, supporting the identification of high-risk adolescents who may not yet be in contact with mental health services. Furthermore, the study advances existing theoretical models by illustrating the interplay between intrapersonal, interpersonal, and sociodemographic variables in the occurrence of DSH, thereby emphasising the necessity of comprehensive prevention strategies that integrate individual therapeutic work with family-based approaches.

Nevertheless, it is important to note several limitations that should be considered. First, the cross-sectional design precludes causal inference and restricts conclusions about the temporal sequencing of risk factors and DSH. Longitudinal research is essential to clarify the directionality and stability of these associations over time, particularly to examine potential bidirectional dynamics such as the reciprocal relationship between DSH and suicidal ideation. Secondly, the exclusive reliance on self-report measures may have introduced social desirability bias and limited the accuracy with which complex constructs such as BPD symptoms and family functioning were assessed. Incorporating clinician-rated instruments or structured interviews in future research would enhance diagnostic validity and provide a more robust evaluation of psychopathological features.

Furthermore, the utilisation of global scores for impulsivity and family functioning, while contributing to model parsimony, may have obscured the distinct influence of specific subdimensions. It is possible, for instance, that only certain facets of impulsivity – such as motor impulsivity or lack of premeditation – are implicated in DSH, yet such nuances could not be detected using an aggregate score. Similarly, the treatment of family functioning as a unitary construct may have resulted in the oversight of relational processes such as emotional disengagement, rigidity, poor communication, or low cohesion, which may exert a more significant influence on self-harming behaviours. Consequently, future research should employ multidimensional assessments to capture the differential impact of these subcomponents and their interaction with intrapersonal vulnerabilities.

Moreover, the sample was drawn from schools in predominantly urban, middle-income areas. While this facilitated access to a relatively diverse adolescent population, it may have constrained the generalisability of the findings to more socioeconomically or clinically vulnerable groups. In order to achieve a more comprehensive understanding of the relationship between risk variables and DSH, it is essential to recruit participants from a wider range of socio-economic backgrounds, rural contexts, and clinical populations. This approach will allow for the exploration of how contextual and structural factors, including poverty, marginalisation, and limited access to care, may moderate the relationship between risk variables and DSH.

Another limitation concerns the absence of data on protective factors such as emotional regulation skills, mentalisation capacity, and perceived social support, which may buffer the impact of psychopathological risk and reduce the likelihood of self-harm. Including these variables in future studies would enable a more balanced understanding of vulnerability and resilience, informing the development of strength-based interventions. Finally, the study did not explore gender diversity or sexual orientation, despite growing evidence that LGBTQ+adolescents are at heightened risk of DSH. Adopting a more inclusive approach to gender and sexual identity in future research would provide deeper insight into the unique stressors, protective processes, and mental health needs of sexual and gender minority adolescents.

Conclusion

The aim of this study was to examine the contributions of demographic variables (gender and age), interpersonal variables (family functioning), and intrapersonal variables (BPD symptoms, suicidal ideation, and impulsivity) to the occurrence of DSH in a community sample of adolescents. Although gender, age, and family functioning initially demonstrated significant associations with DSH, their explanatory power diminished substantially once intrapersonal factors were incorporated. Among these, suicidal ideation emerged as the strongest correlate, followed by BPD symptoms. Despite the interdependence of intrapersonal and interpersonal domains, intrapersonal factors were more strongly associated with DSH within the variables examined.

Taken together, the findings emphasise the correlational nature of these associations, underscoring the particular relevance of intrapersonal distress—especially suicidal ideation and borderline features—while also recognising the role of the broader familial context in shaping risk profiles. While causal inferences cannot be drawn, the findings indicate that both intrapersonal and family-related factors are closely associated with DSH and should thus be considered when designing prevention and intervention strategies. This study provides valuable insights for clinical practice and future research aimed at developing multidimensional approaches to addressing self-harm in adolescents.

Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval All procedures performed involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its latter amendments or comparable ethical standards. This study was approved by the Ethics Committee of the ISPA - Instituto Universitário and was registered with the National Data Protection Commission (CNPD) and the School Survey Monitoring Office (MIME) of the General Directorate of Education of the Ministry of Education.

Informed consent Informed consent from all participants in this study was obtained.

Competing interests The authors have no competing interests to declare. The authors did not receive support from any organisation for the submitted work.

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