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Original article

## The aggressor at the mirror: Psychiatric correlates of deliberate self-harm in male prison inmates

N. Verdolini<sup>a,b</sup>, A. Murru<sup>a</sup>, L. Attademo<sup>b,c</sup>, R. Garinella<sup>b,d</sup>, I. Pacchiarotti<sup>a</sup>,  
C. del Mar Bonnin<sup>a</sup>, L. Samalin<sup>a,e,f</sup>, L. Pauselli<sup>b,g</sup>, M. Piselli<sup>h</sup>, A. Tamantini<sup>h</sup>,  
R. Quartesan<sup>b</sup>, A.F. Carvalho<sup>i</sup>, E. Vieta<sup>a,\*</sup>, A. Tortorella<sup>b</sup>

<sup>a</sup> Bipolar Disorders Unit, Institute of Neuroscience, IDIBAPS CIBERSAM, Hospital Clínic, c/Villarroel, 170, 12-0, 08036 Barcelona, Spain

<sup>b</sup> Division of Psychiatry, Clinical Psychology and Rehabilitation, Department of Medicine, University of Perugia, Santa Maria della Misericordia Hospital, Edificio Ellisse, 8 Piano, Sant'Andrea delle Fratte, 06132 Perugia, Italy

<sup>c</sup> Department of Mental Health, Division of Psychiatry 1, "Azienda Socio-Sanitaria Territoriale Papa Giovanni XXIII", Piazza OMS 1, 24127 Bergamo, Italy

<sup>d</sup> Centro di Selezione e Reclutamento Nazionale dell'Esercito, Italian Ministry of Defence, Viale Mezzetti, 2, 06034 Foligno, Perugia, Italy

<sup>e</sup> EA 7280, Department of Psychiatry, CHU Clermont-Ferrand, University of Auvergne, 58, rue Montalembert, 63000 Clermont-Ferrand, France

<sup>f</sup> Pôle de psychiatrie, Fondation FondaMental, hôpital Albert-Chenevier, 40, rue de Mesly, 94000 Créteil, France

<sup>g</sup> New York Psychiatric Institute Columbia University Medical Center, 1051 Riverside Dr, Unit 100, 10032 New York City, NY, USA

<sup>h</sup> Functional Area of Psychiatry, University of Perugia, AUSL Umbria 2, Servizio Psichiatrico Diagnosi e Cura Ospedale "S. Giovanni Battista", via Massimo Arcamone, 06034 Foligno, Perugia, Italy

<sup>i</sup> Department of Clinical Medicine, Translational Psychiatry Research Group, Faculty of Medicine, Federal University of Ceará, Av. da Universidade, 2853, 60020-180 Benfica, Fortaleza - CE, Brazil

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### ABSTRACT

**Background:** Deliberate self-harm (DSH) causes important concern in prison inmates as it worsens morbidity and increases the risk for suicide. The aim of the present study is to investigate the prevalence and correlates of DSH in a large sample of male prisoners.

**Methods:** A cross-sectional study evaluated male prisoners aged 18+ years. Current and lifetime psychiatric diagnoses were assessed with the Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders - DSM-IV Axis I and Axis II Disorders* and with the *Addiction Severity Index-Expanded Version*. DSH was assessed with the *Deliberate Self-Harm Inventory*. Multivariable logistic regression models were used to identify independent correlates of lifetime DSH.

**Results:** Ninety-three of 526 inmates (17.7%) reported at least 1 lifetime DSH behavior, and 58/93 (62.4%) of those reported a DSH act while in prison. After multivariable adjustment (sensitivity 41.9%, specificity 96.1%, area under the curve = 0.854, 95% confidence interval CI = 0.811–0.897,  $P < 0.001$ ), DSH was significantly associated with lifetime psychotic disorders (adjusted Odds Ratio aOR = 6.227, 95% CI = 2.183–17.762,  $P = 0.001$ ), borderline personality disorder (aOR = 6.004, 95% CI = 3.305–10.907,  $P < 0.001$ ), affective disorders (aOR = 2.856, 95% CI = 1.350–6.039,  $P = 0.006$ ) and misuse of multiple substances (aOR = 2.024, 95% CI = 1.111–3.687,  $P = 0.021$ ).

**Conclusions:** Borderline personality disorder and misuse of multiple substances are established risk factors of DSH, but psychotic and affective disorders were also associated with DSH in male prison inmates. This points to possible DSH-related clinical sub-groups, that bear specific treatment needs.

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**Abbreviations:** aOR, adjusted Odds Ratio; ASI-X, Addiction Severity Index-Expanded Version; AUC, area under the curve; CI, confidence interval; DSH, deliberate self-harm; DSHI, Deliberate Self-Harm Inventory; DSM, Diagnostic and Statistical Manual of Mental Disorders; OR, Odds Ratio; PD, personality disorders; ROC, receiver operating characteristic; SCID-I, Structured Clinical Interview for DSM-IV Axis I Disorders; SCID-II, Structured Clinical Interview for DSM-IV Axis II Disorders; SD, standard deviation.

\* Corresponding author. Fax: +34 932279228.  
E-mail address: [vieta@clinic.cat](mailto:vieta@clinic.cat) (E. Vieta).

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### 1. Introduction

Acts of self-harm encompass a wide range of behaviors, which differ in severity, from minor cuts to violent suicide attempts [1]. Some experts suggest that both deliberate self-harm (DSH) and suicide attempts could be conceptualized on a continuum of lethality, while a dichotomous differentiation between those two sets of behavior may be arbitrary and of limited clinical utility

[2,3]. Despite these controversies, DSH and suicide attempts could be identified as distinct psychopathological phenomena, with meaningful differences related to lethality, aims of the act, the presence of suicidal intent, among other clinical characteristics [1,4].

DSH can be conceptualized as the deliberate, voluntary and not accidental, direct destruction or alteration of body tissue without conscious suicidal intent [5]. In prison populations, DSH was not studied as much as suicidality [6]. Yet, it may represent a relevant source of morbidity and, when present, may moderate the risk of suicide [7,8], especially when underlying mental disorders are present [9]. The prevalence of lifetime DSH in adult offenders ranges between 15 [10] and 35% [11] in male prisoners. Rates are smaller for those who self-harm while in custody, ranging between 5 [7] and 15% [10], whilst they significantly increase among inmates with mental disorders (up to 53% [12] for lifetime DSH and 61% [13] for DSH while in custody).

Relatively few studies evaluated possible clinical correlates of DSH in incarcerated samples [12,14–16]. Most of them were epidemiological studies [7,17], whilst others bore methodological limitations, such as a non-standardized assessment of personality disorders (PD) [18,19]. Finally, very few studies investigated specific factors independently associated with DSH in prison inmates [7,11,19,20].

The objectives of the present study are:

- to estimate the prevalence of DSH in a large sample of male prisoners;
- to explore whether DSH and suicide attempts lie on a same continuum, or otherwise might be more accurately characterized as separated psychopathological entities;
- to investigate socio-demographic, clinical, and treatment-related variables independently associated with DSH in this sample.

## 2. Methods

### 2.1. Participants

The sample was collected from October the 1st, 2010 to September the 30th, 2011 at the Spoleto Prison (Umbria, Italy). In this prison, 4 groups of criminals serve their time:

- common criminals;
- organized crime prisoners, except for leading bosses;
- protected inmates (e.g., serving for pedophilia, rape, or cooperating witnesses);
- leading bosses in organized criminality.

This study was approved by the local Ethics Review Board, by the Regional Penitentiary Committee and by the Italian Psychiatric Association. All participants provided written informed consent.

### 2.2. Inclusion/exclusion criteria

Male inmates, aged 18+ years, serving for crime groups 1, 2, 3 as detailed in the “Participants” section were eligible for this cross-sectional survey.

Inmates serving for crime type 4 or inmates awaiting trial were excluded from the study, as well as those with mental retardation, severe cognitive impairment or unwilling to provide written informed consent.

### 2.3. Study procedures

Eligible inmates underwent a comprehensive psychiatric evaluation performed by medical doctors (LA and RG) with at

least 3 years of training in psychiatry. The interviewers were specifically trained to discriminate between suicide attempts and DSH.

### 2.4. Measures

Participants were interviewed and the following measures were collected:

- the *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)* [21,22], which was shown to provide an accurate assessment of Axis I disorders in correctional settings [23];
- the *Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II)* [24,25], whose reliability has been tested [26], has been widely used in correctional settings for the assessment of Axis II PD [27,28];
- the *Addiction Severity Index-Expanded Version (ASI-X)* [29] is a semi-structured interview validated for use in Italian samples [30] that evaluate the use of alcohol and other substances as well as their impact on functioning in several areas (medical, employment, support, legal, family/social, psychiatric). The reliability of the ASI-X has been previously demonstrated [31,32] and it was validated in prison populations [33,34].

In the psychiatric status area, misuse of substances was reported.

The interviewers also assessed both reported suicide attempts, lifetime and in the last month, and severe suicidal thoughts according to the specific ASI-X items [35]. Suicide attempts were defined as acts of self-harm with intent to die that were not self-mutilatory in nature [36].

In the legal status area, specific information about charges was collected.

In the family/social relationships area, questions about past 30 days and lifetime emotional, physical, sexual abuse and sexual harassment, as well as family history of legal/substances/psychiatric disorders were presented.

#### 2.4.1. The Deliberate Self-Harm Inventory (DSHI) [37]

The DSHI is a 17-item, behaviorally based, self-report questionnaire that assesses frequency, severity, duration, and type of different self-harm behaviors. Interviewers recorded for each self-harm behavior information regarding the age of onset of a DSH behavior, the last time (in months) presenting that behavior, the total duration (in years) of that behavior, and whether a DSH-derived hospitalization or medical care had been required. Psychometric and language-specific characteristics of DSHI are presented elsewhere [37–39]. DSHI was previously used to assess DSH in male inmates [39].

Socio-demographic and clinical variables (drug and alcohol, medical and psychiatric status, prescribed treatments and use of services) were also collected through the specific ASI-X form.

Inmates’ records at the Spoleto Prison were also reviewed to collect further information.

### 2.5. Statistical analysis

The dichotomous DSH variable was derived when inmates affirmatively answered to any of the first 16 items on the DSHI, or when the answer to the item 17 (“Have you ever intentionally done anything else to hurt yourself that was not asked about in this questionnaire? If yes, what did you do to hurt yourself?”) described a behavior consistent with the conceptual definition of DSH [37]. Normality of distribution for continuous variables was evaluated with the Kolmogorov-Smirnov test, visually and with the skewness and kurtosis values. Bivariate analyses were

performed with Chi-square tests, independent-samples *t*-test, or Mann-Whitney U test (according to type of distribution of the variable). Partial correlations were used to assess the relationship between the number of suicide attempts and the number of lifetime episodes of DSH, after adjustment for age. A multivariable hierarchical logistic regression analysis was performed to investigate whether psychiatric diagnoses and other clinical features were independently associated with DSH, after adjusting for age. Predictor variables were chosen basing on:

- past research (i.e. physical abuse and substance abuse [19]);
- significant results from bivariate analyses coherent with previous research (i.e. borderline [20], antisocial PD [40] and psychiatric family history [11]);
- without a well-defined knowledge (i.e. affective [1,4], psychotic [41] and anxiety [40] disorders).

Variables already known as being less strongly associated with DSH and with doubtful clinical importance (i.e. schizotypal PD [40] were not included due to the statistical limits imposed by the logistic regression model). Age was entered at Step 1 in order to control for its influence on DSH. Afterwards, other predictors were entered at Step 2. All tolerance values in the hierarchical regression analyses were > 0.2 and all variance inflation factors were < 2, thereby indicating that multicollinearity was not a source of bias in the regression models [42]. The accuracy of the model in detecting DSH in inmates was explored in receiver operating characteristic (ROC) analysis.

According to a two-tailed, alpha value of 0.05, the statistical power of the study population (0.94 for DSH) was sufficient to detect small effect sizes of about Cohen's *d* = 0.24, when comparing the groups for continuous variables.

Statistical analyses were performed using the Statistical Package for Social Sciences (Statistical Package for Social Science-SPSS, 23.0 version for Windows Inc., Chicago, IL, USA).

### 3. Results

#### 3.1. Sample characteristics

During the 12-month study period, 670 male inmates were detained in the Spoleto Prison and considered for inclusion. Among

those, 102 (15.2%) inmates were not eligible due to the following exclusion criteria: 20 (3%) were awaiting trial, and 82 (12.3%) were serving for type 4 crimes. Of the 568 eligible participants, 42 (7.4%) refused to take part in the study.

The final sample of included inmates was composed of 526 individuals (92.6% of potentially eligible participants) [43].

#### 3.2. Lifetime deliberate self-harm

Among inmates, 93/526 (17.7%) reported at least 1 lifetime DSH behavior, with a median of 2 (range 1–57) lifetime DSH episodes. In addition, 43 out of 93 inmates (46.2%) reported engaging in more than one type of DSH behavior in their life (see Supplementary Table 1 for additional information on the type of DSH).

Fifty-eight individuals (62.4% of the DSH sub-sample, 11% of the total sample) reported a last DSH act while in prison.

Socio-demographic differences between inmates who did versus those who did not self-harm are reported in Table 1.

The prevalence of suicide attempts in the total sample was 10.6% (56/526) and in the DSH subsample it was significantly higher than in those without lifetime DSH (44.1% versus 3.5%, *P* < 0.001). Inmates with a lifetime history of DSH reported significantly more lifetime suicide attempts (Median = 0, 0–10, versus Median = 0, 0–4, *P* < 0.001) and significantly more frequently serious thoughts of suicide compared to prisoners who did not exhibit DSH (57% versus 12.7%, *P* < 0.001). A significant positive correlation between the number of suicide attempts and the number of DSH episodes (*r* = 0.3, *P* = 0.004), after adjusting for age, was observed.

As for psychiatric diagnoses, all Axis I current diagnoses were significantly more represented in the DSH group, with the exception of adjustment disorders (Table 2). Regarding DSM-IV Axis II disorders, significantly more participants with a lifetime history of DSH had borderline PD (*P* < 0.001), antisocial PD (*P* = 0.024), and schizotypal PD (*P* < 0.001) compared to those who did not self-harm.

In addition, inmates with a history of DSH more frequently received both outpatient (*P* < 0.001) and inpatient (*P* < 0.001) psychiatric treatment compared to those prisoners without a lifetime history of DSH.

Inmates with a lifetime history of DSH also reported more frequent misuse of multiple substances (*P* < 0.001) particularly a

**Table 1**  
Socio-demographic characteristics of DSH inmates.

Lifetime variables (yes listed)	No DSH ( <i>n</i> = 433)	DSH ( <i>n</i> = 93)	$\chi^2$	<i>P</i>
Area of the prison	<i>n</i> , %	<i>n</i> , %		
Common criminals	167 (38.6)	37 (39.8)	0.01	0.919
High-surveillance	190 (43.9)	39 (41.9)	0.052	0.82
Protected	76 (17.6)	17 (18.3)	< 0.001	0.986
Nationality				
Italian	289 (66.7)	56 (60.2)	1.171	0.279
EU <sup>a</sup>	82 (18.9)	10 (10.8)	3.009	0.083
Non EU	66 (15.2)	27 (29)	9.077	0.003
Marital status				
Married	178 (41.1)	44 (47.3)	0.967	0.325
Single	179 (41.3)	41 (44.1)	0.138	0.71
Separated/divorced/widowed	76 (17.6)	8 (8.6)	3.927	0.048
	Mean (SD)	Mean (SD)	<i>t</i> / <i>U</i>	<i>P</i>
Lifetime variables	Median (range)	Median (range)		
Age (years)	41.16 (11.82)	38.49 (10.23)	2.016	0.044
Education (years)	8 (0–17)	8 (0–15)	17595.5 (U)	0.044
Longest period of regular employment (months)	60 (0–540)	26 (0–240)	13080 (U)	< 0.001
Longest period of unemployment (months)	56 (0–444)	37 (0–420)	14928 (U)	0.279

DSH: deliberate self-harm; EU: European Union; *n*: number; SD: standard deviation.

<sup>a</sup> Italians excluded.

**Table 2**  
Clinical variables associated with deliberate self-harm.

Variables (yes listed)	No DSH (n=433)	DSH (n=93)	$\chi^2$	P
Axis I psychiatric disorders	n, %	n, %		
Affective disorders	27 (6.2)	26 (28.0)	37.504	< 0.001
Bipolar disorders	5 (1.2)	6 (6.5)	10.491	0.006
Depressive disorders	18 (4.2)	15 (16.1)	16.68	< 0.001
Affective disorder NOS	4 (0.9)	5 (5.4)	9.025	0.011
Psychotic disorders	8 (1.8)	17 (18.3)	45.662	< 0.001
Alcohol and drug related disorders	90 (20.8)	39 (41.9)	17.377	< 0.001
Anxiety disorders	101 (23.3)	32 (34.4)	4.408	0.035
Adjustment disorders	40 (9.2)	5 (5.4)	1.007	0.316
Impulse control disorders	2 (0.5)	5 (5.4)	14.081	0.002
Axis II personality disorders				
Borderline PD	58 (13.4)	61 (65.6)	116.188	< 0.001
Antisocial PD	63 (14.5)	23 (24.7)	5.082	0.024
Histrionic PD	24 (5.5)	1 (1.1)	3.375	0.101
Narcissistic PD	26 (6.0)	3 (3.2)	0.664	0.415
Paranoid PD	29 (6.7)	6 (6.5)	< 0.001	1
Schizoid PD	28 (6.5)	3 (3.2)	0.924	0.331
Schizotypal PD	2 (0.5)	9 (9.7)	31.754	< 0.001
Obsessive-compulsive PD	13 (3.0)	1 (1.1)	1.097	0.482
Avoidant PD	15 (3.5)	2 (2.2)	0.422	0.749
Dependent PD	2 (0.5)	0 (0.0)	0.431	1
Depressive PD	8 (1.8)	4 (4.3)	2.067	0.24
Passive-aggressive PD	20 (4.6)	2 (2.2)	1.164	0.397
Lifetime treatments	Median (range)	Median (range)	U	P
Previous psychiatric inpatient <sup>a</sup>	0 (0–10)	0 (0–12)	14549 (U)	< 0.001
Previous psychiatric outpatient <sup>a</sup>	0 (0–90)	1 (0–30)	11831 (U)	< 0.001

DSH: deliberate self-harm; n: number; PD: personality disorders; SD: standard deviation.

<sup>a</sup> Assessed by means of the Addiction Severity Index-Expanded Version (ASI-X).

longer-lasting lifetime use of cocaine ( $P = 0.008$ ) and cannabis ( $P = 0.012$ ), also presenting a significantly younger age at onset of cocaine ( $P = 0.031$ ) and cannabis ( $P = 0.024$ ) use (Table 3).

Regarding legal status, DSH inmates reported significantly more lifetime charges (Median = 4, 0–81 versus Median = 2, 0–27,  $P < 0.001$ ), with more charges resulting in conviction (Median = 3, 0–81 versus Median = 2, 0–23,  $P < 0.001$ ), such as crimes against property (Median = 1, 0–25 versus Median = 0, 0–15,  $P < 0.001$ ), crimes of violence (Median = 1, 0–80 versus Median = 1, 0–23,  $P = 0.005$ ) and crimes with disorderly conduct, vagrancy and public intoxication (Median = 0, 0–11 versus Median = 0, 0–10,  $P = 0.001$ ) than those without a lifetime history of DSH. Furthermore, inmates with lifetime DSH reported a longer duration of lifetime incarcerations in months, compared to their counterparts who did not self-harm (Median = 79, 0–99 versus Median = 55, 0–99,  $P = 0.040$ ).

Inmates with lifetime DSH more frequently reported a history of physical abuse ( $P = 0.047$ ) and more than one type of abuse ( $P = 0.050$ ). Furthermore, they reported more familiar difficulties such as maternal and paternal substances use issues ( $P = 0.001$ ) and psychiatric problems ( $P < 0.001$ ).

### 3.3. Multivariable analysis

Hierarchical multiple regression was used to assess possible predictors of DSH, after controlling for the influence of age. At Step 1, age was significantly related to DSH ( $\chi^2(1) = 4.165$ ,  $P = 0.041$ ), and explained between 0.8% (Cox and Snell R square) and 1.3% (Nagelkerke R squared) of the variance in lifetime DSH, and had a small protective influence on DSH (odds ratio OR = 0.979,  $P = 0.045$ ) (Table 4). After entry of the independent variables (affective, anxiety and psychotic Axis I diagnoses, Axis II borderline and antisocial PD, positive history of physical abuse, parental psychiatric problems and misuse of multiple substances) at Step 2, the predictive power of the model significantly improved

( $\chi^2(8) = 134.088$ ,  $P < 0.001$ ) and the total variance explained by the model as a whole ranged between 23.1% (Cox and Snell R square) to 38.1% (Nagelkerke R squared). DSH was independently associated with current psychotic disorders (aOR = 6.227,  $P = 0.001$ ) and borderline PD (aOR = 6.004,  $P < 0.001$ ). Other important predictors were affective disorders (aOR = 2.856,  $P = 0.006$ ) and misuse of multiple substances (aOR = 2.024,  $P = 0.021$ ). The overall sensitivity of the model was 41.9% whilst its specificity was 96.1%. The positive predictive value was 69.6% and the negative predictive value was 88.5%.

The ROC analysis supported the utility of the model and its variables because it performed significantly better than chance in predicting DSH in inmates with an area under the curve (AUC) = 0.854 (standard error [SE] = 0.022, 95% CI = 0.811–0.897,  $P < 0.001$ ) (Fig. 1).

## 4. Discussion

A history of DSH was not uncommon in the correctional setting, with a prevalence as high as 17.7%, consistent with previous studies in which lifetime DSH in adult offenders ranged between 15 [10] to 35% [11] in male prisoners.

In the current study, DSH was associated in the multivariable model to affective and psychotic but not anxiety disorders. Furthermore, it was independently associated with borderline but not antisocial PD. Finally, the misuse of multiple substances was significantly related to DSH but no association was found between DSH and both lifetime physical abuse and psychiatric problems in the parents.

### 4.1. Axis I disorders

The presence of a current psychotic disorder was the strongest independent predictor of DSH in this study. This finding has been conflicting and unclear across studies. Hence, the role of psychotic



**Table 3**  
Drugs/alcohol use and related features<sup>a</sup>.

Lifetime variables (yes listed)	No DSH (n = 433) n, %	DSH (n = 93) n, %	$\chi^2$	P
Alcohol over threshold	65 (15.0)	40 (43.0)	35.832	< 0.001
Heroin	43 (9.9)	37 (39.8)	50.621	< 0.001
Methadone	29 (6.7)	27 (29.0)	37.832	< 0.001
Cocaine	147 (33.9)	62 (66.7)	32.87	< 0.001
Amphetamines	7 (1.6)	12 (12.9)	28.011	< 0.001
Cannabis	92 (21.2)	46 (49.5)	30.052	< 0.001
Hallucinogens	13 (3.0)	8 (8.6)	6.263	0.02
Other (opiates, analgesics, psychodrugs)	3 (0.7)	10 (10.8)	32.142	< 0.001
Misuse of multiple substances	95 (21.9)	52 (55.9)	42.212	< 0.001

Lifetime variables (n listed)	Mean (SD) Median (range)	Mean (SD) Median (range)	t/U	P
Alcohol				
Age at first use	19 (7–48)	18 (9–38)	1049,500 (U)	0,175
Lifetime years	6 (0–31)	7.5 (0–28)	1201,500 (U)	0,175
Heroin				
Age at first use	19 (7–40)	17.5 (9–35)	644,500 (U)	0,201
Lifetime years	5.9 (5.99)	6.32 (6.22)	–0.322	0,748
Methadone				
Age at first use	25 (16–47)	25 (6–48)	292,500 (U)	0,297
Lifetime years	1 (0–22)	1 (0–27)	320 (U)	0,313
Cocaine				
Age at first use	20 (12–45)	18.5 (12–40)	3492 (U)	0,031
Lifetime years	3 (0–30)	7 (0–23)	3424 (U)	0,008
Amphetamines				
Age at first use	17.3 (2.43)	16.67 (3.17)	0.444	0,663
Lifetime years	4 (0–7)	2 (0–12)	39.5 (U)	0,83
Cannabis				
Age at first use	17 (11–39)	15 (9–31)	1,544 (U)	0,024
Lifetime years	5 (0–26)	9.50 (0–20)	1546.5 (U)	0,012
Hallucinogens				
Age at first use	17 (14–33)	16.50 (13–24)	40 (U)	0,74
Lifetime years	0 (0–10)	1 (0–10)	35 (U)	0,28

DSH: deliberate self-harm; n: number; SD: standard deviation.

<sup>a</sup> Assessed by means of the Addiction Severity Index-Expanded Version (ASI-X).

disorders as an independent predictor of either DSH or suicide attempts remain unclear [4]. In previous studies, psychotic disorders emerged as a strong independent predictor of DSH, after recurrent depression, and was specifically associated with near-lethal DSH in male prisoners, with a notable 15-fold increased risk [44]. DSH related to psychotic disorders was often associated with high lethality [45] due to bizarre types of injuries [46], but also with a lower rate of suicide attempts due to the absence of a clear suicidal intent [41]. Notably, the presence of psychotic symptoms was an exclusion criteria in some studies performed in the prison setting [47,48].

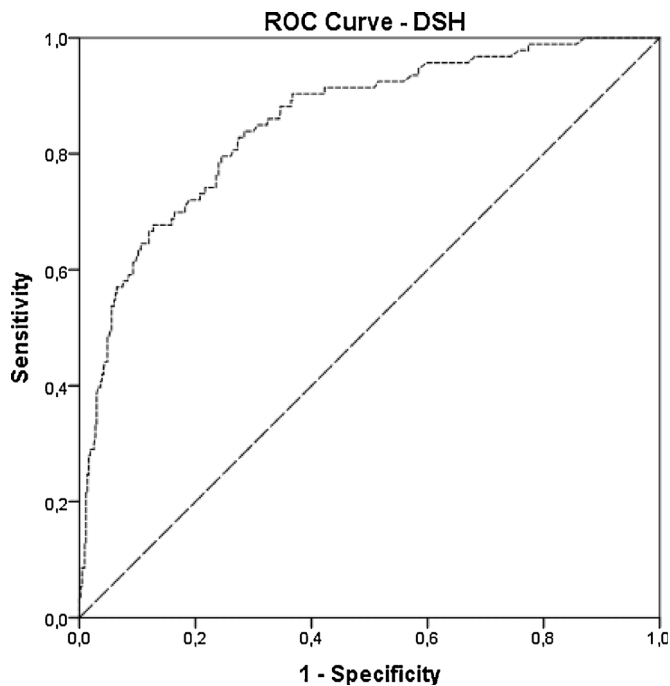
Affective disorders were also independently associated to DSH in our multivariable model. DSH was previously found to be associated with self-reported depressive symptoms [40], but not to a specific diagnosis of major depression, possibly because depressive symptoms were evaluated with self-reported rating questionnaires but not with an established assessment of affective disorders through validated structured diagnostic interviews. Some previous studies did not find a clear association of DSH and major depressive disorder [49]. However, depression was frequently correlated with suicide attempts among inmates [9,44,47,50], and severity of depression was

**Table 4****7** Hierarchical multivariable logistic regression model of socio-demographic and clinical variables associated with DSH in male prison inmates.

Variable	B	Wald	P	OR	95% CI
Step 1					
Age	–0.021	4.014	0.045	0.979	0.960–1.000
Step 2 <sup>a</sup>					
Age	–0.013	0.838	0.36	0.988	0.961–1.014
Psychotic disorders	1.829	11.696	<b>0.001</b>	6.227	2.183–17.762
Affective disorders	1.049	7.538	<b>0.006</b>	2.856	1.350–6.039
Anxiety disorders	0.432	2.048	0.152	1.54	0.853–2.781
Borderline PD	1.792	34.629	< <b>0.001</b>	6.004	3.305–10.907
Antisocial PD	–0.246	0.47	0.493	0.782	0.387–1.580
Misuse of multiple substances <sup>b</sup>	0.705	5.305	<b>0.021</b>	2.024	1.111–3.687
Lifetime physical abuse	0.319	0.552	0.458	1.375	0.593–3.188
Psychiatric FH <sup>b</sup>	0.751	2.773	0.096	2.118	0.876–5.126

CI: confidence interval; DSH: deliberate self-harm; FH: Family history; OR: odds ratio; PD: personality disorder. Step 1: Chi-square = 4.165, df = 1, P = 0.041; Step 2: Chi-square = 134.088, df = 8, P &lt; 0.001.

<sup>a</sup> Adjusted for age.<sup>b</sup> Assessed by means of the Addiction Severity Index-Expanded Version (ASI-X).



**Fig. 1.** Deliberate self-harm in male inmates: ROC curve. Receiver operating characteristic (ROC) curve and area under the curve (AUC) for detecting deliberate self-harm (DSH) in male inmates.

positively associated with the lethality and intent to die of suicide attempts [4,51].

In community psychiatric patients [52], anxiety disorders emerged as a predictor of DSH. Hence, anxiety symptoms were usually reported by psychiatric patients with a history of DSH [52,53]. Nevertheless, in correctional settings this association could be limited to younger prison inmates [40].

Considering that psychotic and affective disorders were associated with near-lethal suicide attempts in previous studies [45] and were strong predictors of DSH in our study, greater attention should be paid to an early detection of these Axis I disorders, in order to intercept with a successful treatment plan a possible suffering patient before DSH or suicidal behaviors.

#### 4.2. Misuse of multiple substances

Misuse of multiple substances was strongly associated to the DSH in the present study, and this finding is supported by an ever-increasing body of literature. Hence, substance use was postulated as a form of DSH [54]. DSH and substance use disorders were independently associated in male inmates [19,20,55] and also among adolescents serving a sentence in juvenile correctional facilities [40,56]. The association between DSH and misuse of multiple substances seemed more evident in prison populations than in psychiatric outpatient/inpatient samples, where those associations seemed inconsistent across studies [57-60].

The misuse of multiple substances could also be influenced by age. Both DSH and the misuse of multiple substances are strongly associated with younger age [61], and in the present study, an older age had a small protective effect on DSH. A possibility is that this triad may underpin a psychopathological role for impulsivity, which is more elevated in younger age groups, and it is also associated to substance use disorders and DSH in inmate prisoners [36].

#### 4.3. Personality disorders

By definition, borderline PD is strongly related to DSH, as it constitutes a diagnostic criterion for the disorder [62]. So, not

surprisingly, it was strongly related with DSH, as previously reported in prison settings [20,40] and also in general population [63] and psychiatric samples [64].

Available evidence on the independent association of antisocial PD and DSH is less consistent thus far. Despite antisocial PD was previously found to be a predictor in both male [40] and mixed [65] samples of offenders, antisocial PD was not independently associated with DSH in our study. A possible explanation is that, as the association between antisocial PD and DSH could generally be better explained in the context of manipulative behaviors rather than a form of environmental coping to handle unbearable emotions [66], it is possible that antisocial inmates in our sample could not properly recall DSH episodes during the assessment [6].

In addition, it should be underlined that in our sample of inmates the prevalence of antisocial PD seemed rather low for a prison population. This could be the consequence of the assessment with diagnostic interviews conducted by clinically trained interviewers and resulting in a significant reduction of the well-known risk of overestimation of PDs in prisoners [6].

#### 4.4. Traumatic experiences and psychiatric family history

Several possible mechanisms, including familiar factors, could influence the associations of Axis II PD and DSH [67]. Traumatic experiences yield an important role in influencing DSH. Previous studies on prison inmates found an association between childhood physical, emotional and sexual abuse and DSH [19,68], but also with other lifetime traumatic experiences such as spousal abuse [69] and witnessing traumas [65]. In our study, lifetime physical abuse was not related to DSH, but it is possible that this effect could be mediated by full-blown psychopathology [11].

Similarly, the presence of parental psychiatric problems did not seem to increase the risk, even though significant differences were identified in the bivariate analyses, as occurred in other studies [11]. The association between parental psychiatric problems and DSH could also be indirectly driven by psychopathology rather than being straightly direct.

#### 4.5. Strengths and limitations

The present study has some limitations that deserve discussion. First and foremost, in this cross-sectional study DSH was assessed through self-report, thus precluding causal inferences. Second, data were drawn from a unique penitentiary institute, and therefore data are not necessarily generalizable to other prisons across different cultures. Furthermore, results were obtained from a purely male sample. Third, the instruments herein used for the evaluation of DSH (e.g. the DSHI) and suicide attempts (specific ASI-X items), are respectively a self-report questionnaire and a semi-structured interview, so data is subject to potential self-report bias. Finally, the diagnostic assessment of antisocial PD in correctional settings is fraught with inherent limitations. Several aspects of this diagnosis overlap with factors associated with criminality [6]. The main strength of this work rests on the inclusion of a relatively large sample, and the use of validated measures, which allowed the proper controlling of potential confounders.

#### 4.6. Preventive strategies and management of deliberate self-harm in inmates

Findings from the present study are not in favor of a linear continuum ranging from DSH to suicide attempts, as they do not show a strong correlation between DSH and suicide attempts. For this reason, it seems unlikely that the two behaviors depict a unique self-aggressive dimension. A consequence would be that

these behaviors are associated to similar, yet different populations [6,70], and further studies are required in this direction. Nevertheless, it is of paramount importance to detect DSH and suicidal behaviors in inmates, as it was associated both in our study as in previous literature [71] to higher suicide attempts rate.

As DSH should be considered not as an illness but as a behavior, its management should be largely dependent on the underlying problems [52] such as PD and substances disorders, but according to our data also on psychotic and affective disorders.

The negative impact of DSH on the course of illness and quality of life of patients suffering from it brought to the development of clinical guidelines for the management of DSH in clinical practice [72-74]. Psychological or psychosocial therapies are effective in reducing repetition of DSH, but there is a lack of evidence in determining the effectiveness of specific types of treatment in correctional settings [72-74]. Evidence is also limited for specific pharmacological treatments, unless comorbid psychiatric disorders are present in inmates [72].

Ideally, psychopharmacological treatment and psychological interventions should be provided in correctional settings, and considered in an integrated case-management model.

Prevention and treatment of DSH in inmates can be a strategic therapeutic target. Our results contribute to this objective by suggesting modifiable, treatable clinical correlates to DSH. An improved early detection of DSH could enhance the level of care, allowing for a better and quicker identification and treatment of this behavior, particularly in the presence of psychiatric disorders, and reducing possible complications.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.eurpsy.2017.04.002>.

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Dr Verdolini, Dr Attademo, Dr Garinella, Dr del Mar Bonnin, Dr Pauselli, Dr Piselli, Dr Tamantini, Prof Quartesan, Dr Carvalho and Prof Tortorella declare that they have no competing interest.

Dr Murru has served as a consultant, adviser, or speaker for Adamed, AstraZeneca, Bristol-Myers Squibb, Janssen-Cilag, Lundbeck, Otsuka, and Sanofi-Aventis but declares that he has no competing interest.

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