ARTICLE

Prevalence and Psychological Correlates of Occasional and Repetitive Deliberate Self-harm in Adolescents

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Objective: To determine the prevalence and the associated psychological and social factors of occasional and repetitive deliberate self-harming behavior in adolescents.

Design: Cross-sectional self-report survey.

Setting: One hundred twenty-one schools in Germany.

Participants: A representative sample of 5759 ninth-grade students was studied between 2004 and 2005.

Outcome Measures: Deliberate self-harm (DSH) and suicidal behaviors, emotional and behavioral problems (Youth Self-Report), living standard, family composition, parental conflict and illness, school type and performance, relationship to peers, bullying, body satisfaction and dieting, media consumption, smoking, and alcohol and drug use.

Results: Occasional forms of DSH within the previous year were reported by 10.9% of the ninth-grade students. Four percent of the students reported repetitive forms of DSH. Suicidal behavior was strongly associated with repetitive DSH, an association that held for both subtypes of DSH. The findings also indicated that social background factors were important concomitants of occasional DSH but were not related to an increased likelihood of repetitive DSH. Symptoms of depression/anxiety and delinquent/aggressive behavior were associated with self-harming behavior in both adolescent girls and boys.

Conclusions: The data suggest that there is a link between social factors and occasional DSH and, especially in repetitive DSH, that there is a strong association between DSH and suicidal behavior as well as DSH and emotional and behavioral problems. These findings indicate a different pathway in the development of DSH in adolescents. The results support a need to investigate the possible neurobiological underpinnings of DSH within a longitudinal model to enhance the knowledge of this poorly understood behavior.

Arch Pediatr Adolesc Med. 2007;161(7):641-649

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RECENT EPIDEMIOLOGICAL studies have demonstrated high rates of deliberate self-harm (DSH) in adolescents.[1,2] Deliberate self-harm is defined as the intentional injuring of one's body without apparent suicidal intent.[3] Repetition of DSH is also frequent in adolescents and includes a wide range of behaviors (eg, cutting and burning). Approximately 6% to 7% of school students reported having self-harmed in the previous year.[1,2] Although DSH is serious and may precede suicide,[4,5] few patients who deliberately self-harm are referred to professional institutions.[1] Common indicators that have been found to be associated with repeated self-harm in adolescents include personality disturbances, depression, alcohol and drug use, troubled relationships with peers and/or family members, poor school performance, and chronic psychosocial and behavioral problems.[1]

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There is growing evidence that DSH has become more prevalent in adolescents during the past decade and a half.[6] A high association between self-harming behavior and a diagnosis of borderline personality disorder has been shown in adult[7] as well as adolescent[8] patients. Likewise, the proportion of young self-harming inpatients with depressive, bipolar, or substance abuse disorders has increased during the past several years.[9]

High rates of DSH have been reported from 2 large school surveys using anonymous self-report questionnaires.[1,2] At least 1 episode of DSH during the previous 12 months was reported by 6% to 7% of the

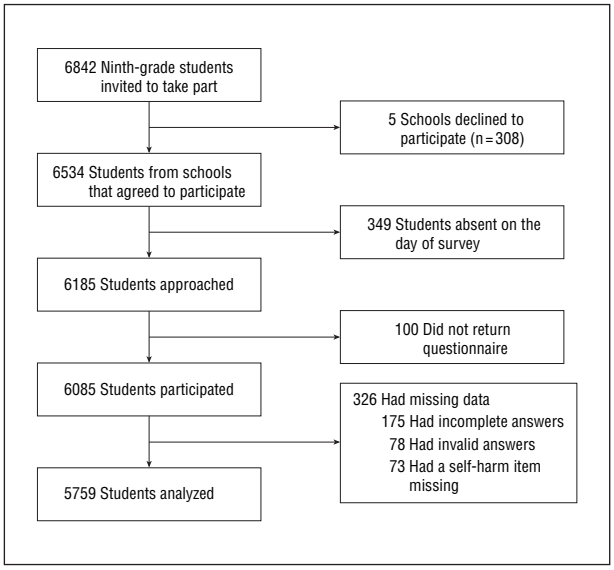

Figure. Flowchart of investigated subjects.

surveyed 15-year-old students. Approximately two-thirds of adolescents who recounted episodes of self-harm were engaged in self-injurious behavior (ie, cutting), whereas the other third reported poisoning mainly due to overdosing on medication.[1,2] Adolescent girls had significantly higher rates (3-7 times) of episodes of self-harm than adolescent boys. Both studies documented an association between a history of DSH and a broad range of psychiatric symptoms, such as low self-esteem, drug abuse, and, especially in adolescent girls, depression, anxiety, and impulsivity.

In this study, we focused on self-injurious behaviors without suicidal intent (ie, cutting and burning). Empirical data from previous clinical[10] as well as nonclinical[11] studies have revealed the following motives of adolescents who engage in DSH: to get relief from distress, to escape from a situation, and to show how desperate they are feeling.[12] Single or occasionally performed self-mutilating acts may be interpreted as time-limited testing or imitation behavior[1] during the period of adolescence, whereas repetitiously performed acts serve primarily as methods of affect regulation in the context of further psychiatric diagnoses. It may be assumed that a single episode of DSH can have a qualitatively different meaning than repeated episodes of DSH. The primary purpose of our study was to determine the prevalence of 2 different types of DSH in adolescents: occasional and repetitive. Second, we aimed to investigate the relationship between DSH and a wide range of internalizing (ie, withdrawal, somatic complaints, and anxiety/depression), externalizing (ie, delinquency and aggression), and suicidal (ie, suicidal ideation, suicide intention, and suicide attempts) behaviors as well as social background factors and risk-taking behaviors.

METHODS

SAMPLE AND PROCEDURES

The Heidelberg School Study was used to determine the prevalence and psychological concomitants of self-destructive behavior and other forms of risk behavior in adolescents. Enrollment in this study took place in cooperation with the Heidelberg Public Health Service between October 2004 and January 2005. The primary sampling pool included all schools that had a ninth grade in the Rhein-Neckar district. This area is typical for geographically mixed populations in Germany and is representative of the distribution of types of schools and parental socioeconomic statuses.[13] The German school system consists of 4 school types characterized by the academic ability of the students and different types of graduation: Gymnasium, 8 years of school after 4 years of elementary school, terminating with the general qualification for university entrance; Realschule, 6 years of school after 4 years of elementary school, terminating with a secondary-school level-I certificate; Hauptschule, 9 years of elementary school; and Förderschule, a school for special educational needs (for children who have lower intellectual abilities but are literate, in general). Overall, 116 of 121 schools agreed to participate. Five schools declined to participate without giving a reason. All students in ninth-grade classes were invited to take part in the study (N = 6842). The analyzed data represent 95.8% of the approached students and 85.2% of the entire population ninth-grade students in this school district. The **Figure** shows the number of eligible and actual participants in this study and reasons for noninclusion.

Informed consent for participation was obtained from the contacted adolescents. Their parents or guardians were notified about the study by letter about 4 weeks before the study's commencement. The adolescents' anonymity and voluntary status were ensured before they agreed to participate in the study. Data collectors, who had been trained in test administration by the researchers, administered the questionnaire to all subjects during a regular class period. A teacher was always present in the classroom because of legal reasons, but he or she did not intervene. In the case of the adolescents in special education classes, the survey personnel assisted subjects who had problems filling out the questionnaire and offered them additional time to complete it. Only in a few cases was this support necessary. The study was approved by the ethics committee of the faculty of medicine at the University of Heidelberg.

ASSESSMENT

A self-report booklet, which included the Youth Self-Report and 53 additional items, was administered to all participating adolescents. A pilot test of this comprehensive questionnaire was completed in 2 school classes. Demographic information included age, sex, and nationality. The additional items in the self-report booklet included school situation, family background, relationships with peers, media consumption, and substance intake during the past 6 months. Pertinent parts of the German version[14] of the Schedule for Affective Disorders and Schizophrenia for School-Age Children[15] were administered to assess the prevalence and frequency of self-harm and suicidal behavior. The frequency of DSH was assessed by the following response options: never, 1 to 3 times a year, and 4 times or more a year. The frequency of 1 to 3 times a year was defined as occasional DSH, and the frequency of 4 times or more a year was defined as repetitive DSH. Lifetime experiences with suicide ideation, plans, and attempts were queried. To assess a broad range of emotional and behavioral problems potentially associated with self-harm, the German version[16] of the Youth Self-Report[17] was administered, a self-report version of the Child Behavior Checklist.[18]

STATISTICAL ANALYSIS

The frequency of self-mutilation was assessed as a multinomial variable with the following 3 categories: no DSH, occa-

sional DSH, and repetitive DSH. The relationship of the explanatory variables with self-mutilation was analyzed using the multinomial logistic regression analysis. The multinomial logistic regression analysis is a generalization of the logistic regression analysis for binary response variables to nominal response variables with more than 2 categories. It can be thought of as simultaneously estimating logistic regressions for each possible pair of categories. Only $n-1$ equations have to be estimated for a response variable with n categories, as the coefficients for the other pairs can be calculated from these equations. In practice, one category is selected as the reference category and all others are compared with it. We used no DSH as the reference category.

A multivariate multinomial logistic regression, including all explanatory variables and the interactions of each variable with sex, contained too many colinearities to provide interpretable results. Therefore, we carried out a multinomial regression analysis for each explanatory variable, with self-mutilation as the response variable, the explanatory variable, sex, and the interaction of the explanatory variable with sex. Then, we calculated a multinomial regression, including all explanatory variables, but only with those interactions with sex that were significant in the bivariate regressions. Each interaction that was not significant in the context of the multivariate regression was also removed. The resultant model is the one we report. To find the most important explanatory variables, we carried out a stepwise backward regression procedure to minimize the Akaike information criterion. The Akaike information criterion is a measurement of goodness of fit. The model with the smallest Akaike information criterion can be considered the best-fitting model.

As in all large surveys with many variables, the accumulation of missing values was a problem. From the 42 variables used in the multivariate analysis, 10 were complete, 21 had less than 1% of values missing, and the remaining 11 had less than 5% of values missing. Complete data were available for 78.8% of the participants; 99.7% had missing values in up to 7 variables. The remaining 17 participants had missing values in 8 to 12 variables. The analysis of only complete cases with the multivariate regressions would have resulted in a substantially reduced and unrepresentative sample. To overcome this problem, we used multiple imputations. Missing values were replaced by imputed values using the multivariate imputation by chained equations algorithm.[19] This procedure was repeated 10 times to create 10 complete data sets. The multivariate regression analysis was carried out with each data set and the results were combined.[20] The bivariate regressions used the original data set, as missing values were not a problem (both self-mutilation and sex had no missing values). Statistical significance was set at $P<.05$; all tests were likelihood ratio tests. All of the analyses were conducted using the statistical computer software program Stata, version 9.2 (Stata Corp, College Station, Texas).

RESULTS

The sample consisted of 5759 ninth-grade students who completed assessment forms. The mean age of the participating adolescents was 14.9 years (SD, 0.73); 2752 (49.8%) were female. The occasional form of DSH within the previous year was reported by 630 (10.9%) students, whereas 229 (4.0%) students reported the repetitive form of DSH; 14.8% of the adolescents with occasional DSH and 27.1% with repetitive DSH were receiving psychological treatment.

Table 1 presents the sample classified into 3 groups (no, occasional, and repetitive DSH) on the basis of the adolescents' reported history of DSH. For each group, the table reports sociodemographic variables, school performance, familial background, media consumption, substance intake, suicidal behavior, body-related issues, and emotional and behavioral problems.

Most participants were German (88.7%). The proportion of different nationalities was typical for the youth population in Germany. The distribution of school types among the participating adolescents was also typical for Germany.[13] Of all participants, 75.4% were living with both parents. With respect to suicidal behavior, suicidal thoughts were reported by 14.4% of the adolescents. A life-long history of 1 or more suicide attempts was reported by approximately 8% of the students. Considering each explanatory variable separately, we found each variable (except for body mass index [calculated as weight in kilograms divided by height in meters squared] and number of friends) to have a significant association with DSH. We found that an individual's sex had a significant interaction with school performance, smoking cigarettes, parental marital problems, social problems, and delinquent behavior. In the multivariate model only, school performance (likelihood ratio, $\chi^2_2=7.18$; $P=.03$) and smoking cigarettes (likelihood ratio, $\chi^2_6=15.33$; $P=.02$) were still significant, whereas parental marital problems (likelihood ratio, $\chi^2_4=7.95$; $P=.09$), social problems (likelihood ratio, $\chi^2_2=2.18$; $P=.34$), and delinquent behavior (likelihood ratio, $\chi^2_2=1.41$; $P=.5$) no longer had sex-specific effects. Thus, only the interactions of sex with school performance and with smoking cigarettes were included in the final model.

Table 2 shows the adjusted odds ratios for the odds of occasional or repetitive forms of DSH vs no DSH for the final model. The occurrence (risk) of repetitive DSH was more than 2 times higher among German adolescents in comparison with adolescents from other countries. There was also evidence that adolescents with a low body mass index were at high risk to be engaged in repetitive DSH; the lower the body mass index, the higher the risk of repetitive DSH. Adolescent girls with low school performance were more likely to be engaged in occasional acts of DSH. For both sexes, there was an increase in risk of occasional DSH in adolescents with lower academic achievement.

The findings may indicate that social factors (eg, school type, academic achievement, and health problems of parents and siblings) are important concomitants in the onset of occasional DSH, whereas these factors did not display any role (heightened risk) in the case of repetitive DSH. There was no evidence that other kinds of living circumstance (eg, family composition, housing problems, or financial problems) were associated with either type of DSH. Adolescent girls who smoked demonstrated a comparably high rate of risk (approximately 2-3 times higher) for both types of DSH. There was no significant association between smoking and DSH in adolescent boys. Generally, more adolescent girls than adolescent boys were smoking in this age group. These findings may indicate that smoking

Table 1. Characteristics of All Potential Predictors of Deliberate Self-harm[a]

Characteristic	Deliberate Self-harm			Total (N = 5759)
	None (n = 4900)	Occasional (n = 630)	Repetitive (n = 229)	
Sex, %				
F	46.9	63.4	74.1	49.8
M	53.1	36.6	25.9	50.2
Age, mean (SD), y	14.81 (0.73)	14.96 (0.78)	14.84 (0.67)	14.90 (0.73)
Nationality, %				
Other	11.5	11.5	5.7	11.3
German	88.5	88.5	94.3	88.7
Body mass index, mean (SD)[b]	20.86 (3.61)	21.07 (3.32)	21.03 (3.42)	21.05 (3.26)
School performance, mean (SD)[c]	2.98 (0.72)	3.18 (0.71)	3.20 (0.71)	3.05 (0.74)
School type, %				
Gymnasium[d]	37.6	24.1	26.6	35.7
Realschule[e]	32.7	31.6	35.4	32.7
Hauptschule[f]	27.2	39.7	34.9	28.8
Förderschule[g]	2.6	4.6	3.1	2.8
Family composition, %				
2 Parents	77.3	66.9	58.4	75.4
1 Parent	13.9	17.2	20.8	14.5
1 Parent and a partner	7.7	14.6	16.7	8.8
Other	1.1	1.3	4.1	1.2
No. of friends, %				
0	0.6	0.3	2.2	0.7
1	1.2	1.7	1.8	1.3
2 or 3	6.2	5.4	6.6	6.1
≥ 4	92.0	92.5	89.5	91.9
Activities with friends, %				
Seldom/never	6.3	4.1	8.3	6.2
1-2 Per week	38.8	27.1	19.3	36.8
≥ 3 Per week	54.8	68.7	72.4	57.1
Relationship with teachers, %				
Good	73.7	63.5	46.3	71.5
Moderate	24.0	32.5	41.9	25.7
Bad	2.3	4.0	11.8	2.8
Relationship with classmates, %				
Good	90.8	87.6	79.9	90.0
Moderate or bad	9.2	12.4	20.1	10.0
Bullied by classmates, %				
No	79.7	75.3	74.0	79.0
Yes	20.3	24.7	26.0	21.0
Hours of television watching per day, %				
< 1	19.2	16.6	21.9	19.0
1-2	50.4	47.9	41.2	49.8
3-4	22.7	24.7	17.5	22.7
> 4	7.8	10.8	19.3	8.6
Hours of video-game playing per day, %				
0	12.5	17.8	19.2	13.3
< 1	34.1	32.8	28.4	33.8
1-2	35.7	31.4	30.6	35.0
3-4	10.7	9.6	8.7	10.5
> 4	7.1	8.4	13.1	7.5
Hours spent listening to music per day, %				
< 1	31.0	17.8	10.5	28.7
1-2	35.1	29.3	25.8	34.1
3-4	18.1	21.8	23.6	18.7
> 4	15.9	31.1	40.2	18.5
Smoking cigarettes, %				
Never	69.5	34.9	22.9	63.9
Sometimes	14.4	18.6	16.3	14.9
At least once per week	4.1	10.8	10.1	5.0
Daily	12.0	35.7	50.7	16.1
Alcohol consumption, %				
Never	33.2	16.5	10.1	30.4
Sometimes	54.9	58.1	46.9	54.9
At least once per week	11.9	25.4	43.0	14.6
Use of illicit drugs, %				
Never	90.7	74.8	55.9	87.6
Sometimes	6.8	19.3	28.2	9.0
At least once per week	2.6	5.9	15.9	3.5

(continued)

Table 1. Characteristics of All Potential Predictors of Deliberate Self-harm[a] (cont)

Characteristic	Deliberate Self-harm			Total (N = 5759)
	None (n = 4900)	Occasional (n = 630)	Repetitive (n = 229)	
Use of analgesics, %				
Never	59.3	38.4	31.1	55.9
Sometimes	38.0	53.5	54.4	40.4
At least once per week	2.7	8.1	14.5	3.8
Use of tranquilizers/barbiturates, %				
Never	97.1	91.7	77.3	95.7
Sometimes	2.9	8.3	22.7	4.3
Suicidal ideation, %				
Never	92.4	56.4	18.1	85.6
Sometimes	7.1	40.2	52.9	12.5
Often	0.5	3.3	29.1	1.9
Suicide plan, %				
No	97.5	79.5	44.6	93.5
Yes	2.5	20.5	55.4	6.5
No. of suicide attempts, %				
0	96.7	73.8	45.0	92.1
1	2.8	20.4	28.8	5.8
≥ 2	0.5	5.7	26.2	2.1
Body image, %				
Too thin	6.9	8.6	3.1	6.9
Just right	61.2	44.9	34.6	58.3
Too fat	32.0	46.5	62.3	34.8
Dieting, %				
Never	65.3	46.5	36.2	62.1
Once	21.4	29.4	20.5	22.2
Several times	13.3	24.1	43.3	15.7
Satisfied with appearance, %				
No	8.5	18.5	28.6	10.4
Somewhat	55.0	54.8	55.9	55.0
Yes	36.5	26.7	15.4	34.6
Self-perceived problems, %				
None	48.7	26.9	10.2	44.8
Some	43.5	50.0	42.5	44.2
Many	7.8	23.1	47.3	11.0
Health problems in the family, %				
None	69.0	57.0	58.9	67.3
Some	22.9	30.0	24.8	23.7
Many	8.1	13.0	16.4	8.9
Problems with siblings, %				
None	71.5	55.0	56.7	69.1
Some	23.2	33.9	30.7	24.7
Many	5.3	11.1	12.6	6.2
Parental mental health problems, %				
None	86.9	74.8	61.9	84.6
Some	9.5	14.1	18.8	10.4
Many	3.6	11.1	19.3	5.0
Family financial problems, %				
None	63.7	47.8	47.2	61.4
Some	27.3	32.9	26.6	27.9
Many	9.0	19.3	26.1	10.8
Housing problems, %				
None	89.5	80.4	84.7	88.3
Some	7.8	13.5	10.6	8.5
Many	2.7	6.1	4.6	3.2
Parental marital problems, %				
None	73.9	60.8	53.2	71.7
Some	15.5	20.8	16.8	16.1
Many	10.6	18.4	30.0	12.2

(continued)

displays a different meaning for adolescent girls and may also be a sign of having problems. The amount of alcohol intake or use of drugs (eg, analgesics, tranquilizers, or barbiturates) was not related to any type of DSH. Adolescents who reported occasional consumption of illicit drugs demonstrated an elevated risk for occasional DSH, whereas adolescents with a frequent consumption of illicit drugs showed no heightened risk for either occasional or repetitive DSH. This finding may indicate that youths with a high frequency of drug consumption regulate their emotions or tension by drugs rather than by self-mutilating acts.

Table 1. Characteristics of All Potential Predictors of Deliberate Self-harm[a] (cont)

Characteristic	Deliberate Self-harm			Total (N = 5759)
	None (n = 4900)	Occasional (n = 630)	Repetitive (n = 229)	
Youth Self-Report, mean (SD)[h]				
Withdrawn[i]	2.81 (2.28)	3.92 (2.48)	4.58 (2.96)	2.86 (2.37)
Somatic complaints[j]	2.60 (2.42)	4.47 (2.95)	5.64 (3.59)	2.95 (2.41)
Anxious/depressed[k]	4.91 (3.96)	8.53 (5.19)	12.02 (5.81)	5.61 (4.71)
Social problems[l]	2.00 (1.90)	2.33 (2.10)	2.59 (2.37)	2.24 (2.19)
Thought problems[i]	1.26 (1.74)	2.09 (2.08)	3.75 (3.19)	1.49 (1.99)
Attention problems[j]	4.30 (2.61)	5.93 (2.73)	6.95 (3.04)	4.80 (2.81)
Delinquent behavior[m]	4.09 (2.88)	6.32 (3.38)	8.51 (3.86)	4.86 (3.29)
Aggressive behavior[n]	8.20 (4.91)	11.46 (5.36)	14.06 (6.10)	9.23 (5.44)
Internalizing[o]	9.98 (6.82)	16.26 (8.22)	21.30 (9.50)	11.10 (7.83)
Externalizing[p]	12.29 (7.03)	17.78 (7.82)	22.56 (8.89)	14.08 (8.05)
Total problems[q]	34.78 (17.07)	51.64 (18.92)	66.51 (20.73)	39.43 (20.75)

[a] Some columns do not add up to 100% because of rounding.
[b] Calculated as weight in kilograms divided by height in meters squared.
[c] Scores range from 1 (highest) to 6 (lowest).
[d] Eight years of school after 4 years of elementary school, terminating with the general qualification for university entrance.
[e] Six years of school after 4 years of elementary school, terminating with a secondary-school level-I certificate.
[f] Nine years of elementary school.
[g] School for special educational needs (for children who have lower intellectual abilities but are literate, in general).
[h] The reported values are the sum of the items scored. Each item can be scored as 0 (not true), 1 (somewhat true or sometimes true), or 2 (very true or often true).
[i] Seven items.
[j] Nine items.
[k] Sixteen items.
[l] Eight items.
[m] Eleven items.
[n] Nineteen items.
[o] Thirty-one items.
[p] Thirty items.
[q] One hundred items.

The strongest risk for being engaged in DSH was the occurrence of suicidal behavior, especially suicidal ideation. There is evidence to suggest a qualitative difference between occasional and repetitive forms of DSH. Adolescents who reported that they sometimes had suicidal thoughts demonstrated a 3-fold higher risk of occasional DSH, whereas the risk of repetitive DSH was increased 7-fold. Adolescents who reported a frequent occurrence of suicidal ideation showed an 18-fold risk of being engaged in repetitive DSH, in contrast to an approximately 2-fold greater risk for occasional DSH. A history of suicide attempts increased the risk for the occurrence of DSH. A history of more than 1 suicide attempt increased the risk for repetitive DSH by 6-fold and occasional DSH by 3-fold.

With respect to body-related issues, adolescents who perceived themselves to be overweight demonstrated a 3-fold greater risk for repetitive DSH. A combination of this distorted body image and a low body mass index—the core symptoms of eating disorders—increased the risk for DSH, especially for repetitive DSH. Regarding family background factors, health problems in the family as well as problems with siblings were associated with a slightly increased risk of occasional DSH. Symptoms of anxiety and depression, as measured by the Youth Self-Report, were associated with an increased risk of both types of DSH. Delinquent behavior was also positively linked to both types of DSH, whereas aggressive behavior was related only to occasional DSH.

COMMENT

In this study, occasional forms of DSH within the previous year were reported by 14.9% of the school students. Four percent demonstrated repetitive forms of DSH. The prevalence rate of 18.9% for all forms of DSH was higher than in previous studies conducted among students in England (6.9%)[1] and Australia (6.2%).[2] This discrepancy might be explained by the different cultural background factors in Germany, or it might possibly be an indicator for the increased incidence of DSH. Congruent findings of the prevalence of repetitive DSH can be found. For example, 3.7% of the adolescent sample from England reported multiple acts of DSH, which is very similar to the prevalence rate in our study (4.0%). Contrary to the finding of a 3- to 7-fold higher prevalence rate in adolescent girls compared with adolescent boys in both previous studies, we found a doubled prevalence rate of DSH in adolescent girls.

The results of this study suggest that social factors like school-related (eg, school type and poor academic achievement) and family-related (eg, health problems of parents and/or siblings) variables especially demonstrated a strong association with occasional DSH. However, these factors did not show any association with repetitive forms of DSH. Psychological factors seem to be more strongly associated with repetitive DSH than with occasional DSH. Body image problems as well as the self-perception of having problems were significantly associated only with repetitive DSH, whereas suicidal behavior (ie, suicidal ide-

Table 2. Adjusted ORs[a] for the Odds of Occasional or Repetitive DSH vs No DSH for the Final Model

Variable	Occasional DSH OR (95% CI)	Occasional DSH *P* Value	Repetitive DSH OR (95% CI)	Repetitive DSH *P* Value
Sex				
F	1 [Reference]		1 [Reference]	
M[b]	1.11 (0.81-1.53)	.51	0.51 (0.24-1.09)	.08
Age	1.04 (0.91-1.18)	.62	0.78 (0.60-1.00)	.05
Nationality				
Other	1 [Reference]		1 [Reference]	
German	1.20 (0.88-1.64)	.25	2.80 (1.35-5.81)	.006
Body mass index[c]	0.97 (0.94-1.00)	.05	0.93 (0.87-0.98)	.01
School performance				
Female	1.29 (1.07-1.56)	.008	0.92 (0.67-1.25)	.59
Male	0.97 (0.79-1.19)	.76	1.40 (0.89-2.18)	.14
School type				
Gymnasium[d]	1 [Reference]		1 [Reference]	
Realschule[e]	1.10 (0.85-1.43)	.459	1.15 (0.74-1.81)	.53
Hauptschule[f]	1.84 (1.41-2.39)	<.001	1.57 (0.97-2.53)	.06
Förderschule[g]	2.80 (1.64-4.75)	<.001	2.32 (0.81-6.67)	.12
Activities with friends				
Seldom/never	1 [Reference]		1 [Reference]	
1-2 Per week	1.35 (0.83-2.19)	.22	0.51 (0.24-1.07)	.07
≥3 Per week	1.59 (0.99-2.57)	.06	0.86 (0.42-1.75)	.67
Smoking cigarettes				
Female				
Never	1 [Reference]		1 [Reference]	
Sometimes	1.79 (1.27-2.53)	.001	1.58 (0.85-2.95)	.15
At least once per week	3.56 (2.25-5.63)	<.001	3.28 (1.54-7.00)	.002
Daily	3.49 (2.45-4.97)	<.001	3.89 (2.13-7.10)	<.001
Male				
Never	1 [Reference]		1 [Reference]	
Sometimes	1.26 (0.82-1.95)	.29	2.33 (0.90-6.03)	.08
At least once per week	1.72 (0.96-3.10)	.07	1.09 (0.25-4.73)	.91
Daily	1.20 (0.80-1.81)	.37	2.15 (0.90-5.13)	.09
Use of illicit drugs				
Never	1 [Reference]		1 [Reference]	
Sometimes	1.65 (1.22-2.23)	.001	1.94 (1.18-3.19)	.009
At least once per week	1.02 (0.63-1.67)	.92	1.61 (0.81-3.19)	.17
Suicidal ideation				
Never	1 [Reference]		1 [Reference]	
Sometimes	3.42 (2.58-4.54)	<.001	7.54 (4.64-12.26)	<.001
Often	1.91 (0.90-4.03)	.09	18.96 (8.35-43.04)	<.001
Suicide plan				
No	1 [Reference]		1 [Reference]	
Yes	1.19 (0.81-1.74)	.38	1.63 (1.00-2.64)	.048
No. of suicide attempts				
0	1 [Reference]		1 [Reference]	
1	2.22 (1.60-3.08)	<.001	2.35 (1.47-3.74)	<.001
≥2	2.87 (1.53-5.40)	.001	6.23 (3.14-12.35)	<.001
Body image				
Too thin	1 [Reference]		1 [Reference]	
Just right	0.89 (0.61-1.29)	.53	2.31 (0.92-5.79)	.08
Too fat	0.98 (0.64-1.50)	.92	3.73 (1.42-9.85)	.008
Dieting				
Never	1 [Reference]		1 [Reference]	
Once	1.30 (1.01-1.68)	.04	0.75 (0.45-1.24)	.26
Several times	1.13 (0.83-1.53)	.43	1.28 (0.77-2.13)	.34
Health problems in the family				
None	1 [Reference]		1 [Reference]	
Some	1.42 (1.13-1.78)	.002	1.17 (0.76-1.78)	.48
Many	1.19 (0.86-1.65)	.30	0.93 (0.53-1.64)	.80
Problems with siblings				
None	1 [Reference]		1 [Reference]	
Some	1.30 (1.04-1.61)	.02	0.94 (0.63-1.40)	.75
Many	1.20 (0.84-1.73)	.31	0.74 (0.40-1.37)	.33
Youth Self-Report				
Somatic complaints	1.06 (1.02-1.10)	.005	1.02 (0.96-1.09)	.495
Anxious/depressed	1.06 (1.04-1.09)	<.001	1.08 (1.04-1.13)	<.001
Thought problems	0.96 (0.91-1.01)	.14	1.06 (0.99-1.14)	.12
Delinquent behavior	1.05 (1.01-1.10)	.01	1.12 (1.05-1.20)	.001
Aggressive behavior	1.03 (1.00-1.05)	.04	1.03 (1.00-1.07)	.09

Abbreviations; CI, confidence interval; DSH, deliberate self-harm; OR, odds ratio;

[a] For categorical variables, the OR is the change of the odds of DSH vs no DSH in relation to the reference category. For continuous variables (body mass index, school performance, and Youth Self-Report), OR is the change of the odds for each unit change of the variable. The ORs are estimates from multivariate multinomial regression analysis. In Stata, version 9.2 (Stata Corp, College Station, Texas), they are labeled as relative risk ratios.

[b] Because of the interaction of an individual's sex with school performance and smoking cigarettes, the sex effect depends on the values of both variables. The estimate reported in this table corresponds to the sex effect at medium school performance and never smoking cigarettes.

[c] Calculated as weight in kilograms divided by height in meters squared.

[d] Eight years of school after 4 years of elementary school, terminating with the general qualification for university entrance.

[e] Six years of school after 4 years of elementary school, terminating with a secondary-school level-I certificate.

[f] Nine years of elementary school.

[g] School for special educational needs (for children who have lower intellectual abilities but are literate, in general).

ation and suicidal attempts) was associated with both forms of DSH (though much more strongly with repetitive DSH). In summary, our results indicate that different influencing factors may be present in the development of the 2 types of DSH. Against this background, the differentiation between occasional and repetitive DSH is reasonable, because there is clinical evidence that repetitive forms of DSH are those predominantly linked to psychiatric syndromes.[9]

Our results also clearly demonstrate that a greater amount of internalizing problems like anxiety and depressive symptoms, as well as externalizing problems like delinquent behavior, is closely related to both subtypes of DSH. This co-occurrence of both categories of symptoms may indicate disturbances in personality development. Aggressive behavior also showed an influence on DSH, though a significant association was revealed only with occasional DSH. An unexpected finding was that no sex-specific association between the investigated variables and both subtypes of DSH could be found in this study, with the exception of smoking and low academic performance in adolescent girls. These latter findings may indicate that smoking has a different meaning for adolescent girls than adolescent boys and may also be a sign of having other problems. Previous studies have pointed to a relationship between smoking and suicidal phenomena as well as poor body image and suicidal phenomena among adolescent girls.[21,22]

Overall, the results of this study support the view that DSH can be linked to emotional and behavioral problems in adolescents. Previous findings of an association

of DSH with awareness of recent self-harm in peers has led to the postulation of a modeling effect in accordance with instances of self-harm among adolescent psychiatric patients.[23] Because adolescents with psychological problems may be more prone to undertake self-mutilating acts, the opinion that DSH among adolescents may be because they view it as "fashionable" could not be supported by this study.

The overall interpretation of our results is limited because of the cross-sectional design of the study. We do not know whether the psychological symptoms are causes or consequences of DSH. A possible causal relationship can be investigated only in a longitudinally designed study. This drawback may be alleviated by the fact that the investigation took place at onset of DSH, as there is growing evidence from clinical and nonclinical samples that DSH typically begins in early to middle adolescence.[10] An advantage of the cross-sectional design is its strict anonymity, which heightened the acceptance of all involved parties and was a prerequisite of the school authorities.

Furthermore, we can postulate that the investigated social background features represent more stable factors, thus making it unlikely that they are consequences of DSH. Several factors strengthen the validity of the findings reported in this study. First, our sample was representative of ninth-grade students in Germany. Second, we used a clear definition of type and frequency of DSH to differentiate it from other self-destructive acts. Third, adolescents' reports may be of enhanced validity, as this survey was based on a self-rating conducted anonymously.

The high prevalence rate of DSH as well as its strong link to suicidal behavior and emotional and behavioral problems may serve as a forewarning to school counselors and public health authorities. Along with former studies,[1,2] this study provides strong evidence that adolescents with DSH rarely seek professional help. The results of this survey highlight the importance of an awareness of DSH so that interventions can be properly targeted. Recent studies in the adult clinical population have confirmed a strong connection between self-harm and subsequent suicide.[24]

It has been assumed that in many cases self-mutilating acts represent a transient period of distress, whereas in other cases it is an important indicator of psychiatric disturbances.[4] Only a longitudinal study of long duration will be able to provide answers as to whether occasional occurrences of DSH are precursors of repetitive DSH and under which conditions a remission or transition into repetitive DSH might occur. Another question of particular interest is whether repetitive DSH also occurs periodically or represents an early indicator of severe personality disturbances like borderline personality disorder and whether it is linked to other severe psychiatric conditions like depressive, bipolar, and substance use disorders.[9] It has been posited that the pathways from emotional, behavioral, and social factors to DSH are influenced by complex and insufficiently known interactions among constitutional factors and external factors, such as stressors, trauma, family pathology, and cultural factors.[24] Future research on DSH in adolescents therefore should address aspects of possible biological vulnerabilities (including genetic markers) that could illuminate differences between the subtypes of DSH.

Accepted for Publication: March 22, 2007.
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Financial Disclosure: None reported.
Funding/Support: This research was supported by the Lautenschlaeger Foundation, the Public Health Department of Heidelberg, and the faculty of medicine at the University of Heidelberg.
Role of the Sponsor: None of the sponsoring organizations had any involvement in the design or conducting of the study; in the collection, management, analysis, or interpretation of data; or the preparation, review, or approval of the manuscript.
Additional Contributions: We thank the teachers and survey personnel for their support.

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