A Functional Approach to the Assessment of Self-Mutilative Behavior

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This study applied a functional approach to the assessment of self-mutilative behavior (SMB) among adolescent psychiatric inpatients. On the basis of past conceptualizations of different forms of self-injurious behavior, the authors hypothesized that SMB is performed because of the automatically reinforcing (i.e., reinforced by oneself; e.g., emotion regulation) and/or socially reinforcing (i.e., reinforced by others; e.g., attention, avoidance–escape) properties associated with such behaviors. Data were collected from 108 adolescent psychiatric inpatients referred for self-injurious thoughts or behaviors. Adolescents reported engaging in SMB frequently, using multiple methods, and having an early age of onset. Moreover, the results supported the structural validity and reliability of the hypothesized functional model of SMB. Most adolescents engaged in SMB for automatic reinforcement, although a sizable portion endorsed social reinforcement functions as well. These findings have direct implications for the understanding, assessment, and treatment of SMB.

Self-mutilative behavior (SMB) refers to deliberate damage to one's own body tissue without suicidal intent and is part of the larger class of self-injurious behavior that includes actions ranging from stereotypic skin rubbing to completed suicide. SMB is a pervasive public health problem, with an estimated rate of 4% of the general adult population and 21% of adult psychiatric inpatient populations displaying these behaviors (Briere & Gil, 1998). As with suicidal thoughts and behaviors, adolescence appears to be a period of increased risk for SMB. Studies suggest that 14%–39% of adolescents in the community (Lloyd, 1998; Ross & Heath, 2002) and 40%–61% of adolescents in psychiatric inpatient settings perform these behaviors (Darche, 1990; DiClemente, Ponton, & Hartley, 1991). The alarmingly high rate at which adolescent self-injurious behaviors occur, coupled with the psychopathology and dysfunction often associated with such behaviors (e.g., Nock & Kazdin, 2002), underscores the need for a better understanding of how to effectively assess and treat these behaviors.

Despite the dangerousness and pervasiveness of SMB, surprisingly little is known about the nature of this problem. Limitations in the literature exist at both descriptive and theoretical levels. For instance, basic aspects of SMB, including the frequency of different methods and the average age of onset, have not been well established. Previous work has focused primarily on describing the psychosocial constructs associated with the presence of SMB. The result of this research is a heterogeneous list of diagnostic and psychosocial characteristics associated with SMB, including higher scores on measures of suicidal thoughts and behaviors, depression, anxiety, posttraumatic stress, anger, aggressiveness, impulsiveness, loneliness, social isolation, and hopelessness (Darche, 1990; Favazza, 1998; Guertin, Lloyd-Richardson, Spirito, Donaldson, & Boergers, 2001). Although this research may be helpful for the identification of those at increased risk for SMB, it adds little to our understanding of why individuals perform SMB.

We examined SMB in this study using a functional approach rather than the syndromal approach used in prior studies. Whereas a syndromal approach focuses on the classification and treatment of behaviors according to their topographical characteristics (i.e., associated signs and symptoms), a functional approach classifies and treats behaviors according to the functional processes that produce and maintain them (i.e., antecedent and consequent contextual influences). Applications of a functional approach to different forms of psychopathology have led to impressive advances in the conceptualization, assessment, and treatment of a range of clinically relevant behavior problems (e.g., Hayes, Wilson, Gifford, Follette, & Strosahl, 1996) but have been surprisingly absent from previous conceptualizations of SMB.

An examination of past research in this area yielded two sources of information that guided the current work. First, possible functions of SMB have been proposed in narrative case reports and theoretical reviews (Favazza, 1998; Suyemoto, 1998) and more recently in empirical evaluations of SMB (Brown, Comtois, & Linehan, 2002). Although these sources have not articulated or evaluated an integrated, theoretically based model of SMB, they provided a useful point of departure for the current work.

Second, experimental studies of stereotypic self-injurious behaviors (e.g., head banging, pica) in developmentally disabled populations have demonstrated that these behaviors are maintained through social (i.e., interpersonal, or reinforced by others) and automatic (i.e., intrapersonal, or reinforced by oneself) contingen-

cies (Iwata et al., 1994).[1] Although stereotypic self-injurious behaviors and SMB share some physical features, there are significant differences in form and severity, as well as in the clinical populations in which they typically occur, that highlight the need for separate evaluation of these phenomena. Nevertheless, these findings provided a solid basis for generating testable hypotheses about the functions of SMB.

Drawing on findings from these two sources, we proposed and evaluated four primary functions of SMB that differ along two dichotomous dimensions: contingencies that are automatic versus social and reinforcement that is positive (i.e., followed by the presentation of a favorable stimulus) versus negative (i.e., followed by the removal of an aversive stimulus). *Automatic-negative reinforcement* refers to an individual's use of SMB to achieve a reduction in tension or other negative affective states (e.g., "to stop bad feelings"). This function is the most commonly invoked in theoretical reports, and there is some empirical evidence supporting the automatic-negative reinforcing properties of SMB. One experimental study revealed that compared with nonmutilators, individuals who had engaged in SMB showed a decrease in psychophysiological and subjective response during a self-mutilation imagery task (Haines, Williams, Brain, & Wilson, 1995), which provided initial support for the existence of such a function of SMB. In *automatic-positive reinforcement*, individuals engage in SMB to create a desirable physiological state (e.g., "to feel something, even if it was pain"). In other words, rather than serving the purpose of removing feelings, SMB may also function as a means of feeling generation (Brown et al., 2002).

In contrast, social reinforcement functions refer to the use of SMB to modify or regulate one's social environment. *Social-negative reinforcement* refers to an individual's use of SMB to escape from interpersonal task demands (e.g., "to avoid punishment from others" or "to avoid doing something unpleasant"). The existence of this function has not been widely discussed in the theoretical literature; however, a similar function was proposed by Brown et al. (2002) with regard to adult women with borderline personality disorder, although empirical support was mixed in that study. *Social-positive reinforcement* for SMB involves gaining attention from others or gaining access to materials (e.g., "to try to get a reaction out of someone, even if it's negative" or "to let others know how unhappy I am"). The notion that adolescents sometimes engage in SMB to gain attention or to manipulate others is often discussed in theoretical articles on SMB and is a well-known piece of clinical lore; yet, like the other proposed functions, this notion has received little empirical support. Thus, one of our primary goals in the current study was to empirically evaluate this four-function model of SMB.

Our main goal in this study was to examine the reasons adolescents endorsed engaging in SMB and to test whether these reasons can be reliably classified into the four theoretically derived functions of SMB. As a preliminary step, we evaluated basic characteristics of SMB, including the frequency of different methods and average age of onset.

Data were collected among clinically referred adolescents admitted to a psychiatric inpatient unit to examine this functional model among those at severe risk for SMB. Following the methodology used in previous studies (Boergers, Spirito, & Donaldson, 1998; Brown et al., 2002), we solicited individuals' self-reports of the perceived reasons for engaging in SMB and used this information to examine the hypothesized, overarching functions of such behaviors. Although the use of self-report to examine the functional determinants of an individual's behavior differs from the behavioral tradition from which this methodology originated, it allowed for (a) an examination of reinforcement that is automatic and thus less detectable by external informants as well as (b) an assessment of SMB that occurs outside the inpatient setting.

Method

Participants

Participants were 108 adolescents (32 boys, 76 girls) age 12–17 years ($M = 14.8$, $SD = 1.4$) who were drawn from consecutive admissions to an adolescent psychiatric inpatient unit in New England. The ethnic composition of the sample was 72.2% European American, 11.2% Latin American, 4.6% African American, and 12.1% mixed ethnicity–other. According to state census tract data, socioeconomic status for adolescents in this sample was 3.0% high, 57.6% moderate, 24.2% low, and 15.2% poverty.

Procedures

Data were obtained from a comprehensive intake evaluation routinely administered to all adolescent inpatients and a supplemental clinical evaluation conducted with all inpatients referred for self-injurious thoughts or behaviors. The use of data from each patient's clinical record was approved for research purposes by the hospital's institutional review board. Adolescents included in the present study were those classified by the admitting psychiatrist as exhibiting self-injurious thoughts or behaviors. Patients with active psychosis or mental retardation were excluded. For participants admitted to the inpatient unit on more than one occasion during the study period, data from only the first admission were used.

Measures

The Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997) is a self-report measure of the methods, frequency, and functions of SMB. Items regarding the methods and functions of SMB were initially developed through an extensive review of past literature on SMB in both normative and psychiatric populations. Next, a series of independent focus groups were conducted with psychiatric inpatient adolescents who had engaged in SMB to supplement the list of methods and functions extracted from past research. Thus, all items on the FASM reflect behaviors that were generated by adolescents with histories of SMB and are generally consistent with past research (see Lloyd, 1998).

Participants first indicated whether and how often they had engaged in 11 different methods of SMB in the previous 12 months, with a space provided for any methods not listed. To assess the functions of SMB, participants were then asked how often they had engaged in SMB for each of 22 different reasons (scored from $0 = never$ to $3 = often$ for each item), with a space provided for any reasons not listed. Other aspects of the participants' SMB, such as age of onset, were also assessed.

The FASM has been used in studies of both normative (Lloyd, 1998; Lloyd et al., 1997) and psychiatric samples (Guertin et al., 2001), which have yielded support for its psychometric properties. For instance, Guertin et al. (2001) reported adequate levels of internal consistency for the FASM for both moderate and severe forms of SMB ($r = .65–.66$). Studies have

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[1] We use the term *automatic* to refer to reinforcement that is conducted or carried out by oneself, which is consistent with previous research in applied behavior analysis; the term does not refer to behavior that is performed without conscious effort, which is a definition often used in cognitive psychology.

Table 1
Frequency of Each Method of Self-Mutilative Behavior

	Incidents									
	0		1		2–5		6–10		≥11	
Method of self-mutilative behavior	No.	%	No.	%	No.	%	No.	%	No.	%
Cutting or carving on skin	23	26	20	23	29	33	7	8	10	11
Picking at a wound	41	46	4	5	14	16	10	11	20	23
Hitting self	50	56	5	6	15	17	3	3	16	18
Scraping skin to draw blood	51	57	10	11	20	23	4	5	4	5
Biting self	60	67	3	3	15	17	3	3	8	9
Picking areas of the body to the point of drawing blood	61	69	3	3	13	15	4	5	8	9
Inserting objects under skin or nails	66	74	6	7	11	12	4	5	2	2
Tattooing self	67	75	12	14	8	9	1	1	1	1
Burning skin	68	76	8	9	6	7	4	5	3	3
Pulling out one's own hair	72	81	1	1	10	11	0	0	6	7
Erasing skin to draw blood	74	83	6	7	5	6	3	3	1	1
Total (*n* = 89 self-mutilators)			6	7	20	22	13	15	50	56

also supported the concurrent validity of the FASM as evidenced by significant associations with measures of suicidal ideation and the presence of a past suicide attempt (Guertin et al., 2001; Lloyd et al., 1997). However, no previous investigations have evaluated the theoretically derived functions that were the focus of the present study.

Data-Analytic Plan

Several data-analytic strategies were used to evaluate the main study hypotheses. We used descriptive statistics to examine the frequency of different methods and the basic characteristics of SMB. Various data-analytic procedures were then used to evaluate the structural validity of our four-function model. First, each of the reasons from the FASM was assigned to one of the four functions according to expert consensus (between Matthew K. Nock and Mitchell J. Prinstein). We then evaluated the structural validity of our four-function model by submitting the reasons given for SMB to a confirmatory factor analysis (CFA) using LISREL 8.5 (Jöreskog & Sörbom, 1996) and evaluated the four subscales in reliability analyses. In this case, the structural validity of our four-function model would be supported if our CFA showed an adequate degree of fit between the data and our hypothesized model. Although our sample size was relatively small, it is notable that power analyses indicated that given the degrees of freedom of the hypothesized model and with alpha set at .05, our level of statistical power (.79) approximated the accepted level necessary (.80) to test the hypothesis that our model is a close fit with the data (see MacCallum, Browne, & Sugawara, 1996).

Results

Frequency and Characteristics of SMB

Overall, 82.4% (*n* = 89) of the adolescents in this sample reported engaging in at least one incident of SMB in the previous 12 months (i.e., 17.6% reported engaging in self-injurious thoughts or suicide attempts but not SMB). Of those who engaged in at least one incident of SMB, the mean number of incidents in the past year was 80.0 (*SD* = 132.3, *Mdn* = 19.0, *Mode* = 2.0, range = 1–745). Only 6 (7%) of the self-mutilators reported engaging in only one incident of SMB, and 45 (50.6%) of the adolescents reported 19 or more incidents in the previous 12 months. Data on the frequency of the 11 methods of SMB queried in the FASM are presented in Table 1. No participants endorsed using any methods of self-mutilation other than those listed in Table 1.

Self-mutilators were more likely to be female (74.2%) than male (25.8%); however, these rates were consistent with the gender breakdown of this sample, and there was no significant gender difference for the presence of SMB, $\chi^2(1, N = 108) = 3.48$, *ns*. Most individuals began engaging in SMB in early adolescence, although some reported doing so during childhood (age of onset in years: *M* = 12.8, *SD* = 2.1, *Mdn* = 13.0, *Mode* = 13.0, range = 6–17). There were no significant age, gender, or ethnic differences for frequency, methods, or age of onset.

Functions of SMB

CFA. Several fit index values can be used to determine goodness-of-fit of confirmatory structural equation models, including nonsignificant χ^2, incremental fit index (IFI) ≥ .90, comparative fit index (CFI) ≥ .90, root-mean-square error of approximation (RMSEA) ≤ .05, and χ^2/df ≤ 2 (Browne & Cudeck, 1993). These last three indices are less biased by sample size than other fit statistics and are of particular importance given the relatively small sample used in this study. The results of the CFA indicate an acceptable degree of fit between the data and our hypothesized model. Although the chi-square value for the final model was statistically significant, $\chi^2(176, N = 89) = 248.42$, *p* = .02,[2] which suggests less than optimal fit, other statistics suggest that the model was a good fit with the data, IFI = .91, CFI = .90, RMSEA = .05 (90% confidence interval = .03–.07), and χ^2/df = 1.41. Twenty-one of the 22 items loaded significantly on the proposed factors (1 item was removed from the analyses because of failure to load on any factor), and the resulting factor loadings are presented in Table 2. Model modification tests revealed no cross-loadings that would significantly improve the model fit,

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[2] The FASM contains several pairs of items that are similar in content (e.g., Item 8 = *to receive more attention from your parents or friends* and Item 3 = *to get attention*). It was expected that such items would share nonrandom error variance given the similarities in wording. To account for this nonrandom error, we allowed for correlated residuals between several such items, as suggested by Lagrange multiplier tests.

Table 2

Confirmatory Factor Analysis and Rate of Reported Reasons for Engaging in Self-Mutilation

Reported reason	A-NR Factor 1	A-PR Factor 2	S-NR Factor 3	S-PR Factor 4	% of self-mutilators (*n* = 89)
14. To stop bad feelings	.73				52.9
2. To relieve feeling numb or empty	.61				30.6
10. To punish yourself		.89			31.8
22. To feel relaxed		.67			23.5
4. To feel something, even if it was pain		.50			34.1
5. To avoid doing something unpleasant you don't want to do			.77		13.0
1. To avoid school, work, or other activities			.71		5.9
13. To avoid punishment or paying the consequences			.58		11.8
9. To avoid being with people			.53		9.4
6. To get control of a situation				.73	15.3
11. To get other people to act differently or change				.69	11.8
7. To try to get a reaction from someone, even if it's negative				.65	15.3
17. To get your parents to understand or notice you				.65	13.0
21. To make others angry				.64	5.9
12. To be like someone you respect				.56	5.9
18. To give yourself something to do when alone				.54	23.5
8. To receive more attention from your parents or friends				.50	14.1
16. To feel more a part of a group				.50	7.1
15. To let others know how desperate you were				.43	14.1
3. To get attention				.38	14.1
20. To get help				.35	14.1
19. To give yourself something to do with others[a]					2.4

Note. A-NR = Automatic-negative reinforcement; A-PR = automatic-positive reinforcement; S-NR = social-negative reinforcement; S-PR = social-positive reinforcement.

[a] This item was excluded.

which suggests that each item loaded only on the proposed factor. Overall, the goodness of fit of this model supports the hypothesized four-function structure of SMB. It is notable that we also tested models with one, two (social reinforcement and automatic reinforcement), and three (social-positive reinforcement, social-negative reinforcement, and automatic reinforcement) functions. Chi-square difference tests revealed that the two-, three-, and four-function models each provided a significantly better fit with the data than did the one-function model. Although the two- and three-function models were more parsimonious than was the four-function model, these models did not provide better model fit; therefore, we retained the hypothesized, theoretically derived, four-function model.

Reliability analyses and correlations among the functions. The internal consistency of each of the four subscales was evaluated with Cronbach's alpha coefficients. The resulting alpha coefficients (presented in Table 3) ranged from .62 to .85, which suggests moderate-to-high internal consistency reliability for each

subscale. As hypothesized, the four subscales were significantly correlated (presented in Table 3). The magnitude of these zero-order correlations (*r*s = .39–.78) indicates shared variance between 15% and 61% among the subscales and supports our hypothesis that although significantly related, the four functions represent distinct (i.e., not redundant) constructs.

Level of endorsement of overall functions and individual reasons of SMB. The relative frequency of each of the four functions and the specific reasons endorsed most frequently by self-mutilators were also evaluated. The mean item response for each subscale is presented in Table 3. A repeated measures analysis of variance indicated a significant overall difference among the subscales, $F(1, 86) = 23.21$, $p < .01$, Cohen's $f = .92$. Post hoc paired t tests examining differences between subscales revealed that (a) scores on the automatic-negative reinforcement subscale were significantly higher than on all other subscales (all $ps < .01$), (b) scores on the automatic-positive reinforcement subscale were significantly higher than on both social reinforcement subscales

Table 3

Alpha Coefficients, Mean (and SD) Item Response, and Zero-Order Correlations for the Four Function Subscales

Subscale	α	*M*	*SD*	Correlations 1	2	3	4
1. Automatic-negative reinforcement	.62	2.09	1.02	—			
2. Automatic-positive reinforcement	.69	1.79	0.88	.52	—		
3. Social-negative reinforcement	.76	1.29	0.59	.39	.57	—	
4. Social-positive reinforcement	.85	1.35	0.52	.34	.57	.78	—

(ps $<$ .01), and (c) there was no difference between scores on the social-reinforcement subscales, $t(88)$ = 1.62, ns.

To provide additional clinical information, we also evaluated the rate of endorsement of each individual reason, as presented in Table 2. The items related to the automatic-reinforcement functions were endorsed much more frequently than items related to the social-reinforcement functions. For instance, more than half of all self-mutilators (52.9%) reported that they engaged in SMB "to stop bad feelings." Overall, items on the automatic-reinforcement subscales were endorsed by 24%–53% of self-mutilators, whereas the items on the social-reinforcement subscales were endorsed by only 6%–24% of self-mutilators. Thus, self-mutilators reported engaging in SMB to regulate their emotions much more frequently than to influence the behavior of others.

Discussion

Our results indicate that SMB is quite prevalent, occurs via multiple methods, and begins at a relatively early age in adolescent psychiatric inpatients. These findings highlight the importance of understanding why individuals perform SMB and ultimately what interventions are most efficacious at decreasing these behaviors.

Perhaps the greatest contribution of this study is the articulation and empirical support for a functional model of SMB. Our findings indicate that adolescents engage in SMB for a variety of reasons that are consistent with learning theory. Reasons related to automatic reinforcement were endorsed most frequently, which suggests that the primary purpose of most adolescent SMB is the regulation (i.e., both decrease and increase) of emotional or physiological experiences. Our results also provide empirical support for social-reinforcement functions of SMB, which have long been the object of clinical theory but have received little empirical attention. Although not endorsed as frequently as the automatic-reinforcement functions, social reinforcement was endorsed by a significant portion of adolescent self-mutilators and is considered a significant factor influencing the occurrence of SMB. On balance, it is possible that automatic-reinforcement functions are endorsed more frequently than social functions because adolescents who engage in SMB are more socially isolated from the outset (Guertin et al., 2001) and thus lack the opportunity for social influence.

The support for these four functions suggests different learning experiences may be involved in the development of SMB and, similarly, that diverse treatment approaches may be needed to effectively reduce SMB. Clinicians should consider using different therapeutic approaches according to the identified function of SMB, and interventions may be most effective if aimed at replacing SMB with functionally equivalent behaviors. For instance, if an individual's SMB is maintained via automatic reinforcement, it is likely that therapeutic approaches that focus on enhancing alternative-affect regulation skills would be most effective. Alternatively, if an individual's SMB is maintained via social reinforcement, it is likely that approaches that focus on teaching more adaptive interpersonal communication skills would be most appropriate (see Linehan, 1993; Miller, 1999; Rudd, Joiner, & Rajab, 2001). The evaluation of the efficacy of such a functionally guided treatment approach represents a rich area for future research on SMB.

Future studies in this area should consider several limitations of this investigation. First, this study was conducted within a relatively small sample of adolescent inpatients referred for self-injurious thoughts or behaviors. Although we had sufficient statistical power to test the primary study hypotheses, our sample size was smaller than that commonly used in CFA, and our results should be considered preliminary until replicated with a larger clinical sample. Second, the method of assessment relied exclusively on self-report at one time point. It is possible that observed relationships between variables may have been increased because of shared method variance. Future researchers would improve on this study by using multiple informants, performance-based assessment methods, and the collection of data over several time points to ensure the validity and reliability of observed results (see Prinstein, Nock, Spirito, & Grapentine, 2001). It also would be instructive to examine whether individuals engage in SMB for multiple functions at one time or whether functions tend to differ over time within individuals. The answers to these key questions will help us better understand the correlations among the four functions observed in this study and will have significant implications for the assessment and treatment of SMB. Finally, although these preliminary data support the structural validity and reliability of our four-function model, support for the construct validity of the model is needed.

Overall, this study offers an integrated, theoretically based model of the functions of SMB in adolescents. Given the high prevalence of this behavior, particularly among clinically referred populations, and the lack of prior empirical research in this area, these results provide an important initial step in conceptualizing SMB in a manner that could be immediately useful in the assessment and treatment of adolescents. We hope the model of SMB articulated and evaluated in this study will stimulate future research on this pervasive and life-threatening behavior problem.

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