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Characterizing Automatically Maintained Self-Injury with the Aberrant Behavior Checklist

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Abstract:	There is significant heterogeneity in the form and function of self-injurious behavior (SIB) among individuals with intellectual and developmental disabilities (IDD). Over the years, there have been several attempts to characterize and delineate different behavioral phenotypes of SIB based on a variety of clinical features, structural dimensions of the response, and contextual factors. Multidimensional variables linked to repetitive behavior, hyperactivity, and mood dysregulation have been shown to predict or correlate with prevalence and severity of SIB in individuals with IDD. Although the Aberrant Behavior Checklist (ABC) was created to assay a number of these variables, this measure has yet to be applied to examine differences in functional classes of SIB (i.e., socially maintained vs. automatic). Therefore, the purpose of this exploratory study was to examine differences in ABC subscales between individuals with socially maintained SIB and automatically maintained SIB (ASIB). Overall, there were not significant differences in ABC subscale elevations between the SIB and combined ASIB groups. However, when ASIB was stratified into distinct subtypes, notable differences in subscale elevations were observed. We discuss the clinical relevance of our findings, as well as future directions regarding the utility of the ABC for characterizing behavioral divergence in SIB.

Abstract

Multidimensional variables linked to repetitive behavior, hyperactivity, and mood dysregulation are correlated with the prevalence and severity of self-injurious behavior (SIB) in individuals with intellectual and developmental disabilities. The purpose of this exploratory study was to examine differences in Aberrant Behavior Checklist (ABC) subscales between individuals with socially maintained SIB and automatically maintained SIB (ASIB). Overall, there were not significant differences in ABC subscale elevations between the SIB and ASIB groups. However, when ASIB was stratified into distinct subtypes, notable differences in subscale elevations were observed. Our results indicate the ABC may have utility for further characterizing the neurobehavioral divergence among individuals with IDD who engage in self-injury.

Keywords: aberrant behavior checklist; automatic; functional analysis; self-injurious behavior; subtype

Characterizing Automatically Maintained Self-Injury with the Aberrant Behavior Checklist

The etiology of self-injurious behavior (SIB) among individuals with intellectual and developmental disabilities (IDD) represents an important topic of research in the behavioral sciences. For decades, researchers across multiple disciplines have attempted to classify SIB in terms of its topographical features, hypothesized etiologies, and hypothesized mechanisms of action. This line of taxonomic research as revealed several subclasses of SIB based primarily on the response dynamics of SIB under specific environmental conditions (Iwata et al., 1982/1994) or based on distinct affective and biological correlates (Furniss & Biswas, 2020; Mace & Mauk 1995). Stratifying SIB in this manner can inform assessment and treatment approaches, which is especially important given the significant heterogeneity in the form and function of SIB among individuals with IDD (Furniss & Biswas, 2020).

Advances in functional analysis (FA) approaches provide a precise method for understanding the environmental conditions under which SIB is most likely to occur. In most cases, SIB is maintained by social positive (e.g., attention) or social negative (e.g., termination of aversive events) reinforcement contingencies. We refer to this subclass as socially maintained SIB. However, in approximately 20–25% of cases, SIB occurs independent of social contingencies (Iwata et al., 1994; Shawler et al., 2019). In these cases, SIB is said to be “automatically maintained” because the response dynamics imply the sensory consequences of the behavior maintain its occurrence (Vaughan & Michael, 1982). Over the years, there have been attempts to characterize and delineate different behavioral phenotypes of ASIB based on a variety of clinical features (e.g., injury characteristics, collateral emotional behavior; Rooker et al., 2020), structural dimensions of the response (e.g., stereotypic vs. rapid), and contextual variables. For example, Mace and Mauk (1995) identified five subclasses of what they referred

to as “biologic SIB.” Briefly enumerated[1] below, these all belong to a broad class of SIB putatively maintained by unspecified biological mechanisms.

Subtype A (Extreme Self-Inflicted Injury) is characterized by the presence of deep wounds and severe scarring. Individuals with this clinical sign may have congenitally altered central pain mechanisms, or engage in SIB because it produces an analgesic effect (Kuhn et al., 2008) or endogenous opioids (Cataldo & Harris, 1982). *Subtype B (Repetitive and Stereotypic SIB)* is characterized by repetitive rubbing together of body parts, hand mouthing, and other behaviors that produce tissue damage resulting from repeated mechanical abrasion and chronic skin moisture (as opposed to severe blows characteristic of Subtype A; Mace & Mauk, 1995). Stereotypic SIB may present or co-occur with non-injurious topographies of stereotypy as well (Schmidt et al., 2021). *Subtype C (High-Rate SIB with Agitation if Interrupted)* is characterized by SIB (e.g., eye gouging, trichotillomania) that is compulsive in nature and may be associated with self-restraint (i.e., a behavior that is topographically incompatible with or prevents SIB, such as sitting on one’s hands to prevent face slapping; Powell et al., 1996). This clinical presentation, which appears to be commensurate with Subtype 3 ASIB (Hagopian, 2015, 2017), has been documented in individuals with IDD, and various neurogenetic and neurometabolic conditions (e.g., Cornelia de Lange syndrome, Fragile X syndrome, Lesch-Nyhan syndrome; Hall et al., 2008; Hyman et al., 2002). Self-restraint is also sometimes observed among individuals with repetitive behavior disorders and obsessive-compulsive disorders (e.g., Muehlmann & Lewis, 2012). *Subtype D (Co-Occurrence of SIB with Agitation)* is characterized by SIB that is accompanied by agitation, including aggression, running, hyperventilation, tachycardia, and related collateral emotional behaviors (e.g., screaming, crying). For example, in a study with three adults with developmental disabilities and severe

[1] Note, Mace and Mauk refer to these as Subtype 1, Subtype 2, Subtype 3, Subtype 4, and Subtype 5, respectively—we will denote the subtypes with letters instead of numerals to avoid confusion with the subtyping framework described by Hagopian et al. (2015) used throughout the current project.

SIB, Barrera et al (2007) found that heart rate consistently escalated immediately before the occurrence of SIB, which was then followed by a temporary decrease in heart rate following SIB. Finally, *Subtype E (Multiple Clinical Features)* is simply a broad subtype for individuals presenting with clinical signs and characteristics spanning multiple subtypes listed above. These subtypes described by Mace and Mauk represent an early attempt to stratify ASIB based on a number of clinical dimensions. There is convergence with these ideas, and a framework proposed by Furniss & Biswas (2020), that makes a distinction between emerging SIB, generalized impulsive SIB, stereotyped SIB, and compulsive SIB. The taxonomies described above (Mace & Mauk, 1995; Furniss & Biswas, 2020) are attractive in that they are conceptually coherent and appear to integrate several key bio-behavioral variables. However, although conceptually intriguing, empirical and quantitative support for these models is underdeveloped.

A Subtyping Model Based on Response Dynamics

Applied researchers and clinicians have long noted distinct and quantifiable patterns of SIB during behavioral assessments of individuals who engage in SIB. In their seminal paper, Iwata et al. (1982/1994) described two different response patterns within the FA that suggest SIB is automatically maintained. Fine-grained analyses of these response dynamics reveal considerable complexity and heterogeneity in the functional classification of ASIB—this is the basis for a subtyping model introduced by Hagopian et al. (2015). One pattern is characterized by highly differentiated responding across the no-interaction condition (viz., comparatively higher rates of SIB) and the toy-play control condition (viz., comparatively lower rates of SIB). This pattern is classified as Subtype 1 ASIB. The second pattern is characterized by undifferentiated responding across all conditions of the FA, including the toy-play control. This pattern is classified as Subtype 2 ASIB. Thus, variation (or lack thereof) in SIB between low-stimulation and high-stimulation environmental conditions, quantified as the level of differentiation (LOD) in relative rates of SIB across FA conditions, is particularly relevant to Subtype 1 and Subtype 2 ASIB.

The LOD is a highly specific and sensitive diagnostic behavioral marker for distinguishing Subtype 1 and Subtype 2 ASIB. The quality measures include an area under curve of 0.99, sensitivity of 0.96, and specificity of 0.99 (Hagopian, Falligant, et al., 2023). Subtypes 1 and 2 have also been found to functionally differ in other ways apart from LOD. Namely, Subtype 1 ASIB is far more responsive to treatment using alternative reinforcement (positive predictive value = 82.6%; negative predictive value = 92.9%; Hagopian et al., 2017), rarely requires protective equipment and restraint, and presents with fewer serious injuries at the time of intake relative to Subtype 2 ASIB (Rooker et al., 2020). A third pattern, also well-documented over the years (e.g., Fisher & Iwata, 1996), is characterized by the presence of self-restraint during FA conditions (Hagopian et al., 2015, 2017). Self-restraint is a serious self-limiting behavior (e.g., intertwining limbs, sitting on hands) that seemingly occurs to prevent SIB (Fisher et al., 1996; cf. Rapp & Miltenberger, 2000). This pattern is classified as Subtype 3 ASIB. These three patterns correspond to the three subtypes of ASIB first delineated by Hagopian et al. (2015), and have been subsequently examined within the applied research literature including large-*N* analyses and reviews (Hagopian et al., 2017; Hagopian, Falligant, et al., 2023; Rooker, 2020), clinical case reports (e.g., Schmidt et al., 2021), and translational research (e.g., Morris & McDowell, 2021).

Aberrant Behavior Checklist

Multidimensional variables linked to repetitive behavior, hyperactivity, impulsivity, and mood dysregulation all have been shown to predict or correlate with prevalence and severity of SIB in children with IDD (Cianfaglione et al., 2015; Cooper et al., 2009), and these markers are featured prominently in a number of frameworks that distinguish different subtypes of ASIB (Furniss & Biswas, 2020; Mace & Mauk, 1995). For instance, mood dysregulation is prominent in individuals with IDD (Schaffer et al., 2023), and there is some evidence to suggest that this predisposition to autonomic arousal contributes to the occurrence and maintenance of ASIB in some cases (Noel, 2018). As the precision of neurobehavioral models for distinguishing

phenotypic divergence in SIB continues to evolve, it is possible that clinical features (e.g., emotional disposition) specific to subtypes of ASIB correspond to indirect measures commonly administered prior to treatment, such as the Aberrant Behavior Checklist (ABC; Aman et al., 1985a). The ABC is a broadband, indirect measure of behavior commonly exhibited by individuals with neurodevelopmental disorders used to assess changes in maladaptive prior to and following treatment. The ABC demonstrates strong psychometric properties (Aman et al., 1985b; Bihm & Pointdexter, 1991) and includes 58 items indexed within five subscales: (1) Irritability; (2) Lethargy and Social Withdrawal; (3) Stereotypic Behavior; (4) Hyperactivity and Noncompliance; and (5) Inappropriate Speech.

The neurobehavioral literature on SIB has identified several autonomic correlates (e.g., hyperactivity, anxiety, irritability, impulsivity; Cianfaglione et al., 2015) of SIB in individuals with neurodevelopmental disorders. Prior research has also shown that several of these correlates (e.g., irritability, aggression, stereotypic behavior; Flowers et al., 2020) correlate with the prevalence of SIB in individuals with autism based on caregiver-administered ABC subscale ratings. However, these studies did not differentiate SIB in terms of either the functional class of SIB (i.e., socially maintained vs. automatic) or ASIB subtype. Therefore, the purpose of the current exploratory study was to examine preliminary differences in ABC subscales between individuals with social SIB and ASIB. As a supplemental analysis, we also sought to examine differences in ABC subscales among subtypes of ASIB (Hagopian et al., 2015).

Method

Participants

Participants were 47 individuals diagnosed with IDD who were admitted to a hospital-based inpatient or outpatient program for the assessment and treatment of severe challenging behavior between the years of 2018 and 2022. All participants received a course of intensive services including assessment (i.e., standardized measures, preference assessment, functional analysis), treatment (i.e., evaluation of function-based treatment), caregiver training, and

generalization (home, school, and community settings). Medical records for this five-year period were reviewed to identify patients who underwent a FA and for whom an ABC measure was completed by caregivers prior to initiating treatment. Results of this search identified 47 participants of which 31 were male and 16 were female; ages ranged from 4–30 (M_{age} = 13.5) (see Table 1). All participants engaged in at least one topography of SIB. Across participants, topographies of SIB included head SIB (e.g., hitting head with object or closed fist), body SIB (e.g., hitting self in the chest with object or closed fist), skin SIB (e.g., biting, pinching, scratching, or skin picking), self-biting (SB), head banging (hitting head on surface), and other SIB (O SIB). Six participants exhibited self-restraint, defined as the participant engaging in any behavior that restricted their ability to engage in SIB (e.g., sitting on hands, wrapping hands in shirt, placing hands under armpits, crossing legs; see Hagopian et al., 2015). Interobserver agreement was assessed on an average of 49.6% (0%–100%; median = 49.1%) of FA sessions. Mean agreement for SIB was 97.2% (88.1%–100%).

Data Preparation and Analysis

We began by applying structured criteria to FA data for each participant to identify the function of SIB (see Hagopian, Falligant et al., 2023). In applying structured criteria, an upper and lower criterion line is drawn one standard deviation above and below the mean rate of SIB in the control condition of the FA. Differentiation is evident if at least five data points in a test condition fall above the upper criterion line. Response patterns during the FA are characteristic of an automatic function if (a) rates of behavior are highest in the no-interaction condition, (b) rates of behavior tend to be higher in conditions with less environmental stimulation (i.e., attention, no interaction; tangible) and lower in conditions with higher environmental stimulation (i.e., demand and toy-play), or (c) elevated rates of behavior occurred across all conditions. Additional rules can be applied to account for trend, low-rate behavior, and low magnitude of effects, so we refer readers to Hagopian, Falligant et al. (2023) for a more in-depth description of these rules. Next, to identify the ASIB subtype (when applicable), we applied the subtyping

criteria delineated by Hagopian et al. (2015). The subtyping criteria involves the calculation a quotient score, which quantifies the extent to which SIB is disrupted by alternative reinforcement based on the proportion of data points above the upper criterion line (placed halfway between the 2nd and 3rd highest point in the toy play control condition) relative to the number of points below the lower criterion line (placed halfway between the 2nd and 3rd lowest points in the toy play control condition; Hagopian et al., 2015).

In applying these criteria, we characterized ASIB as Subtype 1 if the subtype quotient was greater than or equal to 0.5, indicating that significantly higher rates of SIB occurred in the no interaction condition of the FA relative to the play condition. We categorized ASIB as Subtype 2 if (a) the subtype quotient was less than 0.5, (b) more than 30% of data points overlapped between the play and alone condition, or (c) the average rate of SIB occurred at high rates irrespective of environmental changes. Lastly, Subtype 3 was indicated if self-restraint occurred in at least 25% of 10-s intervals across three consecutive series in the no interaction condition of the FA.

Results of the structured criteria and subtyping analyses are shown in Table 1. We identified 38 participants with ASIB (age range: 4 to 30; M_{age} = 12.9) and nine patients with socially maintained SIB (age range: 11 to 23; M_{age} = 16.1). The preponderance of participants with ASIB likely stems from the type of services provided and populations served in the hospital in which this study was conducted. Patients admitted to the hospital engaged in severe challenging behaviors (e.g., ASIB) that are often resistant to first-line treatments in the community (see Hagopian, Kurtz, et al., 2023). Of the patients with ASIB, six met criteria for Subtype 1 (age range: 8 to 16; M_{age} = 12.8), 26 met criteria for Subtype 2 (age range: 4 to 30; M_{age} = 13.1), and six met criteria for Subtype 3 (age range: 8 to 16; M_{age} = 12.2). Of the nine participants with socially maintained behavior, SIB was maintained by escape for four participants, access to tangibles for three participants, and multiply maintained (i.e., access to tangibles and escape, or access to attention and tangibles) for two participants. After classifying

individuals' SIB as socially vs automatically maintained, subscale elevations were dichotomized: clinically significant vs. not clinically significant/subclinical. We subsequently quantified the frequency of clinically significant subscale elevations on the ABC, and conducted a series of Chi Square goodness of fit tests to evaluate differences in the proportion of clinically significant subscales between participants with ASIB and social SIB. We also examined differences in the simple proportion of subscale elevations across subtypes of ASIB.

Results and Discussion

Figure 1 depicts ABC subscale elevations across social SIB and ASIB subtypes. Regardless of the functional class of SIB (i.e., social vs. automatic), for most cases (33 of 46; 71.7%) there were significant elevations of the Irritability subscale of the ABC. However, there were minimal differences (p = .79) in the proportion of cases with clinically significant elevations on the Irritability subscale between individuals with ASIB (27 of 38; 71.1%) and social SIB (6 of 9; 66.7%). Although differences among subtypes did not reach the level of statistical significance, X^2 (2) = 3.7, p = .15, there was a slightly higher prevalence of clinically significant elevations on the Irritability subscale for Subtype 3 (6 of 6; 100%) and Subtype 2 (18 of 26; 69.2%) relative to Subtype 1 (3 of 6; 50%) cases.

There were minimal, nonsignificant differences (p = .99) in the distribution of clinically significant Social Withdrawal subscale scores between individuals with ASIB (15 of 38; 39.5%) and social SIB (4 of 9; 44.4%). At the subtype level, these differences were marginally significant, X^2 (2) = 5.9, p = .05, where there was a slightly higher prevalence of clinically significant elevations on the Social Withdrawal subscale for Subtype 3 (4 of 6; 66.7%) and Subtype 2 (11 of 26; 42.3%) relative to Subtype 1 (0 of 6; 0%) cases. There was a nonsignificant (p = .44) difference in the prevalence of clinically significant Stereotypic Behavior subscale scores between individuals with ASIB (18 of 38; 47.3%) and social SIB (3 of 9; 33.3%). At the subtype level, these differences were significant, X^2 (2) = 9.2, p = .01, evidenced by a higher prevalence of clinically significant elevations on the Stereotypic Behavior subscale for

Subtype 3 (6 of 6; 100%) and Subtype 2 (13 of 26; 50.0%) relative to Subtype 1 (0 of 6; 0%) cases.

There was a nonsignificant (p = .17) difference in the prevalence of clinically significant Hyperactivity/Noncompliance subscale scores between individuals with ASIB (18 of 38; 47.4%) and social SIB (2 of 9; 22.2%). There were significant differences among subtypes, X^2 (2) = 8.5, p = .01, with a higher prevalence of clinically significant elevations on the Hyperactivity/Noncompliance subscale for Subtype 3 (5 of 6; 83.3%) and Subtype 2 (13 of 26; 50%) relative to Subtype 1 (0 of 6; 0%) cases. There were nonsignificant (p = .99) differences in the distribution of clinically significant Inappropriate Speech subscale scores between individuals with ASIB (12 of 38; 31.6%) and social SIB (3 of 9; 33.3%). There were nonsignificant differences among subtypes, X^2 (2) = .02, p = .98, where the proportion of clinically significant elevations was relatively similar for Subtype 3 (2 of 4; 50.0%), Subtype 2 (8 of 26; 30.7%), and Subtype 1 (2 of 6; 33.3%).

Overall, there were nonsignificant differences in ABC subscale elevations between the SIB and combined ASIB groups. However, when ASIB was stratified into distinct subtypes, notable differences in subscale elevations were observed. Visual inspection of Figure 2 depicts a remarkable pattern across subtypes with respect to the proportion of clinically significant elevations across the Irritability, Social Withdrawal, Stereotypic, and Hyperactivity/Noncompliance subscales. Specifically, there was a higher proportion of individuals with Subtype 2 and Subtype 3 ASIB with clinically significant subscale elevations compared to individuals with Subtype 1 ASIB and socially maintained SIB. This is noteworthy finding for two reasons. First, it appears that treatment-resistant ASIB subtypes (i.e., Subtypes 2 and 3 ASIB) are more likely to be characterized by significant elevations on these ABC subscales relative to individuals whose SIB is very amenable to reinforcement-based intervention (i.e., Subtype 1 ASIB and social SIB). Second, the absence of a subtype-specific analysis would have limited our understanding of the usefulness of the ABC for dissecting

relevant behavioral characteristics among individuals who engage in ASIB, and otherwise obscured important differences between individuals with socially maintained vs. ASIB.

Relative to Subtype 1 ASIB, a higher proportion of participants with Subtype 2 and Subtype 3 ASIB evidenced clinically significant elevations on the Irritability subscale. It is plausible that heightened irritability could stem from, or lead to, high intensity SIB that is characteristic of these subtypes (Hagopian et al., 2015; Rooker et al., 2020). Similarly, these subtypes also evidenced considerable elevations on the Stereotypic Behavior subscale. Stereotypic behavior and SIB are highly comorbid problems both belonging to a class of behavior linked by repetition, rigidity, and invariance (e.g., Hall et al., 2001). In fact, as described above, several subtyping models have attempted to categorize SIB based on its stereotypic and repetitive features (Furniss & Biswas, 2020; Mace & Mauk, 1995)—this further suggests that the repetitive/stereotypic dimensions of SIB, and/or comorbid stereotypies, may be implicated in these treatment-resistant subtypes.

Across all subtypes, a higher proportion of individuals with Subtype 3 ASIB displayed clinically significant elevations across the Irritability, Social Withdrawal, Stereotypic, and Hyperactivity/Noncompliance subscales. This finding could stem from one or more of the unique response dimensions that characterize Subtype 3 related to self-restraint. For instance, it is possible that individuals with Subtype 3 engage in self-restraint to avoid the negative consequences (e.g., pain) produced by SIB (Fisher & Iwata, 1996). If self-restraint is maintained by negative reinforcement in the form of escape from aversive stimulation, motivational factors might favor self-restraint and therefore compete with opportunities to engage with others (Social Withdrawal subscale), evoke other forms of challenging behavior if self-restraint is blocked (Irritability), or lead to noncompliance with adult directives and instructional activities (Hyperactivity/Noncompliance subscale).

Recall that Subtype 1 ASIB is more easily treated with alternative reinforcement than Subtypes 2 and 3 (Hagopian et al., 2018). This could have influenced caretaker responses on

the ABC, wherein the ability to easily reduce SIB with alternative reinforcement (e.g., providing the child with a competing toy) may account for the proportionally lower number of significant subscale elevations among participants with Subtype 1 ASIB. Similarly, deficits in expressive language that are characteristic of individuals with IDD likely explain why, across groups, there were minimal differences on the Inappropriate Speech subscale.

The current study included some limitations that merit discussion. First, there was an unequal distribution of individuals across groups (social SIB and ASIB subtypes), indicating some caution is warranted when drawing conclusions about the usefulness of the ABC for distinguishing between these behavioral phenotypes of SIB. Future research may consider recruiting participants from a variety of treatment settings (e.g., specialized hospitals, outpatient clinics, center-based programs, schools) to ensure a relatively balanced sample of individuals with IDD who engage in both social and ASIB (and subtypes). Secondly, although ABC ratings produces scores that fall within three subscale descriptors (i.e., normal, elevated, clinically significant), we chose to dichotomize scores (i.e., normal and clinically significant) to capture differences among SIB subclasses that would have the greatest clinical implications. Examining all three subscales with a larger, more representative sample size might reveal additional differences among groups that were not captured in the currents study.

The current study points to the ABC as a potential tool to compliment multidimensional approaches for assaying and disambiguating behavioral phenotypes of ASIB among individuals with IDD. Prior studies examining the relationship between ABC subscales and SIB among individuals with IDD (e.g., Matson et al., 2008) do not classify SIB according to functional class or subtype. While these studies were published prior to the development of an objective subtyping model (Hagopian et al., 2015), we recommend that future research employ procedures similar to those described in the current study (i.e., use of structured criteria and subtyping model to categorize SIB; Hagopian, Falligant, et al., 2023), but with larger sample size to further investigate the generality of our findings among subtypes of ASIB. The results of

the current study extend this area of research by shedding light on the potential utility of indirect measures as an additional method for examining affective and behavioral correlates of ASIB (e.g., Schroeder et al., 2014).

Indirect measures, such as the ABC, are often completed prior to treatment to provide relevant information about the client's behavioral dispositions, which can be used to tailor assessment and treatment procedures. In the current study, the ABC revealed differences in the perceived degree to which participants engaged in certain maladaptive behaviors (e.g., irritability, social withdrawal, stereotypic behavior, hyperactivity/noncompliance, inappropriate speech) prior to treatment. Interestingly, ABC subscale elevations across subclasses of SIB captured some of the affective correlates and response dimensions of SIB described in prior research (Furniss & Biswas, 2020; Mace & Mauk, 1995). This correspondence suggests the ABC has potential to identify behaviors that could be indicative of a distinct subclass of SIB (social vs. ASIB; ASIB subtypes). Although it is not recommended that the ABC replace standard assessments (FAs) and methods for assessing and subtyping SIB (Hagopian, Falligant et al., 2023), it may supplement extant procedures for characterizing the neurobehavioral profiles of individuals with IDD who engage in SIB. Continued research in this area has potential to improve the efficiency of clinical procedures for assessing (Richman, 2008) and treating (Mahatmya et al., 2008) self-injury in individuals with IDD, and contribute to a more complete neurobehavioral typology of self-injury in this population.

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Table 1. *Participant Characteristics*

Case	Sex	Age	Diagnosis	SIB	Function/Subtype
1	Female	12	ASD; ID; ADHD; AD	Skin SIB	1
2	Female	8	ASD; ID	Head SIB, Body SIB, Head banging	1
3	Male	19	ASD; ID; SD; SPD	Skin SIB	1
4	Female	11	ASD; ID; SMD	Skin SIB	1
5	Male	16	ASD; SMD; OCD	Head SIB, Skin SIB	1
6	Male	11	ASD; SMD; ADHD	Head SIB, Body SIB	1
7	Male	12	ASD; ID; CD; SMD; ADHD	Head SIB, Skin SIB,	2
8	Male	8	ASD; ADHD; DBD; AD	Head SIB, Body SIB, Skin SIB	2
9	Male	17	ASD; ID: SMD; CD	Head SIB, Body SIB	2
10	Male	22	ASD: ID; ADHD; RD	Head SIB, Body SIB	2
11	Male	12	ASD; ID; DBD; SMD	Head SIB, Body SIB	2
12	Male	8	ASD; ID; AD; ADHD; SMD; DBD	Head SIB, Body SIB, Skin SIB	2
13	Male	30	ASD; ID: DBD; OCD; IED	Head SIB, OB SIB	2
14	Male	10	ASD; ID; SMD: DBD; ADHD	Head SIB, O SIB, HB	2
15	Male	20	ASD; ID; FxS	Head SIB, Body SIB	2
16	Female	13	ASD; ID; SMD; DBD; ADHD; BD	Head SIB, Body SIB	2
17	Male	13	ASD; ID	Head SIB, Body SIB	2
18	Female	12	ASD; SMD; CD	Head SIB, Body SIB	2
19	Male	6	ASD; DS	Head SIB, Body SIB	2
20	Female	8	ASD; ID: DBD; SMD	Head SIB, Body SIB	2
21	Male	9	ASD; ID; ADHD; DBD; SMD	Head SIB, Body SIB	2
22	Male	18	ASD; ID: DS	Head SIB, HB	2
23	Female	12	ASD; ID: OCD; GAD	Body SIB, O SIB	2
24	Female	9	ASD; ID; DBD	Head SIB, Body SIB, Skin SIB, HB	2
25	Male	14	ASD; ADHD; DBD	Skin SIB	2
26	Male	12	ASD; ID: DBD:	Head SIB, Body SIB, Skin SIB, HB	2
27	Female	10	DD: SMD: DBD	Head SIB, Skin SIB	2
28	Female	4	ID; SMD: DBD	Head SIB, Skin SIB	2
29	Male	14	ASD; DBD; ADHD; SMD	Skin SIB	2
30	Male	22	ASD; DBD: SMD	Head SIB, Body SIB, Skin SIB	2
31	Male	18	ASD; ID: ADHD	Head SIB, O SIB	2
32	Male	8	ASD; DBD; ADHD	Head SIB, O SIB, Skin SIB, Self-Biting	2

33	Female	16	ASD; ID; DBD; ADHD	Head SIB, Body SIB	3
34	Male	12	ASD; DBD; ADHD	Body SIB, HB	3
35	Male	19	ASD; ID; ICD; OCD	Head SIB, O SIB, HB	3
36	Female	10	ASD; ID; SS	Head SIB, Body SIB	3
37	Male	8	ASD; ID	Head SIB, Body SIB	3
38	Male	8	ASD; ID; SPD	Head SIB, Body SIB	3
39	Male	11	ASD; ID; MREL	Head SIB, HB, Self-Biting	Social (E/T)
40	Female	11	ASD; ID; SMD	Head SIB, Body SIB, HB	Social (E)
41	Female	14	ASD: ID; SMD; DBD	Head SIB, Body SIB	Social (E)
42	Male	17	ASD; DBD	SB, CP	Social (T)
43	Female	20	ID; SD	FP	Social (A/T)
44	Male	18	ASD; ID; GE	Head SIB, Body SIB, OB SIB	Social (E)
45	Male	15	ASD; DBD	Head SIB, Body SIB, OB SIB, SB*	Social (E)
46	Female	23	ASD; ID; SBD; DBD	Head SIB, Body SIB	Social (T)
47	Male	16	ASD; DBD; SMD; ADHD	Head SIB, Self-Biting	Social (T)

Note: **SIB**: OB SIB = Object SIB; HB = head banging; O SIB = Other SIB, SB = self-biting, CP = chin pressing, FP = finger pressing; E = escape; T = tangible; A = attention. **Diagnosis**: ASD = autism spectrum disorder; ID = intellectual disability; SPD = sensory processing disorder; SD = seizure disorder; SMD = stereotypic movement disorder; AD = anxiety disorder; DBD = disruptive behavior disorder; CD = conduct disorder; RD = rumination disorder; IED = intermittent explosive disorder; FxS = Fragile X syndrome; BD = bipolar disorder; DS = Down syndrome; ADHD = attention deficit hyperactivity disorder; GAD = generalized anxiety disorder; DD = developmental delay; SS = Sotos syndrome; SPD = sensory processing disorder; MREL = receptive-expressive language disorder; ICD = impulse control disorder; GE = generalized epilepsy. **Function/Subtype**: E = escape; T = tangible; A = attention

< Insert Figure 1 here >

Note. ABC = Aberrant Behavior Checklist; ASIB 1 = Subtype 1; ASIB 2 = Subtype 3; ASIB3 = Subtype 3

Figure 1

ABC Subscale Elevations Across ASIB Subtypes and Socially Maintainied SIB