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Identification of Emerging Self-Injurious Behavior in Young Children: A Preliminary Study

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Abstract

Self-injurious behavior (SIB) is a chronic disorder that often begins in early childhood; however, few studies have examined the onset of SIB in young children. This preliminary study reports on the identification, assessment and observation of SIB in 32 children who had begun to engage in SIB within the previous 6 months. Participants were ages birth to 5 years and presented with or were at risk for intellectual and/or developmental disabilities. Assessment measures included parental interviews, developmental and language measures, standardized measures of problem behavior, and direct observations conducted in the home. Results indicated that for most children, SIB emerged prior to age 1 year, and multiple topographies of SIB and other problem behaviors developed in most children. Multiple measures were useful in identifying SIB and in characterizing the behavior by topography, frequency, and severity. Findings from the examination of child communication in relation to SIB were inconclusive. Results are discussed in relation to theories of SIB emergence, and previous observational studies of young children with SIB.

Keywords

self-injurious behavior; intellectual disability; early identification; prevention; problem behavior

Self-injurious behavior (SIB) has been defined as an act directed toward oneself that results in tissue damage (Tate & Baroff, 1966). SIB is a chronic and severe problem that affects 10–17% of individuals diagnosed with intellectual and/or developmental disabilities (IDD; Collacott, Cooper, Branford, & McGrother, 1998; Rojahn, 1994; Schroeder et al., 1999). While there is extensive research on biological factors (cf. review by Schroeder, Oster-Granite, & Thompson, 2002) and behavioral treatments for well-established SIB (cf. review by Kahng, Iwata, & Lewin, 2002), relatively few studies have examined the early stages of this disorder.

SIB is known to occur in very young children both with and without developmental delays. In fact, a 15% prevalence of SIB has been observed in typically-developing infants (Bachman, 1972; deLissovoy, 1961; Green, 1967; Romanczyk, Kistner, & Plienis,1982). Importantly, while SIB generally resolves prior to age 5 years in typically developing children (Romanczyk et al., 1982), it often persists in children with developmental delays (deLissovoy, 1962; Kravitz & Boehm, 1971; Kravitz et al., 1960; Sallustro & Atwell, 1978). Indeed, in a retrospective study of institutionalized adults with SIB, emergence of SIB prior to age 5 years was reported in approximately 68% of cases (Schneider, Bijam-Schulte, Janssen, & Stolk, 1996); thus, in a large proportion of chronic cases, SIB may have an onset

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in early childhood. Given that such "early onset" SIB (a) may become a chronic problem for many individuals without intervention (Green, O'Reilly, Itchon, & Sigafoos, 2005), and (b) is generally costly and difficult to treat (e.g., Kurtz et al., 2003, Wacker et al., 1998), research delineating the early course of the disorder is needed. Such studies may be useful in informing early intervention and prevention approaches for young children with or at risk for IDD.

Several risk factors associated with SIB have been suggested. Most notably, the prevalence of SIB has been correlated with severity of intellectual disability (Griffin, Williams, Stark, Altmeyer, & Mason, 1986; McClintock, Hall, & Oliver, 2003). Biological risk factors include a diagnosis of autism (Hodge et al., 2000), sensory impairments (Murphy et al., 1999), and the presence of certain genetic disorders including Lesch-Nyhan, Prader-Willi, Smith-Magenis, Fragile X, and Cornelia de Lange (Schroeder et al., 2001). However, to date, longitudinal and cross sectional studies examining potential risk factors have found that variables such as developmental age, clinical condition, and sensory impairment, which are known risk factors for SIB in older individuals, did not predict persistent SIB in young children (Hall, Oliver, & Murphy, 2001; Maclean, Tervo, Hock, Tervo, & Symons, 2010; Murphy et al., 1999). Developmental theories relate the emergence of SIB to self-stimulation observed in infancy and early childhood. Specifically, isolated or impoverished environments during early childhood, low vestibular stimulation, or experience of pain-related events during early childhood may predispose a child to self-injure (Cataldo & Harris, 1982; Davis, 1940, 1946; deLissovoy, 1963). Guess and Carr (1991) proposed a three-level theory to describe the emergence and maintenance of SIB, where SIB begins as stereotyped movements and eventually come under more voluntary, operant control. While this model appears to delineate a logical and natural progression for the emergence and maintenance of SIB, to date no direct evidence has been available to support it. Additionally, the specific mechanisms by which SIB is acquired and becomes part of a person's behavioral repertoire remains unclear (Symons, 2005). Thus, as with cognitive or biological risk factors, this theory offers little regarding specific variables that may be targeted for early behavioral intervention.

Related research efforts have focused on characterization of the nature, form, and course of early onset SIB. To this end, a few descriptive, longitudinal studies have been conducted to document the incidence and course of early onset SIB in children with or at risk for IDD. For example, Berkson, Tupa, & Sherman (2001) sought to determine the incidence of the SIB, and from a sample of 457 children receiving early intervention services identified 39 participants (ages 3–40 months) who were at risk for the development of or currently exhibited SIB. Results indicated that 4.6% of the total sample (21 participants) exhibited topographically-similar, or "proto-injurious" as coined by the authors, behaviors (those that had potential to cause, but had not currently caused tissue damage) or SIB (behavior that produced visible tissue damage). Examination of longitudinal patterns of SIB in these same participants (Berkson, 2002) found that head banging and head hitting, and eye poking and eye pressing were the most frequently observed forms of SIB in children under age 3 years. The mean age of onset for SIB observed during the study was 16.4 months; however, it was unclear whether other forms of SIB had been observed prior to the study. Age curves calculated for participants demonstrated that for the majority of children, SIB ceased to occur; however, for the few children who continued to exhibit SIB at age 3 years (conclusion of the study), it was not known whether SIB persisted beyond that age. Another limitation of this study was that participant diagnoses, level of functioning, and communication ability were not reported.

In a related treatment study, Kurtz et al. (2003) studied 30 children under age 5 years who exhibited SIB, and they retrospectively reviewed aspects of the emergence of SIB.

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Consistent with Berkson et al. (2001), they found that the mean age of onset of SIB was 17 months, and head banging was the first topography of SIB that emerged. However, the participants in the Kurtz et al. study were a clinical sample with severe SIB with a longer history of exhibiting the behavior.

Another longitudinal study of early onset SIB was conducted by Richman and Lindauer (2005). Twelve children ages 14–32 months with severe disabilities or genetic disorders who exhibited stereotypy or SIB were studied to document the characteristics of stereotypy and SIB over time, to determine whether some forms of SIB evolve from stereotypy. Data were collected on occurrence of stereotypy (repetitive motor behavior that did not make contact with the child's body or any hard surface), proto-injurious SIB (proto-SIB), and SIB. Results indicated that 11 of 12 participants exhibited proto-SIB (non-injurious), most commonly in the form of hand mouthing. Other forms of proto-SIB included head banging, head hitting, leg- or arm banging, and eye poking. Over the course of the study, the hand mouthing of four children progressed to SIB (producing tissue damage). Two participants developed head banging or head hitting that resulted in bruising. The reported mean age of emergence of proto-SIB was 22.6 months (range, 19–27 months), while the mean age of emergence of tissue damage/SIB was 24.8 months (range, 21–31 months). The authors noted limitations of the study including, a) there was no information collected on the presence of proto-SIB or SIB at entry into the study, so true emergence was not documented; and b) all participants had more severe developmental delay or genetic disorders, thereby limiting the generalizability of findings. Finally, no information was reported on communication ability, or on the occurrence of other forms of problem behavior (e.g., aggression, disruptive behavior), which are often reported to co-occur with SIB in young children (MacLean et al., 2010).

Taken together, the above studies provide valuable information on the course of development of SIB in young children with IDD. However, while multiple investigations (Berkson & Tupa, 2000; Berkson, 2002; Richman & Lindauer, 2005, Murphy et al, 1999) have observed emergence of some topographies of SIB, all have the limitation that SIB may have been present for an unknown period of time. Thus, it remains unclear exactly how SIB presents early in its course. To identify SIB as it is actually emerging, it is necessary to observe the behavior within the few months that it first occurs. To date SIB has not been identified and characterized at its earliest stage of emergence in a well described sample of young children with or at risk for IDD.

Additionally, few studies have investigated the relationship between emerging SIB and communication deficits. Epidemiological studies of older individuals with SIB suggest that in 2/3 of cases, SIB serves a communicative function (e.g., Iwata et al., 1994). Furthermore, previous studies with older (Hagopian et al., 1998) and younger children (Kurtz et al., 2003; Reeve & Carr, 2000; Wacker at al., 1998) have demonstrated that communication-based interventions for SIB and other problem behaviors are highly effective. Given that communication deficits are a risk factor for SIB (McClintock et al., 2003), and that communication training is an important part of the solution, it seems logical that communication deficits may play a role in the emergence of SIB.

Accordingly, the present study is a preliminary report of a longitudinal study examining the early course of SIB in young children. Specifically, data are presented for the initial phase of a 2-year study investigating the relationship of communication skills and parental factors to the persistence of SIB. The purposes of the present study are (1) to describe a sample of children under 5 years of age with recent onset of SIB, and (2) evaluate the relationship of child communication skills to the early course of SIB.

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METHOD

Participants

Study participants were recruited from a local children's hospital in Baltimore, Maryland, Maryland Infants and Toddlers Program, Child Find Program, and Baltimore-area developmental pediatricians, as well as through flyers distributed to local preschool programs and child and family magazines. Study eligibility was determined through administration of a brief phone screening measure, consisting of four questions related to the child's SIB, and/or behaviors that were topographically-similar and may result in injury, including: presence of specific topographies, onset of each topography, frequency of SIB, and recency of last episode of SIB. In addition, three items each from the Physical and the Academic subscales of the Developmental Profile II corresponding to the child's age group were administered in order to determine risk for developmental delay. Children who failed one or more items on both subscales were determined to be at risk for developmental delay and were eligible for study participation. A parent-child dyad was included in the study if all of the following inclusion criteria were met: 1) the child currently exhibited SIB; 2) the child's age was under 5 years; 3) onset of SIB was within the past 6 months; 4) the child had displayed at least 4 episodes of SIB during the 2 weeks prior to screening; and 5) the child did not meet developmental criteria for his/her age group.

The study sample included thirty-two child-parent dyads. Participants included 26 male and 6 female children, and 1 male and 27 female parents (note: one parent participated for twins, one parent participated for triplets, and one parent participated for siblings). Age of child participants ranged from 8 months to 4 years, 3 months, with a mean age of 23.4 months. Participant demographic information is provided in Table 1.

Design and Procedure

This study was part of an ongoing investigation of risk factors for persistent SIB in young children (R01HD046722-04), which was funded by the National Institute of Child Health and Human Development (NICHD), and was approved by the Johns Hopkins Medicine Institutional Review Board. The larger study utilized a longitudinal design with measures completed at 3 month intervals over a 2-year period. The current study examined data from only the first assessment.

Each child and parent participated in 2 study visits: a clinic visit at a pediatric hospital for children with intellectual and developmental disabilities, and a home visit. During the clinic visit, a trained examiner administered developmental (Battelle DI/BDI 2nd ed.) and language testing (PLS-4) with the child, and study measures were completed. At the home visit, direct observation of the parent and child was conducted.

Measures

The measures administered or collected during the initial assessment are described below.

Demographic Information and Participant History Form—Parents completed this 36-item form, developed by the investigators to collect demographic information, including current child diagnosis, age of onset of first SIB, first SIB topography exhibited, and situation relating to first SIB (e.g., antecedent situation). Also, this form included a checklist for parents to indicate the current presence of SIB topographies (e.g., head banging, hand-to-head hitting, self-biting) and other problem behavior (e.g., aggression, disruptive behavior).

Services Form—Parents completed this 8-item form, developed by the investigators to collect information regarding treatment services (behavioral, psychiatric, educational,

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speech, physical and occupational therapies) delivered to the child, as well as the intensity of service (hours per week and duration in weeks) and specifics of treatment for SIB (e.g., type of intervention, medication).

Battelle Developmental Inventory, 1st edition (Newborg, Stock, & Wnek, 1984) and 2nd edition (Newborg, 2005)—Battelle DI—Trained examiners administered the full Battelle DI. Following the start of study, the updated BDI-2nd edition became available and was used with some participants. The BDI/BDI 2nd ed. is a developmental test designed to identify strengths and weaknesses of children, ages birth to 7 years, 11 months, with and without disabilities. It provides 30 profile scores assessing child functioning in five domains: Personal-Social, Adaptive, Motor, Communication, and Cognitive. Review of the Battelle DI's psychometric properties reveals moderate to high test-retest reliability and moderately high concurrent validity with other measures of development (Pezzino, Mott, & Waidler, 1986; Telzrow, 1982).

Preschool Language Scale-4—PLS-4 (Zimmerman, Steiner, & Pond, 2002)—Trained examiners administered the PLS-4. The PLS-4 is a measure of receptive and expressive language ability in children ages birth to 6 years, 11 months. This measure has excellent psychometric properties, including internal consistency, test-retest reliability, and concurrent validity. The PLS-4 provides three scores (Auditory Comprehension, Expressive Communication, Total Language Score) which were used as measures of the child's expressive and receptive communication skills.

Aberrant Behavior Checklist-Community—ABC (Aman & Singh, 1994)—The ABC is a 58-item, parent-completed, global measure of behavioral disturbance in persons with IDD. Due to the paucity of available child behavior measures that included specific items addressing SIB at the initiation of this study, the ABC Irritability subscale—specifically items 2 ("Injures self on purpose"), 50 ("Deliberately hurts himself/herself"), and 52 ("Does physical violence to self")—were used to assess SIB severity. Each item was scored using a 4-point Likert Scale: "0" = not a problem; "1" = the behavior is a problem but slight in degree; "2" = the problem is moderately serious; and "4" = the problem is severe in degree.

Functional Analysis Interview—FAI (O'Neill, Horner, Albin, Storey, & Sprague, 1990)—The FAI is a semi-structured parent interview used to identify problem behaviors, specific responses to those behaviors, and generate hypotheses regarding behavioral function. For the purposes of the study, this measure was used to define specific forms of SIB (e.g., head banging, face scratching, hair pulling) exhibited by participants, and to identify situations at home during which child SIB was likely to occur to ensure that these situations were targeted for direct observation in the home.

Self-Injury Trauma Scale—SIT Scale (Iwata, Pace, Kissel, Nau, & Farber, 1990)—The SIT Scale is a 3-part clinician-completed scale used to quantify visible injuries caused by SIB. Part 1 includes sections to indicate SIB topographies and any evidence of healed injury. In Part 2 evaluators document the location and severity of injury (on a 3-point scale). In Part 3, respective scores from Parts 1 and 2 are summed to obtain a Number Index, a Severity Index, and Estimate of Current Risk. This scale has been used in research with adults with SIB (Luiselli, Blew, & Thibadeau, 2001; McDonough, Hillery, & Kennedy, 2000) with reliability averaging over 90%. For the purposes of this study, the SIT Scale was used to estimate SIB severity.

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Direct Observation—Research staff conducted a 75–90 minute naturalistic observation of the child and parent in the home to obtain data on SIB, problem behavior, and communication. Two research staff were present for each visit; efforts were made to videotape as unobtrusively as possible. To increase the likelihood that SIB would be observed during this session, FAI results were reviewed prior to the home visit, and visit times and activities were arranged accordingly. After the visit, videotapes were reviewed and scored by research staff. Data were collected on frequency of SIB and other problem behavior, as well as child communication.

Observational Data Analysis

Each home observation was reviewed and coded, and data were collected, analyzed and reliability calculated using the Noldus Observer XT (version 9.0; Noldus Information Technology b.v., 2009). Frequency data were collected for SIB, other problem behavior and child communication.

Although SIB was operationalized specifically for each child, SIB were generally defined as any behavior with all 3 of the following components: 1) child purposely touches or makes contact with self (not incidental contact); 2) is atypical; and 3) approximates known topographies of self-injury. In addition, specific topographies of SIB were delineated. These included head banging, head hitting, self-biting, body hitting, picking/scratching self, hair pulling, eye poking, kicking self, and slamming body against surfaces.

Other problem behaviors, including aggression, disruptions, dangerous acts, and pica were operationally defined and scored for each participant. Topographies of aggression included hitting, kicking, pinching, scratching, biting, slapping, hair pulling, grabbing, eye poking, head butting, spitting, verbal aggression, choking, and throwing objects within 1 ft of a person. Disruptive behavior included throwing objects, swiping objects off surfaces, banging on surfaces from 6 in. or more, breaking/tearing objects, and kicking objects. Dangerous behavior included climbing on furniture, jumping on/off furniture, touching electrical sockets/heater vents, banging on windows, and climbing on windowsills. On a case by case basis, elopement, pica, and were included as target behaviors.

In addition to SIB and problem behavior, frequency data also were collected on forms of child communication including: gestures (actions directed towards a person or object in the presence of another person that appears as an attempt to communicate nonverbally); non-word vocalizations (vocalizations consisting of vowels, consonants, and phonemes that are not words); single word utterances (vocalizations consisting of single words, including clear approximations of words given context, such as “ba-ba” for bottle); and multiple word utterances (vocalizations consisting of more than one nonidentical words).

Interobserver Agreement

Prior to video scoring, observers were trained to an interval-by-interval exact agreement criterion of 80% or better on the Noldus observation system. Training was accomplished, first, by reviewing the observation system and observation codes with observers, then through rehearsal with training videotapes. Reliability was calculated as Proportion of Agreements within a 5-second tolerance window using Noldus Observer XT 9.0. A total reliability score was calculated across all child and parent behaviors, although parent behaviors are not discussed in this paper. This involved dividing the number of agreements across 10-second intervals between observers by the number of agreements plus disagreements, and multiplying the result by 100. An established “primary” observer coded training videos for a minimum of 25% of the filmed sequences analyzed. Research assistants

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were trained to identify and code all SIB, other problem behavior and child communication to a training criterion of 80% of sample video before coding participant files.

Reliability data were collected for 6 of the 15 video observations. Percentage of agreements was calculated, and averaged 86.57 % across the 6 videos.

Reliability data were collected for 22 of 29 (75.9%) SIT Scales. Interval agreement across all observations was calculated for Part 1: General Description, Number Index, Severity Index and Overall Risk Estimate and totaled 95.5%, 90.9%, 81.8% and 100%, respectively.

Results

Child demographic information is presented in Table 1. Age of participants ranged from 8 months to 4 years, 3 months, with a mean age of 23.4 months; approximately 2/3 of the participants were under 2 years of age. All 32 participants were at risk for or met criteria for developmental delay according to study screening criteria. Twenty of 32 participants (63%) had a developmental disability or developmental delay by history or by assessment on the Battelle DI. 4 participants (13%) were previously diagnosed with an autism spectrum disorder. Other identified conditions were chronic ear infections (9%), cerebral palsy (3%), Joubert syndrome (3%), and other diagnoses (27%; feeding disorder, asthma, communication disorder, motor/vision/hearing impairments, reflux). Three children had no reported diagnoses and no delay on the Battelle DI; four children had not been previously evaluated.

Children received a range of educational and therapeutic services, including speech therapy (43.3%), physical therapy (30%), and occupational therapy (26.7%). Half of the participants were receiving Infants and Toddlers services or preschool services. Information was not obtained from 2 parents. Only 1 participant was taking medication (Adderall) for behavior problems.

Behavioral Histories of SIB

Information reported from parents regarding the onset of their child's SIB, including the age at which SIB was first observed, the first topography(ies) of SIB, and the parent- reported circumstances surrounding the first occurrence of the behavior; these data are summarized in Table 2. The average age of SIB onset was 17.1 months (range, 1 to 54 months). Parents of 17 participants reported that SIB emerged at or prior to 1 year of age.

Head banging was the first topography of SIB observed for 46.7% of participants; hand-to-head hitting was noted as the first topography of SIB for 26.7% of children, followed by skin picking/scratching (13.3%), hair pulling (13.3%), throwing self to floor (13.3%), self-biting (6.7%), and eye poking (3.3%). One parent was not able to recall the first form of SIB observed. For five participants, between 2 and 4 topographies of SIB were noted to emerge simultaneously.

With regard to the circumstances surrounding the first occurrence of SIB, 46.9% of parents indicated that the behavior emerged in response to environmental events, such as their child not getting his or her way, becoming frustrated, or becoming upset when a preferred item/activity was removed. For other participants, SIB appeared to emerge in response to more internal factors, such as occurring in a stereotypic/repetitive manner (18.7% of participants), occurring at bedtime (9.4%), or in response to pain or illness (9.4%). Circumstances were not reported for the remaining 15.6% of participants.

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SIB and Other Problem Behavior at Assessment

Parent report of the current topographies of problem behavior exhibited by their child was cross-referenced across study measures (Demographic Form, FAI, and SIT Scale). Thirty of the 32 children exhibited multiple topographies of SIB. The number of topographies of SIB reported ranged from 1 to 9, with an average of 4.3. As can be seen in Table 3, 28 of 32 children (87.5%) exhibited head banging. Other topographies included throwing self to floor, hand-to-head hitting (65.6% and 53.1%, respectively), skin picking/scratching (37.5%), self-biting (25%), hair pulling (25%), body hitting (18.8%), eye poking (9.4%), and self-kicking (6.3%). The reported presence of other problem behavior is also summarized in Table 4. In addition to SIB, parents indicated that their children exhibited aggression (82.8%), disruptive behavior (44.8%), pica (55.2%), dangerous behaviors (e.g., climbing; 34.5%), tantrums (72.4%), and stereotypy (41.4%). Participant topographies of problem behavior ranged from 1 to 7, with a mean of 4.67.

As a potential indicator of parental concern or severity of child behavior, parents were asked via the Demographic Form if they had contacted a professional regarding their children's SIB. Over half of the parents (53.1%) had discussed their children's SIB with a pediatrician, while parents of a 25% of the children had not made any professional contact. Other parents contacted this research study (15.6%), a child psychiatrist (9.4%), a child psychologist (9.4%), a social worker (3.1%), a teacher (3.1%), and a neurologist (3.1%). A portion of parents (15.6%) contacted other resources that weren't listed. Eight parents indicated that they had contacted more than 1 professional regarding their child's SIB.

In regard to previous behavioral interventions for SIB or other problem behavior, 81% of parents had not sought any treatment services. One parent sought medical evaluation for SIB and another sought a medical evaluation for other problem behavior. Two parents sought outpatient behavioral treatment for SIB, one parent sought medication for both SIB and other problem behavior, and one parent sought school-based services for SIB.

Finally, as part of the FAI, parents were asked: "What *one thing* could you do that would most likely make the undesirable behaviors occur?" Parents were asked to direct their responses specifically to SIB. Four parents did not report this information, and one parent could not identify any one thing that might evoke SIB. According to parent report, environmental situations rather than internal variables were most likely to evoke child SIB. Specifically, 56.3% of parents indicated that their child would exhibit SIB if: someone did not give the child his/her way, removed items from the child, or denied the child access to requested items. Additionally, 21.9% of parents indicated that their child would engage in SIB to get out of situations such as diaper changes, bedtime, and mealtime.

Standardized Measure of Problem Behavior

Scores for ABC items 2, 50 and 52 scores were summarized (see Table 4). Twenty-nine of 32 parents (90.6%) endorsed a score of 1, 2, or 3 on at least one of the items regarding child SIB. By item, parents expressed some level of concern on at least one item for 81.3%, 75%, and 75% of participants across items 2, 50, and 52, respectively. Concern that the behavior was moderate or severe in degree was reported for 18.3%, 18.3%, and 15.6% of participants across the three items, respectively.

Physical Assessment of SIB

Results of the Self-Injury Trauma Scale Number Index for 29 participants were summarized. Injuries from SIB were documented for 16 participants. Most children (37.9%) had between 1 and 4 injuries; however a relatively substantial number of participants (17.2%) had between 5 and 8 injuries. With regard to SIB severity, mild or superficial injuries were noted

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for 44.8% of participants. Moderate injuries were documented for 2 participants, and 1 participant met criteria for "severe" injury, indicating that the child's SIB resulted in a deep or extensive break in the skin, or avulsion was present. That same child was the only participant who received a "High" Overall Risk Estimate; all other participants had a "Low" overall Risk Estimate indicating that they did not have any injuries or only very superficial markings.

Direct Observation of SIB

Home observation data for 15 of 32 participants are summarized in Table 4. All 15 participants exhibited SIB during the observations, and 14 of 15 exhibited other problem behaviors. Frequency of SIB ranged from 3 to 300 occurrences; frequency of problem behavior also ranged from 2 to 835 occurrences. Communication data from the home visit indicated that 4 of the children did not use verbal communication; 3 used single word utterances, and 8 used multiple word phrases/sentences.

SIB and Communication

Results of the PLS-4 indicated that 41% of participants exhibited language delays (13% mild, 28% significant). Over half of the participants scored within the average range of development (3% high average, 34% average, 16% low average). One child scored within the advanced development range.

Several analyses were conducted to examine the relationship of child communication to SIB. The sample was divided into 2 groups based upon scores on the PLS-4. Participants with PLS-4 total scores of 85 and above (n = 16) were categorized as typical language development; participants with PLS-4 total scores below 85 (n = 16) were categorized as delayed language development. An independent-samples t-test was conducted to compare number of reported SIB topographies for the 2 groups. No significant differences in number of SIB topographies were found between the delayed language (M=3.38, SD = 1.928) and typical language (M = 3.33, SD = 1.234) groups; t (29) = 0.071, p = 0.944.

Nonparametric tests were performed to determine if group differences existed on ABC items associated with SIB, specifically items 2 ("Injures self on purpose"), 50 (Deliberately hurts himself/herself"), and 52 (does physical violence to self"). While parents of participants in the delayed language group were slightly more likely to rate their children's SIB on these items with a "3" indicating SIB was a severe problem, Mann-Whitney U tests did not reveal significant differences between groups on these items (p = .860, .785, .740, respectively).

The two groups also were compared on report of injuries via the SIT scale. Specifically, scores on the SIT scale Number Index were divided into 2 categories ("No injuries" and "Any injuries"). Likewise, scores on the SIT scale Severity Index were divided into 2 categories ("No injuries" and "Any severity"). Mann-Whitney U tests were performed to determine if the groups differed on the number of injuries or severity of injuries according to the SIT scale. Results revealed no significant differences for number (p = .839) or severity (p = .839) of injuries.

Finally, group comparisons on SIB were conducted for 15 participants for whom direct observational data were available. Means for SIB from the home observations were calculated for each participant. An independent-samples t-test was then conducted to compare SIB from the home observation for 2 groups. No significant differences in SIB were found between the delayed language (n=7, M=1.5, SD=) and typical language (n=8, M=0.64, SD=1.234) groups; t (13)=1.434, p = 0.175.

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Discussion

This study reports the initial findings for the first phase of a 2-year longitudinal study whose aim is to identify risk factors for SIB in young children. The purpose of the current study was to describe emerging SIB (i.e., SIB onset within 6 months) in a sample of children with or at risk for IDD. Thirty-two children were assessed using interviews, direct observation procedures, developmental and language testing, and standardized measures of behavior in an attempt to observe and describe SIB at its earliest stages. Although preliminary, the results of the present study support previous findings that identification and characterization of emerging SIB in young children not only is possible, but also informative.

There were several notable findings in the current study. First, with regard to the emergence of SIB, the early age of emergence and the rapidity with which SIB progressed was surprising. More than half of the children had an onset of SIB at or prior to 1 year of age. Also, while participants had (by entry criteria) begun to display SIB within the previous 6 months, even within that brief window of time, several parents noted that multiple topographies of SIB emerged simultaneously. Furthermore, 30 of 32 parents reported that their child currently exhibited multiple topographies of SIB; these reports were supported by the direct observation data collected in the children's homes. Thus, it appears that for some children, SIB may emerge and within a span of months quickly expand in terms of its forms.

Second, results of the age of onset and the topography of SIB first observed at emergence are consistent with previous reports. The mean age of onset of SIB in this study was 17.1 months, similar to the ages of 16.4 months reported by Berkson et al. (2001), and 17 months for a clinical sample reported by Kurtz et al. (2003). Richman and Lindauer (2005) reported a later age of SIB onset (22.6 months for proto-SIB, 24.8 months for SIB), but this may be accounted for by their study sample, which only included children with severe disabilities and genetic disorders. In the present study, head banging was the first topography of SIB observed for the majority of cases, followed by hand-to-head hitting; these forms accounted for 73.4% of cases. Again, these findings are fairly consistent with Berkson (2002), wherein head-directed SIB (head banging/head hitting) was the most prevalent form of SIB in 91.9% of cases, and with Kurtz et al. (2003), who reported head banging and head hitting as the forms of SIB first noted by 80% of parents.

Third, SIB is often overlooked at this age because it does not cause injury (Berkson & Tupa, 2000). However, the SIT Scale, which was developed with and is typically used with older individuals with severe SIB, was effective in quantifying both frequency and severity of SIB injuries in our sample. Surprisingly, even in a sample of children who had very recently begun to exhibit SIB, injuries were already apparent in 50% of participants, some of whom had multiple injuries (albeit mild in terms of severity). Thus, the SIT Scale may be useful in detecting emerging SIB in young children, as well as quantifying progressive severity of SIB throughout early childhood. The latter will be examined in future research.

This study also provides additional data on problem behaviors co-occurring with SIB. Although consistent with the findings of Kurtz et al. (2003) and MacLean et al. (2010) that young children with SIB also exhibit a wide range of problem behaviors such as aggression and disruptive behavior, the results of the present study are concerning given the very young age of the participants and the emerging nature of their SIB. The findings of multiple topographies of problem behavior co-occurring with SIB suggest that a more serious behavior disorder may be developing in some children. Similar to the SIT Scale with SIB, the ABC was useful in this study in detecting a level of clinical concern that warrants continued monitoring by parents and professionals.

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Previous studies have reported that parents often do not seek professional attention for SIB or are advised by pediatricians to ignore this behavior, assuming it will resolve itself (Kravitz et al., 1960; Romanczyk et al., 1982). In the current study, 25% of parents did not contact a professional, and those who did, discussed their concerns at a routine pediatrician visit. These findings generally were consistent with reports by parents of young children with severe SIB receiving treatment services (Kurtz et al., 2003). However, based on responses to questions regarding SIB on the ABC, 90% of parents in the current sample expressed some level of concern regarding their child's SIB. This finding is consistent with results reported by Ellingson, Briggs-Gowan, Carter, and Horwitz (2004) regarding parental concern over emerging behavior problems. It is possible that parents recognize SIB is a problem, but may not receive adequate guidance in addressing it in its early stages. This finding, taken together with the rapid progression of SIB noted in the current study, highlights the importance of educating parents and professionals to communicate regarding potential emerging topographies of the behavior and consider referrals for early treatment.

The direct observation data provide a rich source of information on the rate of SIB as it emerges, and on occurrence of both appropriate communication and other problem behaviors. One potentially important finding was the difference in rate of SIB between the delayed language and typical language groups (1.5 and 0.64 responses per minute, respectively). While the mean differences were not statistically significant, likely due to lack of power from a small sample size (n=15), participants in the delayed language group exhibited SIB-like behaviors over twice as much as participants in the typical language group. This mean difference provides directional support for the hypothesis that child language ability is related to SIB. Given that the data are for the first assessment period of a longitudinal study, it is hypothesized that these differences will become more pronounced and statistically significant over time.

Another issue that arose from the observational data had to do with the distinction made in previous studies (Berkson et al., 2001; Richman & Lindauer, 2005) between proto-injurious and injury-producing SIB. While the term "proto-injurious SIB" appears to have utility in understanding SIB in some circumstances, it is unclear how the term can be equitably applied to the variety of topographies described in the SIB literature. Specifically, the term does not fully take into account certain dimensions of SIB, such as force and duration of the behavior, as well as the cumulative effect of certain behaviors. Behavioral topographies that do not result in immediate, observable injury may therefore be overlooked, especially in the early stages of SIB emergence. There are two potential instances where use of the term proto-injurious may be misapplied. In one case, an injury may occur rapidly, but is not observed, for example when head banging produces immediate but unobservable injury such as retinal detachment. Similarly, injury may be produced only after prolonged engagement in the behavior, For example, hand mouthing over a prolonged period often results in skin callusing and breakdown. The determination of when hand mouthing should be considered "injury-producing" may be arbitrary and irrelevant, and places increased importance on the behaviors that are more temporally related to the occurrence of injury. Injury from hand mouthing in this example likely is the result of a cumulative effect of prolonged engagement in the behavior. Applying the concept of "proto-injurious SIB" to this example would consider the initial occurrences of hand mouthing as non-injury producing when all the responses are of equal intensity and part of the same response class. Therefore, it may be best to consider all behaviors that are topographically similar to well-known forms of SIB in the same class, especially when trying to understand the early stages of the behavior. Given our focus on the emerging nature of the behavior, we based on our direct observations on the topography of the behavior rather than its outcome, and used the SIT Scale to systematically assess frequency and severity of injury. Future observational studies could examine whether

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this distinction is a necessary or useful one, and if it assists in differentiating participants in terms of severity of the disorder, or in relation to clinical diagnosis.

One additional finding of note relates to the rate of SIB during home observations. Specifically, results indicated that of the 5 participants with high frequency SIB and problem behavior, 4 were diagnosed with autism spectrum disorder. In contrast, none of the children with low frequency SIB were diagnosed with autism. While previous research has not identified autism per se as a risk factor for early onset SIB, the current findings suggest that this specific clinical population may be in need of particularly close monitoring for emerging SIB.

Similarly, the severity of communication deficits is another variable that warrants further examination in relation to emerging SIB in young children. Epidemiological studies (e.g., McClintock et al., 2003; Rojahn et al., 1999) have shown that expressive verbal skills are negatively related to SIB. Observational studies of preschool children with disabilities (e.g., Sigafoos, 2000) have demonstrated an inverse relationship between receptive language skills and aberrant behavior. More specifically, communication and language deficits appear to set the occasion for behavior problems such as SIB to develop, as these behaviors often serve communicative functions (Carr & Durand, 1985a; Carr & Durand, 1985b). Language and communication scores for the current sample were below that of same age peers. The average PLS-4 total score for the entire study sample was 82.5 (SD = 20.9), roughly 18 points below the standardization sample mean. This finding alone does not support a relationship between language delay and the emergence or persistence of SIB. However, given the large base of evidence that communication deficits are frequently observed in older individuals with SIB (Rojahn et al., 1999), and communication-based interventions are often cornerstones to treatment (Tiger, Hanley, & Bruzek, 2008), the current findings are consistent with language deficits being implicated in the early stages of SIB.

Several specific analyses conducted to determine if participant language/communication skills were related to various aspects of SIB were not statistically significant. In the case of the relationship between language skills and the number of SIB topographies or the occurrence of injuries from SIB, the delayed language and typical language groups were nearly identical. Since the entire sample was relatively equivalent in terms of the recency of SIB onset, it may be that it was too early in the course of the disorder to detect differences. It is hypothesized that the delayed language group will continue to exhibit more topographies of SIB and more injuries from SIB than the typical language group.

In the case of the relationship between child language skills and parent concern over SIB reported via the ABC, there were no statistically significant differences between the groups. However, parents of participants in the delayed language group tended to rate higher levels of concern over their children's SIB than parents in the typical language group. Again, the lack of statistically significant differences could be due to the small sample size or to the early point in the study at which the analyses were conducted. However, as previously noted, it is an important finding that parents recognize SIB as a concern this early in the course of the behavior. This concern may be amplified when a communication or language deficit also is present, which may in turn result in increased parental attention to and inadvertent reinforcement of SIB. Indeed, Murphy et al. (1999) noted that early teacher concern about SIB was correlated with increases in child SIB.

Finally, the relationship between our results and prevailing theories of SIB development warrants consideration. While we did not systematically measure stereotypy, only 37% of participants exhibited stereotypy at the start of the study. SIB emerging from stereotypy did not appear to be the case for this sample, thus our results do not provide clear support for

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Guess and Carr's (1991) model of SIB development. In fact, the Guess and Carr model may describe a course of development for SIB whose origins are more sensory in nature and more likely to be maintained by automatic reinforcement. Our sample appears different from Richman and Lindauer's (2005) sample, in that not only did the majority of our participants not display stereotypy, but multiple topographies of SIB and multiple forms of problem behavior emerged very rapidly. Thus, our participants may present a completely different course of emergence and maintenance of SIB and other behavior problems. Additional research in this area is needed.

Several limitations to the present study should be noted. Although verified to some extent by direct observation, study results are based on a single assessment point and on parent report. However, multiple methods verified occurrence of SIB, and results were consistent with previous research. Also, nature of study sample—parents with concern about their child's SIB and also interested in research participation—may differ from a true sample of young children with emerging SIB. Also, our sample was heterogeneous in terms of age, developmental functioning, and communication skills, as compared to participants in previous studies (Berkson et al., 2001; Murphy et al., 1999; Richman et al., 2005). Despite some dissimilarity in sample characteristics, similar results were obtained in our study. Finally, our characterization of emerging SIB must be considered preliminary, as it is not yet known whether these children will go on to develop chronic SIB. Future studies will report on persistence of SIB over time.

There are a number of promising avenues of research related to emerging SIB. Training of parents and professionals in identifying the behavior at its earliest stages is needed. Additionally, studies are needed to develop and evaluate standardized measures for detection and monitoring of emerging SIB in children with or at risk for IDD. Studies also should examine the relation between early onset SIB and the development of other problem behavior, and the impact of skills and communication deficits. Finally, the findings of the current study together with those of previous investigations of early onset SIB suggest that it is feasible to begin to examine the problem of SIB from a prevention perspective. To begin constructing a prevention framework for SIB, however, requires experimentally verified predictors for persistent SIB in young children, which to date do not exist. We look to continue, along with other researchers, studies on potential predictors of this disorder, with the ultimate goal of systematically developing and evaluating prevention-based treatments for young children at risk for SIB.

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Table 1

Participant Demographic Characteristics

Participant	Sex	Age (years-months)	Diagnosis/Medical History	Battelle DI: Global Development
1	M	4-3	Autism, Feeding Disorder	Significant Developmental Delay
2	M	1-5	Not Yet Evaluated	Significant Developmental Delay
3	M	1-2	Developmental Delay	Average Development
4	M	2-4	None	Significant Developmental Delay
5	M	1-10	Cerebral Palsy, Communication Disorder, Feeding Disorder	Significant Developmental Delay
6	M	1-1	Not Reported	Mild Developmental Delay
7	M	1-7	None	Low Average Development
8	M	4-6	Pervasive Developmental Disorder, Developmental Delay	Significant Developmental Delay
9	M	4-6	Pervasive Developmental Disorder, Developmental Delay	Significant Developmental Delay
10	M	1-6	Not Reported	Average Development
11	M	1-3	None	High Average Development
12	M	2-2	Chronic Ear Infections	Average Development
13	M	1-5	None	Significant Developmental Delay
14	M	1-5	None	Significant Developmental Delay
15	F	1-5	None	Significant Developmental Delay
16	F	0-8	Developmental Delay	Low Average Development
17	M	2-5	Developmental Delay	Low Average Development
18	M	3-0	Pervasive Developmental Disorder, Developmental Delay	Significant Developmental Delay
19	M	1-4	Not Reported	Average Development
20	M	3-6	Developmental Delay	Mild Developmental Delay
21	M	1-8	None	Average Development
22	F	1-3	Developmental Delay, Chronic Ear Infections, Asthma, Acid Reflux	Average Development
23	M	1-1	Not Reported	Average Development
24	M	1-0	Not Yet Evaluated	Low Average Development
25	M	1-1	Not Reported	Average Development
26	M	2-8	Not Yet Evaluated	Average Development
27	M	3-0	Developmental Delay	Significant Developmental Delay
28	M	1-6	Chronic Ear Infections	Average Development
29	M	1-0	Joubert Syndrome, Hearing and Visual Impairment, Developmental Delay	Significant Developmental Delay
30	F	0-10	Not Yet Evaluated	Low Average Development
31	F	1-3	None	Significant Developmental Delay
32	F	3-4	Developmental Delay	Significant Developmental Delay

Note: Child diagnosis as reported from a checklist of diagnoses on the parent-completed demographic form; checklist included “None” and “Not Yet Evaluated” as options to select.

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Table 2

Parent Report of Age of SIB Onset, First Topography of SIB, and Events Surrounding First Occurrence of SIB

Participant	Age of SIB Onset (years-months)	First Topography of SIB	Events Surrounding First Occurrence of SIB
1	1-0	head banging, hand-to-head hitting	temper tantrum
2	1-3	head banging, hand-to-head hitting, skin picking/scratching, hair pulling	during the day for no reason
3	0-10	head banging	just sat against the wall and started tapping head
4	1-9	hand-to-head hitting	not indicated
5	1-3	head banging, hand-to-head hitting	didn't want to go to bed
6	0-9	skin picking/scratching	sickness-tonsilitis
7	1-4	head banging	due to sister taking things from him
8	4-3	biting self	frustration, not getting own way
9	4-5	throwing self to floor	frustration with parents
10	0-11	unknown	unknown
11	0-10	head banging	bed time when falling asleep
12	1-8	head banging	bedtime
13	0-11	head banging	in the high chair
14	1-0	head banging	while sitting in high chair waiting for food
15	1-0	hand-to-head hitting, hair pulling	child was in living room while parent in kitchen; separated by gate
16	0-3	skin picking/scratching, hair pulling	showed the behavior when came home from hospital
17	2-1	head banging	when I said no
18	2-6	eye poking	not indicated
19	1-1	throwing self to floor	I took something away from him and he threw himself on the floor
20	3-2	head banging	bedtime
21	1-3	hand-to-head hitting	when he does not get his way
22	0-9	hand-to-head hitting	after we woke her up in the morning
23	0-10	head banging	hitting his head on the floor when he is frustrated
24	0-9	hand-to-head hitting	I believe he was sick
25	0-9	unknown	unknown
26	2-0	throwing self to floor	I told him that he had to wait a minute for me to get his juice
27	2-0	throwing self to floor	sickness
28	1-0	head banging	frustration tantrum over toy sharing
29	0-2	skin picking/scratching	head shaking/leg and foot rubbing since birth, biting since first top tooth emerged
30	0-10	hair pulling	not indicated
31	0-10	head banging	got mad or something
32	2-4	biting self	transitioning between activities

Note: Wording used to describe “Events Surrounding First Occurrence of SIB” was taken directly from parent reports on the Demographic Form; question was open-ended.

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Table 3

Summary of topgraphies of child self-injury and other problem behavior at beginning of study

Category	Number of Participants (N=32)	Percentage of Participants
Current Topography of SIB		
Head banging	28	87.5
Hand-to-head hitting	17	53.1
Skin picking/scratching	12	37.5
Biting self	8	25.0
Hair pulling	8	25.0
Body hitting	6	18.8
Kicking self	2	6.3
Eye poking	3	9.4
Throwing self to floor	21	65.6
Current Topography of Other Problem Behavior		
Aggression	24	75.0
Disruptive Behavior	13	40.6
Dangerous Acts	10	31.3
Pica	16	50.0
Stereotypy	12	37.5
Elopement	8	25.0
Tantrums	21	65.6
None	1	3.1

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Table 4

Frequency of ABC Item Scores: Comparison of Delayed Language and Typical Language Participants

	ABC2 *"Injures Self on Purpose*		ABC50 *"Deliberately hurts himself/herself"*		ABC52 *"Does physical violence to self"*	
Item Score	**Delayed Language**	**Typical Language**	**Delayed Language**	**Typical Language**	**Delayed Language**	**Typical Language**
0: Not a Problem	5	1	5	3	4	4
1: The behavior is a problem but slight in degree	3	8	3	7	4	5
2: The problem is moderately serious	4	5	4	4	5	5
3: The problem is severe in degree	4	2	4	2	3	2

Note: Participants with PLS-4 total scores below 85 (n = 16) were categorized as delayed language and participants with PLS-4 total scores of 85 and above (n=16) were categorized as typical language.

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Table 5

Direct Observation Data for 15 of 32 Participants

	PROBLEM BEHAVIOR				COMMUNICATION							
Participant	**SIB Resp per Min**	**SIB Freq per Obs**	**OPB Resp per Min**	**OPB Freq per Obs**	**Gestural**	**Gestural**	**Nonword**	**Nonword**	**Single Word**	**Single Word**	**Multiple Word**	**Multiple Word**
001	2.73	300	7.56	281	0.95	104	0.61	67	-	-	-	-
003	0.25	23	0.09	8	0.41	38	0.02	2	-	-	-	-
007	2.33	260	2.04	227	0.74	82	0.13	5	-	-	-	-
008	0.12	9	0.06	4	0.18	13	1.33	96	-	-	-	-
012	1.67	156	2.13	198	0.56	52	2.39	223	0.34	32	0.41	38
013	2.88	269	8.94	835	0.33	31	2.58	241	0.39	36	0.19	18
014	0.22	20	0	0	0.51	47	1.13	105	1.10	102	0.01	1
015	2.98	280	0.46	43	0.38	36	2.84	267	1.12	105	0.02	2
023	0.15	13	0.23	20	0.50	44	2.57	226	1.56	137	0.61	54
026	0.03	3	1.39	122	0.52	46	1.83	161	1.64	144	0.30	26
027	0.23	17	0.1	7	0.4	29	0.88	64	2.18	159	2.47	180
028	0.51	37	0.03	2	0.11	8	0.81	59	0.23	17	-	-
029	0.94	75	0.44	35	0.40	32	2.61	208	0.70	56	0.01	1
030	0.14	13	0.05	5	0.41	37	1.52	139	0.01	1	-	-
033	0.18	15	0.71	61	0.28	24	1.78	152	0.08	7	-	-

Note: SIB = self-injurious behavior and behaviors that were topographically similar to SIB; OPB = other problem behavior; Resp per Min = responses per minute; Freq per Obs = frequency per observation; Gestural = gestural communication; Nonword = nonword vocalizations; Single Word = single word utterances; Multiple Word = multiple word utterances.

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