

# **Assessment and Treatment of Self-injurious Behavior in a Student with Moderate Mental Retardation**

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## **Abstract**

The purposes of this study were to assess the functions of self-injury in one student with moderate mental retardation, and to develop appropriate functional-based intervention to reduce such aberrant behavior. An analogue functional analysis was used in Experiment 1 to assess the function of the student's self-injurious behavior which might serve to escape from task demands, get attention from others, or produce sensory self-feedback. Results of functional analysis indicated that his self-injury was maintained by avoidance of demanding academic task and producing self-sensory feedback. For its function sake, non-contingent taking a rest was applied to task demand conditions, and preferred toys were employed to compete with the consequence of sensory feedback during alone conditions. The multiple-baseline design across operant functions was used in Experiment 2 to further evaluate the treatment effects on the self-injurious behavior. Specifically, sensory alternatives and non-contingent reinforcement were provided during all intervention sessions. Results of the present study demonstrated negative social and sensory reinforcement was a determinant of self-injurious behavior in this student. Preferred sensory stimulation could be successfully substitutable for self-injurious behavior. Additionally, non-contingent rest from task could reduce such aberrant behavior as well.

**Key words: self-injury, functional analysis, mental retardation.**

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Self-injurious behavior (SIB) is a serious, chronic problem influencing about 10% to 14% of individuals with mental retardation (Iwata & Rodgers, 1992). It occurs frequently in form of face slapping, head banging, and hand biting (Durand & Crimmins, 1988). Such aberrant behavior is so obvious and physically harmful that catches caregivers' and special educators' attention all the time in naturalistic settings (Durand & Crimmins, 1988). Injuries and health problems caused by this behavior could highly increase social isolation, restricted educational and vocational opportunities, and costly medical and residential care (Kurtz et al., 2003). Therefore, developing appropriate intervention to decelerate such aberrant behavior is indeed needed.

Behavioral research typically characterizes self-injurious behavior as learned behavior maintained by its reinforcing consequences (Iwata, Pace, et al., 1994). The environmental events could contribute to reinforce the self-injurious behavior. Earlier researches have shown that some variables in the naturalistic environment could be identified as involved in the maintenance of self-injurious behaviors. These variables included social attention (Carr & Durand, 1985), tangible consequences (Durand, 1986), escape from unpleasant situation (Durand, 1982), sensory consequences (Durand, 1982), and multiply motivation (Durand, 1982).

Currently, quite a few studies have focused on identifying the functions of severe problem behavior via functional analysis methodology (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994; Kurtz et al., 2003) and then adopting function-based interventions (Iwata, Pace, et al., 1994; Kurtz et al., 2003; Pelios, Morren, Tesch, & Axelrod, 1999). For example, Kurtz et al. (2003) investigated 30 children with SIB (one case was discontinued at the parent's request due to the severity of tantrums), and found that negative social reinforcement accounted for 1 case (3.4%). Positive social reinforcement accounted for 11 cases (37.9%), sensory reinforcement accounted for 4 (13.8%), and multiple controlling variables accounted for 2 cases (7%). However, 11 cases (37.9%) were undifferentiated. In contrast, Iwata, Pace, et al. (1994) demonstrated the utility of functional analysis methodology in a study of 152 individuals with SIB, and found that negative social reinforcement accounted for 58 cases (38.1%). Positive social reinforcement accounted for 40 cases (26.3%), sensory reinforcement accounted for 39 (25.7%), and multiple controlling variables accounted for 8 cases (5.3%). Seven sets of data (4.6%) showed inconsistent

patterns of responding that were uninterpretable. In summary, in Iwata, Pace, et al.'s study, functions for SIB were identified for 95% of the cases. In contrast, contrary to those comprehensive studies aforementioned, some researchers have shown that SIB served to maintain single function-either positive social or negative social reinforcement or sensory reinforcement (e.g., Fischer, Iwata, & Worsdell, 1997; Kahng & Iwata, 1998). For instance, Fischer et al. (1997) demonstrated social attention could contribute to the exhibition of SIB in 36 participants with developmental disabilities in an institution. In consistent with the study of Fischer et al., Moore, Mueller, Dubard, Roberts, and Sterling-Turner (2002) have indicated that self-injurious behavior emitted by one girl with developmental disabilities could be maintained by social attention as well. Contrary to these studies, Kahng and Iwata (1998) investigated 66 persons with developmental disabilities, and found that their SIB was maintained by escaping from task demands. Similarly, Chen (2003) studied one student with mental retardation and found that his SIB was maintained by escaping from demands as well. On the other hand, Lindberg, Iwata, Roscoe, Worsdell, and Hanley (2003) found that self-injury emitted by 3 persons with developmental disabilities could be maintained by sensory reinforcement. Therefore, SIB could be displayed in order to gain different social or sensory functions from cases to cases. Further extended analyses in this aberrant behavior are needed.

With respect to the treatment of SIB, if this behavior was maintained by positive social reinforcement, non-contingent attention (or access to food or materials) or functional communication training could be highly effective in decreasing SIB (Chang, 2003; Iwata, Pace, et al., 1994; Kurtz et al., 2003; Lai, 2003). If SIB was maintained by negative social reinforcement, non-contingent removal of task demands or other aversive stimuli or functional communication training could be used to reduce such behavior (Chang, 2003; Chen, 2003; Iwata, Pace, et al., 1994; Kurtz et al., 2003; Lai, 2003). Additionally, if SIB was maintained by sensory reinforcement, non-contingently continuous access to alternative sources of stimulation could be used to decelerate this behavior (Iwata, Pace, et al., 1994; Kurtz et al., 2003).

*Purpose of the study.*

The first purpose of this study was to examine possible functions of one student's

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self-injury maintained mainly by positive and/or negative social reinforcement, and/or sensory reinforcement. Analogue functional analyses were used in Experiment 1 to assess this aberrant behavior which served as escape from task demands, obtaining attention from the investigator, and producing self-stimulation.

Secondly, if the functions for the participant's self-injurious responses was maintained either by sensory or social reinforcement, this study would test functional analysis findings via a concurrent operant procedure. Experiment 2 would be used to evaluate the effect of interventions derived from prior functional analysis on this self-injurious behavior.

### *Hypotheses of the study.*

1. The functions of this student's self-injurious behavior may be maintained either by positive social reinforcement, negative social reinforcement, or sensory reinforcement.
2. Functional-based intervention program developed from findings of functional analyses may be successfully employed to decelerate this student's self-injurious behavior.

### General Method

The present study used single subject methodologies to investigate one student who exhibited lots of self-injurious behavior. Functional analyses were used to examine possible contingencies which might maintain this student's self-injury.

### *Student and settings.*

Tim was enrolled in a self-contained class located in a regular school which included one teacher and one teacher assistant in each class. He was selected because of his high rates of self-injurious behavior that were exhibited throughout the day. He was a 9-year-old boy classified as having moderate mental retardation. He could not walk without assistance. Tim depended on others for all his care. He sat in a wheelchair joining the physical education and art class. He could understand two-step directions at times. He can speak with one word or two words to express his needs. He often sat in a wheelchair and hit his head repetitiously.

*Measures.*

The dependent variables were self-injurious responses. His self-injurious response was defined as “Hitting his head with either his right fist or palm.” The investigator videotaped each condition using a videocassette recorder and a stopwatch. Two observers recorded the frequency of self-injurious responses by employing a 15-second partial interval sampling method. All data were converted to percentage of 15-second intervals during which self-injurious behavior occurred.

*Interobserver agreement.*

Before conducting the functional analysis, two graduate students in special education were trained for 4 hours to use the observational system and reached a 90% agreement criterion, and then served as observers for all sessions. These two observers recorded data independently and compared with data sheet simultaneously. Across experiments an average of 23% sessions (range, 20% to 31%) was scored for interobserver agreement. An agreement was computed using an interval-by-interval agreement method to assess percentage agreement for the frequency of self-injurious behaviors (Kazdin, 1982). Interobserver agreement was computed by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying by 100%. The interobserver agreement for Tim’s self-injurious behavior is 95% (90% to 100%) in Experiment 1, 92% (90% to 100%) in Experiment 2.

Experiment 1: Analogue Functional Analysis

*Method.*

Before functional analysis was conducted, Tim was observed in classrooms to analyze possible antecedent and consequence events. He was observed 4 hr across activities for several days.

A multielement design (Sidman, 1960) was employed to assess the occurrence of self-injury across four conditions: (a) attention, (b) demand, (c) alone, and (d) play (Iwata,

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Dorsey et al., 1982/1994). Each condition was presented once per day for 5 min with a random sequence occurring each day. Sessions were conducted at the same time each day. Session data were collected every other day per week. Twenty four sessions were conducted and all sessions were videotaped by a graduate student and recorded by two graduate students using data sheets. The graduate student positioned video camera facing the student from approximately 2 m, repositioning it if the participant moved. These conditions were used to identify possible operant functions that the self-injury might serve. During the Attention condition, Tim sat in a wheelchair while the investigator sat beside him. When seated the investigator read a magazine, while the subject was provided with toys. If self-injury occurred, the investigator provided 5 s of social comments to him, telling him not to engage in self-injurious responses, and provided physical contact. After the 5 s of social comments elapse, the next occurrence of self-injurious response occasioned a similar consequence. All other responses exhibited by Tim were ignored. During the Demand condition, Tim sat in a wheelchair, while the investigator sat beside him. The investigator delivered a verbal demand every 10 s (e.g., "Put the blocks in the cup"). Correct responses were immediately praised and incorrect or no responses resulted in a partial physical prompt after 10 s elapsed. Any occurrence of self-injurious responses resulted in 30 s cessation of task demands. During the Alone condition, Tim was seated in a wheelchair. No social interaction or activities occurred during this condition. During the Play condition, Tim was seated in a wheelchair while the investigator sat beside him. Tim was provided with various toys identified by the teachers as being preferred and was praised every 30 s in the absence of self-injury (occurrences of self-injurious responses were ignored).

### *Results.*

Figure 1 displays the results of the functional analysis for Tim's self-injurious responses. Throughout 24 sessions Tim exhibited a high frequency of self-injury within Alone and Demand conditions, but a lower frequency in Play and Attention conditions. For all of the sessions a mean of 48% (range, 40% to 55%) of intervals contained self-injury in the Alone condition, a mean of 2% (range, 0% to 10%) of intervals contained self-injury in the Play condition, a mean of 36% (range, 30% to 40%) of intervals contained self-injury in the Demand condition, and a mean of 8% (range, 5% to 10%) of intervals contained self-injury

in the Attention condition. The results suggest that his functions of self-injury were maintained by avoidance of demanding academic task and producing self-sensory feedback.

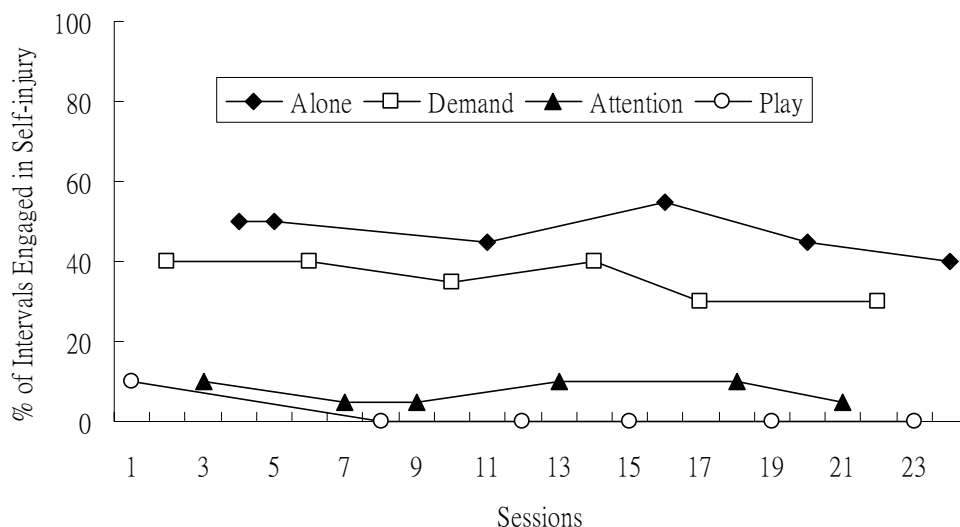


Figure 1. Percentage of intervals engaged in self-injury in analogue functional analysis

### Experiment 2: Functional-based Intervention

#### *Method.*

Experiment 2 examined competing sensory stimulation and non-contingent negative reinforcement as a means to decelerate self-injury and to further evaluate the sensory and social consequences as identified in Experiment 1.

#### *Research design.*

A multiple baseline design across operant functions was used to assess the effects of presentation of sensory stimulation and non-contingent reinforcement for a break on self-injurious behaviors. The percentage of the time intervals with self-injury was the

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dependent variables. The preferred item and non-contingent negative reinforcement developed from Experiment 1 was the independent variable. All sessions were conducted across two conditions including Alone and Demand conditions. Therefore, through observation and data collection, the effects of treatment procedure on the self-injurious responses were assessed.

### *Procedure.*

**Baseline.** Potential operant functions identified in Experiment 1 were incorporated into the baseline phase. Self-injurious responses were assessed via the Demand and the Alone conditions in this phase. These two conditions were further employed to examine the possibly multiple functions which Tim's self-injurious behavior served. The procedures of the Alone and Demand conditions conducted were the same as those in Experiment 1. The same definition and measures of self-injury as Experiment 1 were conducted.

**Treatment evaluation.** A multiple baseline design across operant functions was used to evaluate the treatment effects of functional-based intervention on Tim's self-injurious responses. Tim was exposed to baseline condition until his data were stable. During treatment evaluation in the Alone condition, the most preferred toy (a soft hammer reported by his classroom teachers) was presented. Tim was seated in a wheelchair, and free access to this toy was provided throughout all 5 min sessions. Outside sitting in the wheelchair, no social interaction or activities occurred during this condition. In contrast, during treatment evaluation in the Demand condition, the investigator and Tim were seated next to each other. The investigator delivered a verbal demand every 10 seconds (e.g., "Put in the box"). Correct responses were immediately praised and incorrect or no responses resulted in a partial physical prompt after 10 seconds elapsed. Meanwhile, taking a break was provided every 40 s non-contingently for lasting 20 s. In addition, any occurrence of self-injury resulted in no cessation of task demands.

### *Results.*

Figure 2 displays the results for Tim's treatment evaluation data. His baseline data of self-injurious responses in the Alone condition had little variability and produced an upward trend (a mean of 47%, range, 40% to 55%). During the preferred



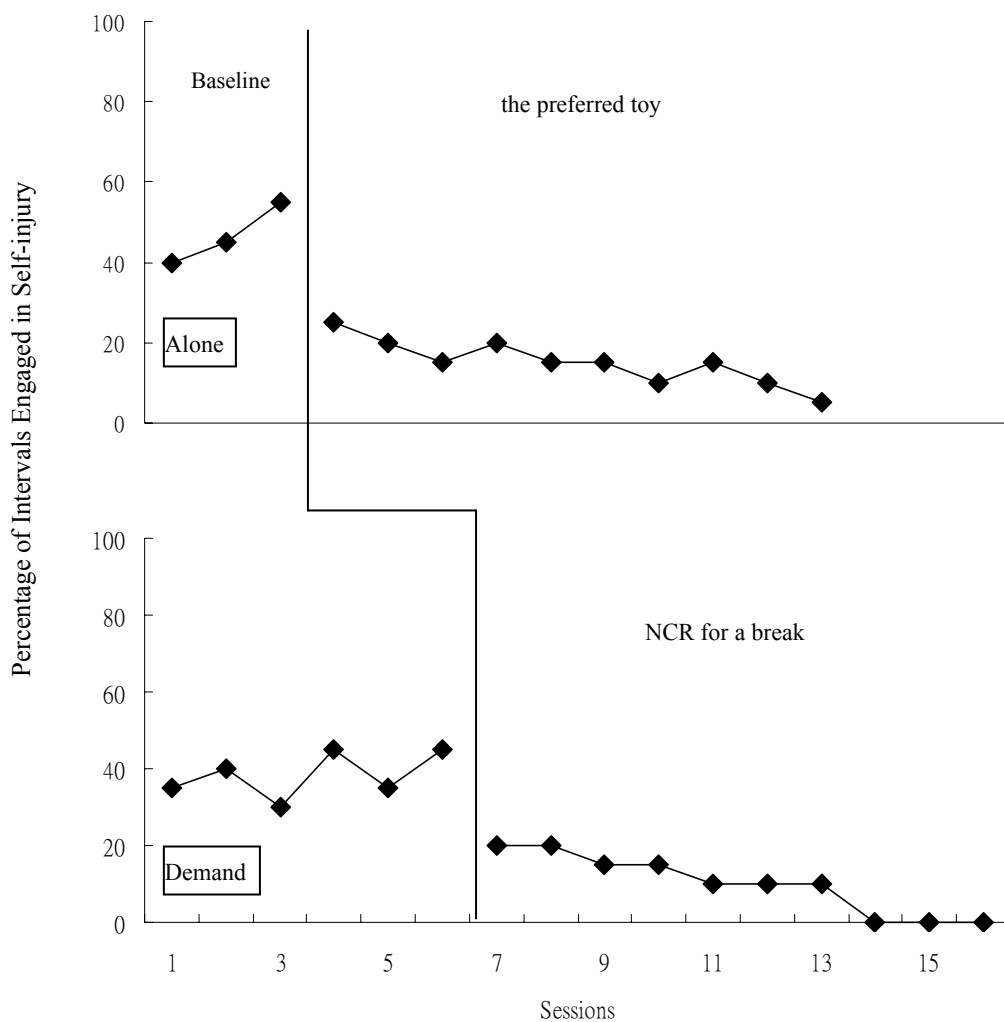


Figure 2. Tim's percentage of self-injurious behavior during baseline and functional-based intervention phases

object assessment, manipulation in the toy produced near-zero levels of self-injurious responses throughout the phase (a mean of 15%, range, 5% to 25%). The results showed that alternative sensory stimulation could be used to decelerate the level of self-injury which may serve to produce self-stimulation. Similarly, Tim's baseline data of self-injurious responses

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during the Demand condition also showed an upward trend with stability (a mean of 38%, range, 30% to 45%). The non-contingent provision for a break from a demanding task then was introduced to Tim. After 10 sessions of providing for a break from task demands noncontingently, the mean percentage of his self-injurious response was 10% (range, 0% to 20%) with zero-level in the last three sessions. The results indicated that negative noncontingent reinforcement could be successfully used to reduce self-injurious responses seemingly maintained by negative social consequences.

### Discussion

These data of the current study suggest that Tim's SIB was maintained by multiple sources of reinforcement. Specifically, the data for Tim reflect both social and nonsocial component to his SIB. In other word, Tim's self-injurious behaviors sometimes exhibited to obtain sensory reinforcement in a lack of environmental stimulation, and to get negative social reinforcement via escape or avoid from demands at times. The findings of present study supported the hypothesis that self-injurious behavior could be maintained by multiple sources (Iwata, Pace, et al., 1994; Kurtz et al., 2003). Previous studies have demonstrated that high levels of self-injurious behaviors occurred simultaneously during two assessment conditions (e.g., in alone and social conditions) and low levels of responding during other conditions may function to obtain more self-stimulation from impoverished settings, and to escape from task demands (Iwata, Pace, et al., 1994; Kurtz et al., 2003). However, the issue of multiple controls over SIB has been examined in very few studies (e.g., Day, Rea, Schussler, Larsen, & Johnson, 1988), conclusions based on assessment data alone must be tentative. Researchers should pay more attention to such multiple control analysis in order to come up with more effective and concrete treatments in future studies.

Additionally, it should be noted for the sources of Tim's self-injurious head hitting. The source of self-stimulation for Tim may be his fist/palm or head due to acceleration in his levels of self-injurious responses during the Alone condition as showed in Experiment 1. Moreover, provision of a preferred toy to substantially reduce the levels of self-injurious behavior of Tim further confirmed such stance. Tim often touched or hit his head with the provided toy all the time, and thus decreased the rates of SIB. It is highly possible that such

stimulation derived from the preferred toy could be substitutable for the sensory consequences of Tim's SIB. However, without further exact analysis of the specific stimulation contributed to his head hitting, draw any definite conclusion is still premature at this time.

Finally, the findings of this study were also consistent with that of prior studies (Iwata, Pace, et al., 1994; Kurtz et al., 2003). In conducted with persons with developmental disabilities who exhibited SIB, Iwata, Pace, et al. (1994) found that one woman's self-injurious behavior was exhibited to escape from social demands, and to produce self-stimulation. Non-contingent reinforcement consisted of access to leisure materials and escape could be effectively used to decelerate the frequency of self-injurious responses. Similarly, the investigators in present study also provided Tim the preferred object non-contingently, and demonstrated that this non-contingent preferred reinforcer could be successfully substitutable for the aberrant self-injurious responses. In contrast, after a break from task demands was provided non- contingently, Tim's self-injurious responding was decelerating. In summary, to select appropriate functional equivalent derived from the results of prior functional analyses is the critical points to reduce this aberrant responses. Therefore, more studies conducted in similar analysis and developed appropriate intervention accordingly are needed in the future.

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# 中度智能障礙學童自我傷害行為 的分析與介入

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## 摘 要

本研究的目的旨在評估一位中度智能障礙學童自我傷害行為的功能，並發展適當的功能本位的介入方案，以便減少此異常行為的次數。研究一，以類比功能分析來評估該學童自我傷害行為是否由逃避工作的要求、獲得他人的注意或是產生自我感官的回饋所造成的。研究結果顯示：該學童自我傷害行為是由於逃避學業工作的要求，以及產生自我感官的回饋所形成的。研究二，採多基準線跨不同制約功能的設計來評估功能本位介入方案的處理成效：即以非後效增強及喜愛的玩具分別於要求情境及獨處情境下進行介入。研究結果證實，社會負增強與感官增強是決定該學童自我傷害行為的功能。喜愛的感官刺激物可以成功地替代自我傷害行為；此外，定時地提供休息，也可以減低此異常行為的次數。

**關鍵詞：**自我傷害、功能分析、智能障礙