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Interventions to Reduce Self-Injurious Behaviors in Youth with Autism

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Interventions to Reduce Self-Injurious Behaviors in Youth with Autism

by

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Chapter 1: Introduction

Our society within the United States has transitioned year by year from one of local and regional concerns, to one in which we can obtain information on a national or world scale almost instantaneously. These profound changes have allowed us to expand our understanding of many issues, while at the same time bringing additional questions to the forefront. The large increase in the number of children who receive school-based services under the disability category of Autism is one of those questions. According to the National Center for Education Statistics (2016), from the 2000-01 academic year to the 2013-14 academic year, the number of children served under the category of Autism rose from 93,000 to 538,000. That is a 478% increase over that relatively short span of time. That profound increase within our school systems has pushed a once little hardly noticeable disability category into the public eye. The increase in visibility has raised questions regarding how to best serve those individuals within our population. A key area of concern in children with autism spectrum disorders (ASDs), and one that can be very public, are self-injurious behaviors (SIBs). These are behaviors that an individual engages in that may cause physical harm, such as head banging, or self-biting. SIBs are more common in children with ASD than those who are typically developing or have other neurodevelopmental disabilities (Minshawi et al., 2014). Those in the fields of education and medicine have an interest in development of better early interventions for those children with autism spectrum disorders who engage in self-injurious behaviors. One group of researchers found that in a sample of children with ASD, approximately 18.3% (some as young as 12 months of age) were engaging in SIBs (Fostad, Rojahn, & Matson, 2012). Ultimately, regardless of if SIB's emerge early in the life of a person with ASD or become more pervasive during school age, the presence of the behavior predicts

poorer long-term outcomes for the child and those invested individuals such as family, caregivers, teachers, and so on (Totsika, Toogood, Hastings, & Lewis, 2008).

Guiding Question

What interventions are effective in reducing self-injurious behaviors in children and young adults with autism?

Focus of the Review

The original focus of this literature review included the interactions of autism, self-injurious behavior, and anxiety; however, the number of recent studies on the subjects were more limited than I would have preferred. A change was made in the guiding question and the search terms by removing “anxiety,” to provide a more robust amount of recent material. Twenty-two studies were identified for use in the Chapter 2 literature review. This was completed through the use of the Academic Search Premier database using keywords and combinations of: autism spectrum disorder, self-injurious behavior, and interventions. The studies that were used came from both domestic and international researchers. These studies were conducted in multiple types of environments including home, clinical, and educational settings. Studies were chosen or rejected based on age of the considered work, within the last 7 years, and also to expand the number of intervention types. At the completion of this process 13 studies were chosen to be reviewed for Chapter 2.

Importance of the Topic

As a current special education teacher who is licensed in the area of ASD, I have students with autism spectrum disorder on my caseload. Some of these children do display self-injurious behaviors within school, home, and community settings.

As mentioned earlier, the drastic increase in the number of students arriving with an existing diagnosis or receiving an autism diagnosis upon arrival at public schools has created more awareness of potential challenges that those students may face. These challenges, such as SIBs, impact a student's home life as well as their academic and social interactions in the school setting. Obtaining an improved understanding of effective interventions that can positively contribute to the student's development and reduction in self-injurious behaviors is of growing importance.

Historical/Theoretical Background

Autism Spectrum Disorders (ASD) is characterized by clinically significant deficits in social-communication skills, including poor eye contact, difficulty maintaining conversations, and lack of developmentally-appropriate peer relationships, as well as the presence of restricted or repetitive patterns of behavior such as stereotyped behaviors, hypo- or hypersensitivities, and unusual interests (American Psychiatric Association, 2013). ASD affects, on average, 1 in 68 children and occurs in all racial, ethnic, and socio-economic groups. The prevalence is significantly higher among boys than girls: 1 in 42 boys versus 1 in 189 girls (Center for Disease Control and Prevention, 2014).

While the term "autism" was first used in the early 1900s by Eugene Bleuler, it was not until 1943 that Dr. Leo Kanner used the term in its modern version. Kanner described, during work with a clinical group of children, characteristics of modern day autism: autistic aloneness and insistence on sameness. Dr. Kanner's theory was that autism was a result of an infant's response to what Kanner termed as "refrigerator mothers" or lack of maternal warmth. This theory was the prevalent theory on the subject until the mid-1960s, but has since been discarded.

Other researchers were working on theories of their own regarding the cause of autism. One of these individuals was Dr. Bernard Rimland. He disagreed with Kanner regarding the cause of autism, and he had a personal investment in developing a better understanding. He was not only a psychologist, but was also a parent of an autistic child. In 1964 Rimland published *Infantile Autism*, which argued that autism had biochemical roots. He followed this up in 1965 by founding the National Society for Autistic Children, which later became the Autism Society of America.

Dr. Rimland was not the only individual in the field who was formulating new theories around autism. Dr. Ole Ivar Lovaas theorized that with the right instruction some children with autism spectrum disorder could close skill deficiency gaps with peers and function in typical classrooms. At that time children with autism, especially those with physically aberrant behavior patterns, were often misdiagnosed with developmental delays and institutionalized. Dr. Lovaas took a behaviorist approach to his treatment planning. He believed that children could be taught using a rigorous one to one program of behavior modification. Intensive repetition was emphasized and early intervention with therapy starting prior to the age of 3½ was stressed. Dr. Lovaas used a system of rewards and punishments to reinforce desired behaviors and discourage undesired ones. Early in his research his discouragements included slapping and administration of electric shock. This is no longer the case today, as the Lovaas model uses only positive reinforcements today to reward desired behaviors.

Debate regarding classification and treatment approaches has continued, although in 1988 classification became more similar to our modern day viewpoint when British psychiatrist Lorna Wing proposed that autism was one disorder that occurred along a continuum of symptoms and

severity. She, like Dr. Rimland, was driven to further the understanding of autism because she had a child with the disorder (Kita & Hosokawa, 2011).

Within schools students with autism have seen an increase in support and services over the years; however, it has taken a lot of work and time from families, educators, and researchers to transition to where we currently are. In 1975 with the passage of Public Law 94-142, better known as the Individuals with Disabilities Education Act (IDEA), children displaying autistic characteristics qualified for special education services under the category of Serious Emotional Disturbance (SED).

Recategorization happened in 1981 and students with autism were placed under Other Health Impairments (OHI). Because these categories did not identify autism on its own it created a situation of unmet educational needs. Finally, in 1991, Congress recognized autism as a distinct disability and added it to IDEA (Turnbull, Wilcox, & Stowe, 2002). Clinicians were the last to complete the transition when, in 1994, autism was defined as a developmental disorder under its own category in the DSM-IV, though DSM-V (2013) folded all subcategories of autism [Autistic Disorder, Childhood Disintegrative Disorder, Asperger's Syndrome, Pervasive Developmental Disorder not otherwise specified (PDD-NOS)] under one umbrella of Autism Spectrum Disorder.

Self-injurious behaviors, its relation to autism, and potential interventions have been considered from many viewpoints such as behavioral, biomedical, and genetic. The biomedical approach of treatment of SIB with atypical antipsychotic drugs to reduce the incidence of SIB (Politte & McDougle, 2014) and the genetic theories suggesting that ASD symptoms can be attributed to disruptions in particular genes, such as the *Shank3* gene, which cause

neurodevelopmental and neurobehavioral deficits among affected individuals (Peca et al., 2011) inform our understanding of SIB and help to explain why it is so prevalent among people with ASD.

Behavioral treatments, beginning with the completion of a Functional Behavior Assessment (FBA), have taken many forms as well. They attempt to address the environmental factors that may trigger SIBs to occur, increase the presence of more appropriate behaviors, and decrease the likelihood that the individual will continue to engage in SIB. They may be used independently or in combination with one another.

Definitions

Antecedent-Based Intervention. Environmental events that are precursors to undesired behaviors are used to design interventions that can be implemented to alter the environment ahead of the problem behavior in order to reduce the likelihood that the behavior will occur again in the future. These strategies can be as unique as the individual circumstances surrounding a child's problem behaviors. One common category of antecedent intervention is changing a child's schedule to avoid, minimize or rearrange challenging parts of the day. Another category of antecedent intervention is the adaptation of demands that may be precursors to SIB.

Electroconvulsive Therapy. Electroconvulsive therapy (ECT) is a procedure, done under general anesthesia, in which small electric currents are passed through the brain, intentionally triggering a brief seizure. ECT seems to cause changes in brain chemistry that can quickly reverse symptoms of certain mental illnesses. ECT often works when other treatments are unsuccessful and when the full course of treatment is completed, but it may not work for everyone. Much of the stigma around ECT is due to early treatments in which high doses of

electricity were administered without anesthesia, leading to memory loss, fractured bones and other serious side effects.

ECT is considered safer today. Although ECT still causes some side effects, it now uses electric currents given in a controlled setting to achieve the most benefit with the fewest possible risks.

Extinction-Based Intervention. When using an extinction based strategy the reinforcer that was maintaining the SIB is stopped, removing the motivation for the problem behavior. One example may be if an SIB is maintained by receiving social attention, planned ignoring can be employed. The attention from others in the environment that was maintaining the problem behavior is no longer provided when the behavior is displayed. Essentially, SIB is ignored by the people in the child's environment.

Functional Behavior Assessment. An FBA is an assessment method for developing behavioral interventions that maintain their effectiveness. Information is gathered about the antecedents, behaviors, and consequences surrounding a specific behavior in order to hypothesize the function of that behavior for the individual. Common functions of behavior are: social attention, access to tangible rewards, escape or avoidance of activities or situations, and internal stimulation.

Punishment-Based Interventions. These interventions are more controversial in behavior modification. Also referred to as "aversives," "response reduction procedures," or "behavioral decelerants." Punishment is accomplished through the application or removal of stimuli in order to decrease the likelihood that a particular behavior will occur again in the future. Some of the most commonly studied punishments are: physical restraint, "response reduction" procedures

(e.g., time-out, facial screens), and the application of aversive stimuli (e.g., water misting, aversive odors, brief contingent electric shock).

Reinforcement-Based Intervention. Reinforcement is the application or removal of stimuli to increase more desirable behaviors, and therefore, decrease the frequency, duration, or severity of SIBs. Reinforcement strategies are considered to be the least intrusive form of behavioral intervention for SIB because they do not use punishment procedures. These may involve Non-contingent Reinforcement (NCR) which involves the presentation of the reinforcing consequence for the problem behavior on a time-based and response-independent schedule, Differential Reinforcement of Other behaviors (DRO), or Differential Reinforcement of Alternative behaviors (DRA). In DRO any “other” behavior besides self-injurious behavior is reinforced, while DRA focuses on the use of reinforcement to teach a new, “alternative” behavior that can serve to replace SIB.

Chapter 2: Review of Literature

In Chapter 1 I briefly discussed the history and theoretical background of autism spectrum disorder (ASD), as well as the drastic increase that has been seen in ASD diagnoses in our school systems. Due to the prevalence of self-injurious behaviors (SIBs) in individuals with ASD, interventions have been developed to attempt to address this challenge. This chapter reviews 13 studies that were conducted to examine the effectiveness of interventions to reduce self-injurious behaviors.

Behavioral Interventions

Behavioral interventions are the most common type of intervention for individuals with autism who display SIBs. Functional analysis is a fundamental part of these interventions in order to identify the reason(s) why an individual engages in self-injurious behavior. This identification guides the process of selecting appropriate, and relevant, treatment. Seven studies are reviewed in this portion that focus on behavioral strategies to reduce the undesired behaviors.

Banda, McAfee, and Hart (2012) conducted a study to analyze the use of positive attention in reducing the frequency of a boy's self-injurious behavior (hitting himself in the head with a closed fist). Jack, age 13, was diagnosed with severe autism at age 6. He received a range of instruction all located in a self-contained classroom including academics, speech therapy, occupational therapy, and adapted physical education. Jack was observed to hit himself in the head with his fist at a rate of 6-10 times per minute. At the beginning of the study, he was wearing a padded helmet and gloves for his safety. Special Education instructors contacted the examiners when previous attempts to reduce his behaviors were unsuccessful.

This study took place within Jack's self-contained classroom. Those present were the student, a teaching assistant, and the researchers. The dependent variable (hits to the head or face) were recorded using frequency counts. All data were converted to frequency per minute to allow for comparison across sessions and intervention phases.

The study followed a single-subject ABAC design, which was preceded by a functional behavior assessment to try and determine the function of Jack's SIBs. This indicated that his behaviors were attention-seeking and escape motivated. The first baseline phase (A) involved Jack completing table top activities with the teaching assistant providing praise for task completion. If self-injurious behavior occurred the assistant used existing classroom procedures. This was followed by the first intervention phase (B) which consisted of 10-minute work sessions, during which the assistant provided positive attention every 10 seconds if Jack did not engage in SIBs. Display of the behavior resulted in the assistant ignoring Jack for 10 seconds before resuming activities. A second baseline phase (A) was completed with a return to original classroom procedures, which was again followed by an intervention (C) period. The intervention was the same as the first with the exception of a shorter work period of 5 minutes.

The results showed that Jack's SIBs averaged 5.7 minutes during the first baseline, 3.7 minutes during the first intervention, 4.6 minutes during the second baseline, and 3.5 minutes during the second intervention. The authors concluded that positive attention and extinction was effective in reducing SIBs with significant decreases in the participant's SIBs shown during the intervention phases. The implications of an intervention such as described here is that it can be used without the need for additional resources. Additionally, it was found to be a useful tool that could be applied outside of the school environment.

McClellan and Grey (2012) conducted a 3-year study on the impact of positive behavior support in reducing SIB and thus improve a number of quality of life elements. Participants included four boys between the ages of 15 and 23, all of whom had a diagnosis of autism and were identified on the Irish National Intellectual Disability Database as having severe intellectual disabilities. All four boys were rated as a “5” on the severity subscale of the Harris Challenging Behavior Checklist (Harris, 1993), which defines as displaying behaviors that cause very serious tissue damage to others/self.

Comprehensive behavioral assessments and intervention plans were completed for each of the four participants. The behavioral assessments provided information that the boys’ behaviors were escape motivated. Baseline durations varied (2-6 weeks) due to time it took researchers to conduct behavior assessment and delays in obtaining medical and psychiatric evaluation information. Interventions were then introduced using a multi-element baseline design with sequential introduction of interventions: low arousal, rapport building, predictability, functionally equivalent skills training, and differential reinforcement. Incidents related to aggression and SIBs were recorded and graphed weekly throughout the baseline and subsequent five intervention periods, as was information for the Checklist of Challenging Behaviors (Harris, 1993), the Health of the Nation Outcome Survey—Learning Disabilities (HoNOS-LD; Roy, Matthews, Clifford, Fowler, & Martin, 2002), and the Quality of Life Scale (QoLS; Kincaid, Knoster, Harrower, Shannon, & Bustamante, 2002).

Introduction of the sequential interventions showed reductions in behaviors: 46.7% of baseline with introduction of low-arousal interventions, 27.7% of baseline with the addition of rapport-building interventions, 14.1% of baseline when visual sequencing was added, 8.2% with

escape communication training, and 2% with the final addition of differential reinforcement.

Reductions were seen across the phases in HoNOS scores with a cumulative average reduction of: 14% low-arousal, 32% rapport building, 45% predictability, and 68% differential reinforcement. Conversely, QoL scores improved, for participants, family, and caregivers within 4 months of the program beginning.

The study concluded that multi-element positive behavior support can have an impact on behavior and the cumulative effect of intervention sequencing on mental health and quality of life. It also supports treating those with autism and severe behavior in low-arousal settings rather than with others who display similar challenges. A potential major limitation of this approach would be that this is a support, not a treatment. As the authors noted it is conceived to be maintained in order to sustain gains made during interventions.

Tereshko and Sottolano (2017) measured the effects of pairing escape extinction (EE) procedures with protective equipment to reduce SIBs. There was a single study male participant named Michael. He was 8 years old and had a diagnosis of autism. Previous interventions had been attempted with limited success, including differential reinforcement of alternative behaviors (DRA) at the time of the study. The high frequency and intensity of Michael's SIBs resulted in face bruising, learning interference, and separation from peers.

Researchers used an ABABAB reversal design. Condition A was baseline (response blocking and DRA) and Condition B was treatment (EE with protective equipment (helmet) and DRA). Prior to conducting their baseline the researchers used a competing-item assessment and a demand assessment to identify preferred items and non-preferred tasks. A functional analysis of Michael's head hitting was conducted and showed that SIBs were higher during the demand

condition (mean = 18%) versus during other conditions (mean = 4%). This suggested negative reinforcement as Michael's maintaining function.

During the baseline and treatment conditions Michael could earn tokens on a variable ratio schedule. Five tokens earned Michael a 2-minute escape from demands. In the treatment phase a helmet was put on Michael at every instance of head hitting rather than only attempting to block his behaviors. Three correct responses, including one related to the demand that preceded the self-harm, would earn removal of the helmet. Reduction was seen in both the average number of head hitting incidents and the amount of time that Michael had the helmet on over the course of treatment:

Table 1

Average SIBs during Intervention Phases

PHASE	MEAN HEAD HITS/MIN/DAY
Baseline 1	0.32
EE 1	0.04
Baseline 2	0.32
EE 2	0.05
Baseline 3	0.55
EE 3	0.02

Table 2**Protective Equipment Required Beginning versus End**

AVG # OF MIN. OF HELMET FIRST 5 SESSIONS 5 SESSIONS	AVG # OF MIN. OF HELMET LAST 5 SESSIONS
EE 1 = 9.7	EE 1 = 2.0
EE 2 = 10.4	EE 2 = 4.7
EE 3 = 5.9	EE 3 = 2.5

Follow-up was continued over the subsequent 18 months during which time the escape extinction procedures with protective equipment were continued to be implemented. The results that were observed during the three original sessions were maintained over the course of the follow-up time. This suggests that the use of escape extinction paired with protective equipment can be a successful intervention in reducing escape maintained SIBs. This treatment also does not required large resources to implement. There are limitations to this study. It did not include a fading procedure to systematically reduce the use of the helmet on Michael, during the study the helmet use was restricted to the school environment, and it has not been generalized yet.

Banda et al. (2012) conducted a study to decrease SIBs while fading effective self-restraints and provide long term maintenance. A single subject ABAB study design was used with a 14-year-old boy diagnosed with severe autism. Travis's scores on the Vineland Adaptive Behavior Scales—Second Edition placed him in the profound deficits area for total adaptive level. He received all services in a self-contained classroom and wore a padded helmet and gloves for his safety. Previous interventions had reduced behaviors, but the results had not been maintained.

During this study the participant used a semicircular table for activities and also had the use of a recreational room. Frequency of head hitting was recorded over 5-minute intervals and graphed as the number of hits in a 5-minute session.

The initial baseline phase consisted of a teaching assistant asking Travis to complete academic activities. Praise was provided for task completion and blocking was attempted if SIBs were displayed. Travis did not have access to blankets for self-restraint during the baseline, but he did wear his helmet and gloves. Use of his helmet and gloves continued during the first intervention phase. During this time Travis was allowed to hold one large blanket during his 5-minute work session. Social attention was provided on a fixed interval schedule every 10 seconds if no SIB was displayed, and ignoring was used for 10 seconds when Travis hit himself.

Upon return to baseline Travis no longer had access to blankets. The second intervention phase was marked by two items. First, parents voluntarily discontinued use of the helmet and gloves due to reduced rates of SIBs; and secondly fading procedures were begun contingent upon low SIB rates. Beginning sessions consisted of access to a large blanket, and then the blanket was systematically cut by removing portions of the edges until the blanket use was discontinued. Follow-up sessions showed that the results were maintained at the 6-month mark without return to self-restraint activities. The study resulted in a reduction in hitting while also fading out Travis's self-restraint behavior. Baseline numbers showed that Travis hit himself an average of 21.3 times/session. This was sharply reduced during the first intervention to 2.1 times/session. When baseline returned Travis's average increased above original amounts to 37 times/session, but again dropped sharply during the intervention fading timeframe to 1.1 times/session. At the 6-month follow-up Travis did not display any SIBs during sessions.

Guidance may be obtained from this study on fading self-restraint to alternative formats which may be more acceptable in school, or other social, settings. Generalization was reported by parent to home and community settings.

Hansen and Wadsworth (2015) investigated the effect of simple antecedent identification and intervention on repetitive behaviors such as eye poking. Repetitive behaviors can serve a variety of functions including: self-stimulatory, positive reinforcement, tangible reinforcement, or negative reinforcement. Therefore, antecedent interventions should be linked to functional assessments. Hansen and Wadsworth's study participant was a 10-year-old boy named Ernesto who had multiple diagnoses including autism. A functional assessment produced a hypotheses of self-stimulation as the behavior did not result in attention, escape, or during increased demands. A withdrawal design was used to evaluate the effects of each treatment component. Baseline (A) for this study used a ignore condition to assess automatic reinforcement. Environmental Enrichment 1 (B) was then instituted during which time Ernesto was provided, prior to each session, with a ball that promoted tactile and visual stimulation. During this phase the participant received glasses. At that time Environmental Enrichment 1 was removed to observe the effects of the glasses (C). Glasses were worn for the remainder of the study. Environmental Enrichment 2 (D) was conducted in the same manner as the first enrichment except that Ernesto had a choice of toys for each session. A follow-up (E) was completed 9 months later during the same classroom routines as the baseline and intervention phases. Baseline conditions resulted in eye poking occurring for an average duration of 57.71 seconds per session. This decreased to an average of 13.33 seconds per session during the Environmental Enrichment 1 phase. Removal of this intervention upon introduction of Ernesto's glasses resulted

in a spike in behavior to 185 seconds per session. However, the reintroduction of the Environmental Enrichment during phase D levels dropped again to a level of 1 second per session. Eye poking was not observed at the 9-month follow-up.

A major limitation to this study is that observational time was brief, which brings sustainability of intervention effect into question. Additionally, while the goal of reduced repetitive behaviors was met the student was not taught any replacement behaviors which may alter long-term maintenance.

Boesch, Taber-Doughty, Wendt, and Smalts (2015) conducted a study involving decreasing self-injurious behavior using training that included functional communication training (FCT). It is an individualized intervention that attempts to replace challenging behaviors with functionally equivalent communication.

Mike was a 14-year-old boy with autism. He had moderate to severe deficits in all assessed categories. He preferred to request items by physically leading others to the item and was considered non-vocal. The setting for all sessions consisted of a designated work space in a corner of the room and classroom consistent instructional materials. Self-injurious behavior was recorded using partial-interval recording due to the high frequency. Event recording was used to document each occurrence of Mike correctly requesting something using the manual sign “want.”

A changing criterion design was used to show the impact of the interventions of the dependent variable. This included a baseline and four variations of the intervention. The baseline (A) consisted of Mike doing educationally aligned activities. Verbal redirection was used if Mike stopped working on his activities or engaged in SIBs. Following the baseline Mike was taught to

sign “want” and completed a training session similar to the baseline using shorter activities and hand-over-hand shaping was used to teach the desired sign. During the subsequent intervention phases (B1-B4) Mike was prompted to engage in structured activities for amounts of time that increased with each phase starting at 1 minute and increasing to 4 minutes. Additional criteria related to SIB occurrence was also increased at each phase. Producing the desired communication “want” at the appropriate time was earned Mike a desired stimulus.

Use of fixed-interval schedules with FCT intervention proved to be successful in decreasing this student’s SIB and increasing his appropriate communication. During the baseline Mike’s SIB occurred during an average of 49% of intervals per session ($SD=8.93\%$). Phase B1 saw an increase in SIB to 64% per session ($SD=35.6\%$) followed by a decrease to move on to the next phase. The B2 mean SIB decreased again to 33% per session ($SD=24.3\%$), and B3 fell to 4% ($SD=4.69\%$). The B4 phase saw an increase in the initial session, but the remainder resulted in zero SIB (mean of 21% and $SD=36.37\%$). Initial rates of SIB increased at each level of expectation, but these regressions were short. Further inspection showed that more than half of the intervention data points were below the lowest point in the baseline. This indicated to Boesch et al. (2015) that Mike’s SIBs improved even as the performance expectations increased.

Comparison of Mike’s ability to appropriately request desired items (post training) showed that in B1 Mike averaged 6/session ($SD=1.97$) with an upward trend showing. Phase B2 averaged 4/session ($SD=1.26$), B3 averaged 4/session ($SD=0.96$), and B4 averaged 4/session ($SD=2.31$). The correct requesting was declining in B2 prior to trending upward again in B3.

This study lends additional support to the efficacy of behavioral training packages in the treatment of self-injurious behaviors in children with autism. Each of the criterion changes resulted in data showing a reduction in SIBs. Specifically, the phases that instituted delayed reinforcement were promising. There were initial increases in behaviors with changes in the criterion, however reductions were then noted. The authors of this study viewed this as encouraging for those instituting this type of treatment who cannot provide immediate reinforcers thus providing flexibility in various environments.

There were several limitations to this study such as lack of a second baseline to demonstrate replication and lack of maintenance measurement of intervention. Future research in this area should address these areas in order to provide further validation of the study results.

Chen, McComas, Reichle, and Bergmann (2015) examined active variables in Tolerance for Delay of reinforcement (TFD) interventions. The focus of their study was efficacy differences in TFD reinforcement with general delay cues when compared to TFD reinforcement with both general and explicit delay cues.

The study researchers chose one male participant, Max, who was 18 years old at the time of the study. The participant had diagnoses of autism and attention deficit hyperactivity disorder. Prior to the study an intellectual assessment had been completed using the Wechsler Intelligence Scale—IV (WISC-IV) resulting in a full scale IQ of 42. Max had a history of hitting himself on the head, legs, or on surfaces. He also was aggressive toward others. Previous interventions, including medication regimens, had not diminished Max's severe self-injurious behaviors.

Chen et al. (2015) chose to implement the study procedures within Max's natural group home environment. Group home staff implemented the interventions with experimenters

observing. Preferred food items that were used as intervention material were visible to Max, but they were kept out his reach. Dependent variables, problem behavior occurrence and problem latency, as well as independent variables, tolerance for delay (TFD) with combined explicit/general cues and tolerance for delay with only general cues, were monitored.

The study researchers conducted their research with Max in a 3-Phase experimental design. Phase I consisted of an antecedent based analysis of four conditions: play, no attention, demand, and restricted access to tangible. Phase II was a TFD intervention with general and explicit delay cues using Phase I data as a baseline. During Phase III, Chen et al. (2015) completed a component analysis of the delay cues through the use of a brief ABA withdrawal design. Using of the Phase I data the researchers determined that Max's behaviors were elevated during the restricted access to tangible condition. Looking at the percentage of 10-second intervals with problem behaviors the data showed $M=24\%$ with a range of 7-50%. They determined that Max's behavior seemed to be tangibly maintained. Introduction of the intervention had a positive effect on Max's behavior latency, moving from a baseline of 37 seconds to a latency of 10 minutes with the use of general and explicit delay cues. Behavior occurrence also diminished to a level of ($M=2\%$, range 0-6%).

A number of suggestions have been made to account for limitations of this study. Replication with a larger number of participants, extension of the intervention to escape and attention seeking maintained behavior are all possibilities.

Non-Behavior Based Interventions

Demanche and Chok (2013) examined the use of wrist weights and vibratory stimulation, both separately and combined, as a means to achieve sensory reinforcement and reduce chronic self-injurious behavior.

The study participant, Taylor, was a 12-year-old boy with a history of frequent and intense SIBs. He had, for the previous 4 years, been receiving intensive 1:1 year round applied behavior analysis services. His behaviors remained consistent, sometimes over 1000 instances a day, over that time and continued to result in significant tissue damage including lacerations and care for a hematoma. Changes to his environment and reinforcement procedures had shown little success.

Demanche and Chok (2013) conducted their study over 286 sessions with frequency data being collected during Taylor's school day. Initial preference assessments were conducted to evaluate Taylor's vibratory stimulation preferences using a number of different products. This information guided the choice for product use during the study. Effects on SIB rates were evaluated using a multiple treatments reversal design which included varying amounts of weight and stimulation that was matching to the hypothesized sensory consequences or unmatched to it. Wrist weights began at the 4 pound level and were reduced to 2, 1.5, 1, .5, and .25 pound amounts through the study. Stable, or declining, SIB levels resulted in lowering the weight amount. Escalation in the participant's behavior saw a reintroduction of a heavier weight. Unmatched stimulation, using a massager with leads placed on Taylor's back, was conducted hourly if he was not already accessing it independently. Matched stimulation was assessed hourly as well;

however, Taylor had to request its use through the use of a card system. Engagement in SIB's during the use of the matched stimuli resulted in loss of the requesting card until an absence of the targeted behavior occurred for a set amount of time.

B = baseline

WW = wrist weight

UM = unmatched vibratory stimulation M

= matched vibratory simulation

Table 3

Average Hourly SIBs through Intervention Phases

INTERVENTION	SIBS/HOUR
B	83.5
WW - 4lbs	1.7
B	86.5
WW - 4lbs	7.1
WW - 2lbs	3.3
WW - 1lb	7.9
UM + WW 1lb	9.1
B	36.3
UM	39
WW - 2lbs	7.8
WW - 1.5lbs	5.4
WW - 1lb	3.2

Table 3 (continued)

INTERVENTION	SIBS/HOUR
WW - .5lb	5.5
WW - .25lb	17.6
WW - .5lb	5.3
M + .5lb	2.2

The study authors concluded that the findings of their study were consistent with previously completed work in this area. Non-contingent intervention using weights and matched stimulation provided Taylor with the opportunity to participate more fully in his academic tasks as well as engage in more social engagement with peers and teachers. The main limitation of this study was that some of the phases were fairly brief in duration due to the need to balance data with the participant's safety. The percentage of sessions that Interobserver Agreement (IOA) was collected was adequate, but the percentage of total time in which IOA was collected was relatively low.

Davis, Dacus, Strickland, Machaliecek, and Coviello (2013) performed a study to evaluate the use of noncontingent matched stimuli (NMS) to reduce automatically maintained SIBs through replacement with forms more compatible to daily activities.

Kipton, an 8-year-old nonverbal boy with autism, engaged in high levels of SIBs such as ear digging. That behavior consisted of pushing small objects into his ear canal until they were too deep to be retrieved at home or school. This occurred multiple times per day, and it would require daily appointments with his doctor. Assessments had been previously completed and did not result

in a medical cause or explanation for Kipton's behavior. Study sessions were conducted in an individual instructional room adjacent to his classroom.

After analysis was completed to identify reinforcers and a preference assessment was conducted to find potential objects for safely matched stimulation, a multi-element design was used to evaluate the effects of two conditions: non-contingent access to unmatched stimulation and non-contingent access to matched stimulation. The matched stimulation was meant to provide stimuli similar to that of the SIBs. Davis et al. (2013) used acrylic balls that could rest inside Kipton's ears, but were not small enough to fit into the ear canal itself. During the baseline timeframe Kipton's behaviors occurred with a range of 80-100% depending on the task condition. The researchers found that the unmatched stimulation continued to see frequent SIBs with a mean of 93.8% (range = 76.7-100%); however, during the matched stimulation his frequency reduced dramatically to a mean of 5.7% (range = 0-26.6%). Use of the alternative stimuli (acrylic balls) as a matched stimuli suggested affected the frequency of his self-injurious ear digging. This, like a previously discussed study, continued to demonstrate that NMS can be effective for treating automatically maintained SIBs. Limitations of this study included that the specific source of stimulation was not assessed and that the duration of the assessment for the effectiveness of the matched stimuli was relatively short.

Devlin, Healy, Leader, and Hughes (2011) chose to investigate the effects of Sensory Integration Therapy (SIT) versus a behavioral intervention in reducing rates of SIB. Participants in this study consisted of four male youths with Autism Spectrum Disorder ranging in age from 6 to 11 years old. Each had a history of aggression and self-injury including head hitting, hand biting, and finger biting. The participants had varying degrees of independence in completing

functional living tasks. All had been diagnosed using the Gilliam Autism Rating Scale along with the DSM-IV criteria for autism. None of the children were taking any type of psychotropic medication at the time of the study.

Alternating treatment sessions were conducted in the participants' regular classrooms, with an occasional technique conducted in an occupational therapy room. The treatment sequence was randomized prior to the start for each of the participants. The SIT equipment used during this study included a net swing, trampoline, therapy ball, "peanut" ball, beanbag, lycra blanket, oral motor device, and brush/sponge combo. Frequency data were collected for the number of SIB incidents per day during both the SIT and behavior intervention conditions. Salivary cortisol samples were taken to measure stress levels. A baseline was established during a school holiday break, and then samples were collected three times daily at 10 a.m., 12:30 p.m., and 2:30 p.m.

Table 4

Sequence of Alternating Treatments

Child	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
1	SIT	SIT	BI	BI	SIT	SIT	BI	A	A	A
2	BI	SIT	SIT	BI	BI	SIT	BI	BI	SIT	SIT
3	SIT	BI	SIT	BI	BI	SIT	SIT	BI	A	A
4	BI	SIT	SIT	BI	BI	SIT	SIT	BI	BI	SIT

SI = Sensory Integration Therapy, BI = Behavioral Intervention, A = absent

Functional based interventions for each of the participants were developed using results from functional assessments, while SIT interventions were designed by an Occupational Therapist who was familiar with each of the study participants and who supervised their implementation. The SIT interventions consisted of a “sensory diet” that facilitated a number of different inputs: vestibular, proprioceptive, and tactile.

Table 5

Mean Rate of SIB (baseline, behavioral intervention, sensory integration)

PARTICIPANT	BASELINE	BEHAVIORAL	SENSORY
#1	11	6	16
#2	9	3	7
#3	9	2	9
#4	12	4	8

The authors of this study felt that it demonstrated the effectiveness of a behavioral intervention over a sensory based intervention in treating challenging behavior. Limitations observed in this study were a lack of additional participants and what was perceived to be low levels of cortisol.

Politte and McDougle (2014) studied the use of atypical antipsychotics in the treatment of children with autism and related pervasive developmental disorders displaying aggressive and self-injurious behavior. They wished to know what the efficacy level was related to Risperidone and Aripiprazole and the reduction of the targeted behaviors. They felt that reduction in

interfering symptoms would enhance patients' participation in not only education, but also therapeutic interventions in their various settings.

Risperidone is a dopamine and serotonin receptor antagonist. It is approved by the Food and Drug Administration (FDA) for use by those with autism. Common side effects of risperidone include increased appetite, weight gain, fatigue, drowsiness, dizziness, and drooling.

A large scale randomized, double-blind, placebo-controlled trial was conducted that included 101 children. The participants ranged in age from 5 to 17 years of age (mean age 8.8 years). They were chosen based on their level of severe disruptive behavior using a Clinical Global Impression-Severity (CGI-S) score of 4 (moderate severity) or greater and a subscale score of at least 18 on the Aberrant Behavior Checklist-Irritability (ABC-I). The treatment phase for this study was 8 weeks, during which medication was flexibly dosed. The mean dosage amount was 1.8 mg daily, with a range of 0.5 to 3.5 mg daily. A 2-month discontinuation phase followed the treatment phase.

At the end of the 8-week treatment period ABC-I scores showed a reduction of 56.9% in the risperidone group compared to 14.1% for the placebo group. Sixty-nine percent of the participants saw at least a 25% reduction in their ABC-I and CGI-S scores compared to 12% of those receiving the placebo treatment. Once the discontinuation phase began relapse rates related to the return of targeted behaviors was observed. The placebo substitution group relapsed at a 62.5% rate, while the continued treatment group displayed a 12.5% rate.

Aripiprazole has a different mechanism of action than risperidone. It acts as both a dopamine agonist and antagonist depending on concentrations of the neurotransmitter. Aripiprazole, just like risperidone, is also FDA approved for treatment of children with autism. Twenty-five children with autism, 5-17 years of age (mean = 8.6), were treated over a 14-week period. This was followed by a 4-week titration and a 8-week maintenance phase. The mean dosage amount during treatment was 7.8 mg/day, and ranged from 2.5 mg/day to 15 mg/day. Eighty-eight percent of the participants showed at least a 25% improvement in their ABC-I and CGI-S scores. ABC-I scores started with an average baseline of 29 and averaged 8.1 at the end of the study.

The study authors felt that the efficacy shown by the use of these medications demonstrated positive effects that would benefit individual's developmental progress and improve quality of life for both participants and their caregivers. These types of medication do, however, carry the risk of developing long-term side effects such as: insulin-resistant diabetes, movement disorders, and elevated blood sugar.

Narasingharao, Pradhan, and Navaneetham (2017) hypothesized that structured yoga intervention would provide an alternative treatment method for children with ASD and behavioral problems. An exploratory study using pre-test and post-test control design was used and conducted over a 4-month timeframe. The study consisted of 64 children between the ages of 5 and 16 years old. Three sets of questionnaires, each consisting of 61 questions, were developed by the researchers. These were administered pre and post intervention to collect data. The experimental group received yoga intervention for a period of 90 days while the control group

continued with its normal school curriculum. Yoga intervention was performed daily for a 75-minute duration to begin the day. Post intervention analysis done by the research team returned a significance value of 0.001. This would be considered statistically highly significant, with less than a 1 in 1,000 chance of being wrong.

The authors felt that their research demonstrated that a structured yoga intervention improves the behavioral problems of children with ASD thereby reducing the severity. Limitations noted by the study authors included that data collection pre and post intervention was dependent upon the parents of the study participants which may raise validity concerns.

The last study that I reviewed was one that involved, at least in its connotation, a degree of avoidance. Manente and LaRue (2017) looked at the effectiveness of differential punishment of high rates of behavior (DPH) in treating severe self-injury. DPH procedures involve the use of an established criterion related to a rate of response within a time interval. When this occurs a punisher is delivered. The word “punisher” should not be construed, however, to only mean some form of objectionable response. Manente and LaRue defined punishment as a stimulus change that immediately follows a response which decreases the future frequency of similar responses.

The study used a single male participant who presented with severe self-injurious behavior. He had previously been treated with a number of antecedent and reinforcement based strategies. These had all been ineffective in reducing his behaviors. A schedule of signaled DPH in conjunction with a verbal reprimand was implemented to treat the participant’s head hitting over a 17-month time period. The participant was given access to highly preferred items contingent upon task completion, as well as non-contingent access to moderately preferred

activities, throughout all phases of this study. The DPH procedure was approved by a human rights committee prior to its implementation.

Using a repeated reversal design (ABABABCDBAB) the researchers evaluated the effects of the DPH procedure and its individual components on the baseline (A) behaviors. The DPH procedure (B) consisted of the presentation of a picture of a person giving a verbal reprimand covered by four pieces of paper. It remained within the participant's view during the day. Each time a target behavior occurred a piece of paper was removed. Once all four pieces of paper were removed the participant was given the aversive stimulus, the verbal reprimand. This was a direct statement such as "There is no hitting your head" given in an authoritative tone. Both a visual cue only (C) component, and also a reprimand only (D) component, were analyzed to help determine which part of the DPH protocol was the contributor to the reduction in the participant's SIBs.

Table 6

Average Rates of SIBs per Hour during Conditions

Baselines (A)	16.38
DPH (B)	2.47
Visual Cue only (C)	5.75
Reprimand only (D)	2.26

When evaluated across the conditions, there was an 84.9% decrease in SIB's during condition B compared to A. Comparison of the initial baseline phase to the final treatment phase shows a 93.7% decrease. This study suggests that the use of DPH can be an effective treatment for severe SIB's. However, as the study authors note, implementation of this strategy should always be guided by the principle of least restrictiveness.

Table 7

Table of Reviewed Studies

AUTHORS	STUDY DESIGN	PARTICIPANTS	PROCEDURE	FINDINGS
Banda, McAfee, & Hart (2009)	ABAC	One boy, age 13, diagnosed with ASD and Tourettes	Completion of a FBA to determine multiple functions. Initial baseline followed by first intervention. Secondary baseline, followed by secondary intervention	Positive social attention and extinction interventions reduced overall SIB's with decrease in session duration and fixed time schedule.

Table 7 (continued)

AUTHORS	STUDY DESIGN	PARTICIPANTS	PROCEDURE	FINDINGS
Banda, McAfee, & Hart (2012)	ABAB	One boy, age 14, diagnosed with ASD and Tourettes	Baseline activity used existing classroom procedures, social attention on a fixed interval, with use of self-restraint (blanket) was used with a return to the baseline, fading was used during the secondary intervention	Fixed interval reinforcement, along with access to self-restraint was effective. Restraint fading produced long-term maintenance at the 6-month recheck
Boesch, Taber-Doughty, Wendt, & Smalts (2015)	A-B1-B2-B3-B 4 Changing criterion	One boy, age 14, diagnosed with ASD	Functional Behavior Assessment, observations provided suggested reinforcers of SIB's, gradual increase of fixed interval reinforcement schedule along with introduction of functional communication training	Changes in initial fixed interval schedules resulted in a increase in SIB rate, but subsequent increases did not. Use of FCT allowed participant to appropriately request desired stimulus

Table 7 (continued)

AUTHORS	STUDY DESIGN	PARTICIPANTS	PROCEDURE	FINDINGS
Chen, McComas, Reichle, & Bergmann (2015)	Experimental 3-phase	One boy, age 18, diagnosed with ASD and ADHD	Phase I: antecedent based analysis based on play, no attention, demand, and restricted access Phase II: Tolerance for Delay using general and explicit delay cues with contingent behaviors Phase III: ABA withdrawal design was used to examine effects of explicit delay	TFD reinforcement when used with a combination of explicit and general delay cues was more effective than use of TFD with only general cues. This also was confirmed when looking at maintaining the desired behaviors.
Davis, Dacus, Strickland Machaliecek, & Coviello (2013)	Multi-element -evaluate effects of 2 conditions	One 8-year-old boy, diagnosed with ASD	FBA conducted to identify maintaining reinforcers of SIB and identification of object for safe matched stimulation 2 conditions -noncontingent access and unmatched stimuli -noncontingent matched stimuli	Results of NMS were assessed over short period of time. However matched stimuli did show positive results even when access to know preferred items were unsuccessful. Control condition was not conducted during research phase so results should be taken with caution.

Table 7 (continued)

AUTHORS	STUDY DESIGN	PARTICIPANTS	PROCEDURE	FINDINGS
Demanche & Chok (2013)	Multiple treatments reversal design	One 12-year-old boy, diagnosed with ASD and moderate Intellectual disability	Vibratory stimulation for both matched sensory consequences (OSIM uCrown 2 Head Massager) and unmatched sensory consequences (Mini ISmart Massager) were used	Matched stimulation applied as a noncontingent antecedent intervention showed the most success.
Devlin, Healy, Leader, & Hughes (2011)	Alternating treatment design	Four participants: 6-year-old boy with ASD 11-year-old boy with ASD 10-year-old boy with ASD 9-year-old boy with ASD	Sensory Integration Therapy and Behavioral Interventions were alternated across daily sessions. Sequence of treatment was random for each participant	Behavioral interventions were more effective in reducing levels of challenging behaviors than SIT in all participants. Baseline and SIT conditions showed similar rates of behavior.
Hansen & Wadsworth (2015)	Withdrawal design	One 10-year-old boy, diagnosed with ASD, ID, D/HH	Antecedent intervention that combined environmental enrichment and choice of materials	While intervention was successful, limited participants should be taken into consideration. Lack of replacement skills may alter maintenance of desired behavior

Table 7 (continued)

AUTHORS	STUDY DESIGN	PARTICIPANTS	PROCEDURE	FINDINGS
Manente & LaRue (2017)	Repeated reversal design with component analysis	28-year-old male, diagnosed with ASD	Schedule of differential punishment used a visual cue and verbal reprimand. Access to highly preferred items and activities contingent upon task completion was available	Use of punishment strategies should be guided by principle of least restrictiveness. DPH procedure provided ability to implement without needing a continuous schedule of punishment making it less intrusive.
McClellan & Grey (2012)	Alternative, individualized placement Multiple baseline across individuals	Four people with ASD and severe ID	Behavior assessment and intervention plan based on Behavior Assessment Report and Intervention Plan Evaluation Instrument	Cumulative effect of intervention sequencing and impact of positive behaviour support was supported in areas of behaviour, mental health, and quality of life

Table 7 (continued)

AUTHORS	STUDY DESIGN	PARTICIPANTS	PROCEDURE	FINDINGS
Narasingharao, Pradhan, & Navaneetham (2017)	Exploratory	63 children ages 5-16, diagnosed with ASD	Yoga modules were administered for 75-minute durations for 3 months prior to school start time. Modules selected from S-VYASA Integrated Application of Yoga Therapy	Intervention proved that structured yoga produced a number of benefits, including reduction in behaviors.
Politte & McDougle (2014)	Randomized double blind	22 children and adolescents ages 3-16 with ASD and severe disruptive behaviors	4-week risperidone treatment followed by 6-month extension and discontinuation phase	Effective in relieving symptoms, but carry risk of long-term side effects. Should be reserved for treatment of children whose PDD's pose risk to themselves or others
Tereshko & Sottolano (2017)	ABABAB reversal design	One 8-year-old boy, diagnosed with ASD	Variable ratio schedule used to reward appropriate behavior while redirection was maintained to complete requested demands. Follow-ups followed for 18 months.	Escape extinction procedures combined with use of protective equipment showed success. Limitation in this study includes the absence of a fading procedure to reduce use of equipment.

Chapter 3: Conclusions and Recommendations

The purpose of this paper was to evaluate the effectiveness of various interventions in reducing self-injurious behaviors in children and young adults with autism spectrum disorder. Chapter 1 of the paper provided background on, as well as the importance of, the topic. Chapter 2 reviewed literature pertaining to a variety of interventions aimed at reducing SIBs. In the final chapter, I discuss the findings of the studies, as well as recommendations and implications from the research

Conclusions

Thirteen studies were reviewed that examined the effectiveness of varying interventions in reducing SIBs in youth. Seven of the interventions were behavioral in nature, while six of them I would classify as alternatives to the more widely known behavioral interventions. The studies had varied types of design, data collection, and sample sizes.

Behavioral interventions. Seven of the interventions addressed the use of behavioral based interventions in reducing targeted behaviors. Behavior based interventions are based on the development of a functional behavior assessment (FBA) to help determine behavioral cause and maintenance. All seven of the studies found that the application of the knowledge gained through an FBA in conjunction with the intervention provided an effective means of reducing the targeted self-injurious behavior(s). A goal of interventions is that the participants are able to ultimately generalize the instructed skills into additional environments thus expanding their ability to participate in age appropriate activities. In the Banda, McAfee, and Hart (2009), Banda et al. (2012), and Boesch et al. (2015) studies, the participants were able to display a continued reduction in SIBs in environments outside of the researched setting. This improved

the study participants ability to be part of peer activities within their educational settings, as well as taking part in activities located within their local communities.

An additional similarity between all of the behavioral intervention studies that I evaluated was that the study participant numbers were small. Six out of the seven studies were single subject studies, while the seventh study had four participants. Each of the single subject design studies: Banda et al. (2009), Tereshko and Sottolano (2017), Banda et al. (2012), Hansen and Wadsworth (2015), Boesch et al. (2015), and Chen et al. (2015) found that application of the study specific intervention was beneficial to the individual within the study.

Non-behavior based interventions. I reviewed six studies on the use of alternatives to behavior based interventions. These interventions looked at a wide variety of options to assist with the reduction of SIBs. In comparison to the behavioral intervention studies with sample sizes from 1-4 youth, the studies in this group had a much larger range of participants with sample sizes from 1-126 youth. The studies conducted by Demanche and Chok (2013) on wrist weights and vibratory stimulation, Davis et al. (2013) on non-contingent matched stimuli, and Manente and LaRue (2017) on differential punishment each were single subject studies. As with the single subject behavioral intervention studies, each was found to be effective in reducing that specific individuals SIBs. Though each of the studies evaluated a different type of intervention, they all produced reduction in the participant's automatically maintained behaviors.

The study by Politte and McDougale (2014), looking at the use of antipsychotics to reduce SIBs, and the study by Narasingharao et al. (2017), which considered the use of a structured yoga program to attain the same goal, both observed reaching the target goal through

the use of larger sample sizes. Out of all of the evaluated studies for this paper these two had the largest samples coming in at 126 and 64, respectively. This focus on the group dynamic versus the individual may produce results that are more generalizable across barriers. At the same time this potential wide usage may also produce a situation in which the results are more likely to be applied without due consideration for the individual client.

Recommendations for Future Research

The strength of single-subject designs, with its focus on an individual, may also be its weakness. The most common limitation for all of the studies that I evaluated as part of Chapter 2 was a lack of sample size. The question is: How are we to judge conclusions about a single individual and whether they are relevant to other clients? We can think about this as a generalizing problem. We, as special education practitioners, want to take what has been tested in one research context and apply the findings to different settings, clients, or communities. Being able to do so when the sample consists of a single subject, engaged in a particular intervention, provided by a particular individual, is challenging.

Within the behavioral-based interventions, a common stated limitation was the lack of a taught replacement behavior. Oftentimes a child will need to have explicit instruction in a more appropriate behavior if we are to expect that they will increase its use and therefore maintain the reduction in the targeted behavior. Desired behavior that is reinforced by the same function as the undesired behavior is more likely to see positive long-term effects. Researchers noted in Boesch et al. (2015) that this area needs to be addressed in additional studies in order to provide further validation of the research findings.

There was a number of limitations that crossed over between the two main groupings of studies. The first was the duration of some of the intervention phases were brief. When the intervention is aimed at reducing a harmful behavior, proper caution must be given to maintain the safety of the study participants. Occasionally this results in phases being prematurely halted, or limited, due to an increase in participant behavior. This potential for reduced research data makes the need for an increased number of studies more important in order to display effectiveness. Hansen and Wadsworth (2015), Chen et al. (2015), Demanche and Chok (2013), and Davis et al. (2013) all noted that this could have limited the studies' findings. Institutional Review Boards review proposed studies, and look at potential risks and benefits, yet each of these boards are made up of individuals who may come to differing opinions regarding the study. Researchers should, as the above listed researcher did, continually assess the need for child participant safety. Children cannot assent to the study themselves, and these children are already more likely to be vulnerable when entering the research setting.

Lastly, is the idea of social validity or the acceptability of the treatment goals, procedures, and outcomes. This is something that is of particular concern when working with this population of children due to the above mentioned increase in vulnerability. The Politte and McDougle (2014) and Manente and LaRue (2017) studies both are limited by these social concerns. Society's view on the use of antipsychotics in the youth population, as well as the connotation that the word "punishment" conjures, may create additional hesitancy within the research community to further analyze benefits provided by these types of interventions.

Implications for Current Practice

The field of special education, while often times focused on scientifically based strategies, also is predicated on the idea of the individual. The fast growing number of children who are diagnosed with ASD almost demands that research, and instruction, be increased into strategies that through the reduction in undesired SIBs improves the ability of these children to fully participate in their academic and social growth. We want to generalize results of interventions to increase validity; however, we must keep in mind that each student is different. A variety of strategies must be available to address behavioral concerns just as we have a variety of curriculums to address their academic needs. Focusing only on behavior based interventions, which I believe to be the most effective, would reduce our ability to help our students. Innovative ways that are being proposed to assist a child in the least intrusive way possible, such as something like a structured yoga program, need to be taught within our schools and career field. Variations of this type of program, such as Mindfulness, are already being applied in a more general way to all students within grade levels or schools. As a student progresses through curriculums aimed at instructing them in all of the areas that we deem as important their needs also change. It is my job as an educator to continually look for new ways to accomplish our set out goals. It is our ethical mandate to address the individual's needs, which requires us to commit to understanding current, or new, strategies. This will have an effect not only on educators, but also on the universities doing the research or teaching future teachers, and also on the school districts who provide funding for materials and curriculum.

Summary

Dr. Ole Ivar Lovaas, who pioneered the application of applied behavior analysis to improve the lives of individuals with autism, once said, “If they can’t learn the way we teach, we teach the way they learn.” This quote sums up my outlook on the application of these interventions after having the opportunity to evaluate them more closely. I had hoped to provide myself with a more narrow view of effective interventions in the reduction of these harmful behaviors. In the end though, I came away thinking to myself that I should not be looking to narrow the options down. Each of the interventions that I reviewed in Chapter 2 was effective for those within the study. There were studies, like Devlin et al. (2011), that showed greater improvement for the participants using a behavior based intervention versus Sensory Integration Therapy (SIT); however, this was directly applicable only to those study participants. Could it be generalized to a larger population of children? Yes, but at the same time the use of SIT might be the change of teaching needed for a child. The numbers of children diagnosed with ASD are growing. It does not matter if that number is growing because of a better awareness of the disorder, better diagnostics, or an increase in the prevalence of those affected by it. Continued collaboration between teachers, parents, specialists, and researchers in order to provide the greatest number of interventions to assist a child improve their quality of life should be our goal.

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