Reducing the Stereotypic Behavior of Individuals with Mental Retardation Using Response Cost within Applied Behavior Analysis

Crystal Holmes
Longwood University

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Reducing the Stereotypic Behavior of Individuals with Mental Retardation Using Response Cost within Applied Behavior Analysis

Longwood University

Crystal Holmes

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Date of Approval 12/13/04
Abstract

The focus of this study is to demonstrate that using response cost through applied behavior analysis is an effective treatment for reducing the stereotypic behaviors of individuals with mental retardation. McEntee and Saunders (1997) conducted a study in which response cost was used as an intervention within applied behavior analysis successfully to reduce the stereotypic behaviors in four male individuals with severe or profound mental retardation. An attempt was made to replicate this study and provide further research on the effects of response cost through applied behavior analysis on the stereotypic behaviors of individuals with mental retardation. There were three male participants between the ages of five and seven in this study who demonstrated stereotypic behaviors. Participant 2 and participant 3 had a label of mental retardation, and participant 1 had a label of developmental delay. Results showed that response cost as an intervention within applied behavior analysis was effective overall in reducing the stereotypic behaviors of participant 1 and participant 2. Participant 3, however, showed an increase in stereotypic behavior. More research needs to be conducted on a larger group of participants before it can be concluded that response cost is or is not effective in reducing the stereotypic behaviors of individuals with mental retardation between the ages of five and seven.
Acknowledgments

I would like to acknowledge everyone who participated in this study including the committee members, the school, the teachers, and the participants. In addition, I would also like to thank my family and friends who offered their continual support. I would especially like to thank Dr. Ruth Meese, Katie Wilkins, and Bethany Stanton whose assistance made this study possible.
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Reducing the Stereotypic Behavior of Individuals with Mental Retardation

Individuals with mental retardation make up two percent of our population. As our society is adapting to meet the needs of these individuals, it is important that we gain an understanding of what this disability is, what problems are associated with it, and what can be done to treat associated problems. Our understanding of mental retardation has changed dramatically throughout history. Several changes in the definition of mental retardation have been made as we begin to have a better understanding of this condition (Bruininks, McGrew, & Thompson, 2002; Hourcade, 2002). Despite the many alterations, a few characteristics remain unchanged. These characteristics include low intellectual functioning and a deficit in two or more adaptive skills or behaviors. Mental retardation is now defined as a disability that demonstrates limitations in intellectual functioning, limitations in adaptive behavior in terms of conceptual, social, and practical skills, and an onset of the disability before the age of eighteen (AAMR, 2004; Hourcade, 2002; Raymond, 2004). Each of these defining characteristics have been given careful consideration, as each have been outlined several times in past definitions.

*Mental Retardation*

Individuals with mental retardation were poorly understood prior to the 1700’s. At this time, only individuals with severe mental retardation were noticed, and they were perceived as fools, jesters, idiots, and even demons (Raymond, 2004). They were termed as ‘idiots’ until the mid 1800’s when research by Down and Seguin showed a deeper understanding of mental retardation (Raymond, 2004; Scheerenberger, 1987). However, these individuals continued to be mistreated, as they were often forced to live in institutions for the remainder of their lives because of misconceptions that these people were dangerous and should be feared (Raymond, 2004). Abortions and infanticide of individuals with mental retardation were repeatedly
performed until halfway through the twentieth century (Scheerenberger, 1987). The National Association for Retarded Children, now known as ARC, was established to advocate for these individuals by informing society about mental retardation and to bring attention to the many existing problems in their treatment (Hourcade, 2002; Raymond, 2004; Scheerenberger, 1987).

Legislation

Many laws which focused on the rights of individuals with mental retardation followed in the second half of the twentieth century. Normalization and deinstitutionalization were two movements, which greatly affected the lives of many people with mental retardation (Raymond, 2001; Scheerenberger, 1987). Normalization focused on making the lives of these individuals as normal as that of any individual without mental retardation (Scheerenberger, 1987). Along with this idea of normalization was deinstitutionalization, which focused on moving individuals with mental retardation out of the institutions and into society (Scheerenberger, 1987). Some of the laws that were passed included Public Law (PL) 91-517, which made sure these individuals received the treatment and care they needed, and PL 93-112, which made it illegal to exclude a person from any activity because of a disability. Public Law 94-142, which entitles all children with disabilities to a free and appropriate public education (AAMR, 2004; Hawkins-Shepard, 1994; Irvin & Singer, 1987; Raymond, 2004; Scheerenberger, 1987) is a landmark law that resulted in some of the biggest changes for these individuals in terms of education.

Public Law 94-142, which was renamed the Individuals with Disabilities Education Act (IDEA) in 1990, mandates what services are to be provided to all children. Because a free and appropriate public education is mandated, services must be available to help address behavioral concerns and other related problems regarding students with disabilities (Hourcade, 2002; Irvin & Singer, 1987). The principle of least restrictive environment (LRE) was developed through
IDEA, which is the belief that students should be educated with their non-disabled peers to the maximum extent possible (Douvanis & Hulsey, 2002; Hawkins-Shepard, 1994; Raymond, 2004). After schools became responsible for educating individuals with mental retardation, it became necessary to create a system for identifying students with mental retardation. The American Association on Mental Retardation (AAMR), which was founded in 1919, mandated that a system of classification be created (Bruininks et al., 2002; Hawkins-Shepard, 1994; Raymond, 2004). The defining characteristics needed for an individual to be classified as having mental retardation have changed four times since 1959; however, each definition included low intellectual functioning and a deficit in adaptive skills or behaviors (Bruininks et al., 2002; Hawkins-Shepard, 1994; Raymond, 2004).

**Defining Characteristics**

To understand the defining characteristics of mental retardation, we must first understand what intellectual functioning means. Intelligence is defined as the capability of an individual to learn, which is demonstrated by an Intelligent Quotient (IQ) score measured by an intelligence test (AAMR, 2004; Hourcade, 2002). The two most commonly used intelligence tests are the Stanford-Binet and the Weschsler Intelligence Scale (Bruininks et al., 2002; Raymond, 2004). Although intelligence tests are not perfect (AAMR, 2004), they give a good idea of an individual’s general intellectual functioning compared to the population.

A normal distribution of the population shows that the mean or average IQ score of the population is one hundred, with fifteen points considered one standard deviation from the mean (Hourcade, 2002; Raymond, 2004). Based on this, mental retardation is considered to be present at two standard deviations below the mean, which is an IQ score below seventy (AAMR, 2004; Hourcade, 2002; Raymond, 2004). The lower the IQ score of an individual, the lower the
Reducing Stereotypic Behavior

intellectual functioning and the greater the severity of the mental retardation. The American Association of Mental Retardation has classified mental retardation into four levels based on the IQ scores. Intelligent Quotient scores ranging from 55 to about 70 are considered mild, from 40 to 55 are considered moderate, from 25 to 40 are considered severe, and scores below 25 are considered profound (Hawkins-Shepard, 1994; Hourcade, 2002; Raymond, 2004). While intelligence gives an idea of an individual’s intellectual functioning, it is only one aspect of determining whether or not an individual has mental retardation; therefore, intelligence should not be considered the only defining characteristic (AAMR, 2004; Bruininks et al., 2002; Reiss, 1994).

The second defining characteristic is the deficit in adaptive behaviors or skills, which are the skills people use to function in their every day life (AAMR, 2004; Bruininks et al., 2002; Hawkins-Shepard, 1994; Hourcade, 2002). These adaptive behaviors include conceptual skills such as counting money and reading or writing, social skills such as self-esteem or responsibility, and practical skills such as using transportation, taking medicine, eating, and dressing (AAMR, 2004). To determine if an individual has a deficit in these adaptive skills, behavior scales or tests are created such as the Vineland Adaptive Behavior Scales, the AAMR Adaptive Behavior Assessment System, and the Adaptive Behavior Assessment System (AAMR, 2004; Bruininks et al., 2002; Raymond, 2004). Once again, a score of at least two standard deviations below the mean is considered to be a deficit in adaptive behaviors (AAMR, 2004).

The AAMR definition also requires that the disability be evident before the age of eighteen, which is the time it takes for an individual to fully develop intellectually (AAMR, 2004; Bruininks et al., 2002; Hawkins-Shepard, 1994). Accidents may occur during adulthood that may alter an individual’s intellectual functioning; however, these individuals should be
Reducing Stereotypic Behavior

classified as having a traumatic brain injury rather than mental retardation since they had previous normal learning experiences (Raymond, 2004).

The Population

Individuals with mental retardation make up about two percent of the population based on the normal distribution of IQ scores (Hourcade, 2002; Raymond, 2004). Within this population, we see a wide variation of individuals with mental retardation when considering the various degrees of their mental retardation. About eighty-five percent of the cases are considered mild, ten percent are considered moderate, and only five percent are considered severe or profound (Raymond, 2004).

Another factor to consider when looking at this population group is the number of students with mental retardation being served within special education. According to the twenty-second Annual Report to Congress, approximately eleven percent of all special education students were students with mental retardation during the 1998 to 1999 school year (U.S. Department of Education, 2000); however, a dramatic decrease in the number of students in special education with mental retardation has occurred (Hourcade, 2002). A reduction of thirty-eight percent of the number of students identified has having mental retardation occurred between 1977 and 1994. Many researchers strongly believe that many students with mild mental retardation are being identified as having a learning disability, since the number of students in this category has increased two hundred and seven percent (Bocian, Gresham, MacMillan, & Siperstein, 1996). Bocian et al. (1996), looked at the IQ scores of a number of students identified as having a learning disability and found that the average IQ of this group has dropped, which supports the idea that students with mild mental retardation are being identified as learning disabled. Another possible reason for the decline in the number of students identified as
having mental retardation may be the frequent changes in the identification procedure. The AAMR has changed the IQ score necessary for identification as mentally retarded and the definition of adaptive skills several times, both of which are major factors in classifying an individual as having mental retardation (Chamberlain, Denning, & Polloway, 2000; Smith, 1994). The stigma attached to the term mental retardation may also be a reason that fewer students are identified as having mental retardation (Hourcade, 2002).

Although the population of individuals with mental retardation may only be two-percent, individual strengths and weaknesses of each person must be assessed to create an appropriate educational environment with the correct amount of individual support (Raymond, 2004). Correctly identifying mental retardation in students is necessary in order to meet their educational needs.

Causes

The AAMR has divided the causes of mental retardation into four risk categories. The categories are biomedical, social, behavioral, and educational (AAMR, 2004; Hourcade, 2002; Raymond, 2004). About twenty five percent of all mental retardation cases originate from biomedical causes such as genetic or chromosomal abnormalities, birth defects, infections, toxins, brain injuries, and prematurity (Raymond, 2004). Of the genetic and chromosomal defects, some of the most common include Phenylketonuria (PKU), Down Syndrome, Fragile X Syndrome, galactosemia, neurofibromatosis, and hypothyroidism (Hourcade, 2002; Raymond, 2004). These disorders are either inherited or are a result of a chromosomal defect in which chromosomes are either missing, damaged, or extra in number (Raymond, 2004).

Some forms of mental retardation include concomitant physical and medical problems that can cause learning difficulties. Usually, people with mild mental retardation do not show
any physical abnormalities other than slower development (Hawkins-Shepard, 1994; Raymond, 2004). The greater the degree of mental retardation, the more apparent are physical and medical differences. For example facial anomalies, sensory disabilities including vision or hearing problems, and seizures may be prevalent in individuals with a higher degree of mental retardation (Hawkins-Shepard, 1994). These physical abnormalities most often occur in individuals with mental retardation as a result of biomedical disorders and chromosomal disorders (Raymond, 2004). Some of the physical anomalies seen in a chromosomal disorder include slanted eyes, a flat face, a protruding tongue, short hands, large ears, and abnormal finger joints. Medical problems may also exist within the cervical area, the heart, and the digestive tract. Medical and physical problems often lead to several learning deficits such as learning disabilities, attention problems, memory problems, speech disorders, and behavior disorders (Hawkins-Shepard, 1994; Raymond, 2004). The learning problems resulting from the medical and physical problems associated with mental retardation are often served in school and vocational settings.

In addition to having low intellectual functioning, these individuals also tend to learn slower (Hourcade, 2002; Raymond, 2004) than their non-disabled peers. This makes it difficult for individuals with mental retardation to learn the skills they need to become independent adults. Instruction in school, therefore, focuses on teaching these students functional skills they will need to become as independent as possible (Holmdal & Xin, 2003). Before delivering instruction, however, the severity of mental retardation needs to be taken into account, as each individual is capable of a different level of academic achievement.

To determine how to best educate each student with mental retardation, educators created a system of supports that adjusts to the level of support required by each individual with mental
Reducing Stereotypic Behavior

The supports are separated into the four categories of intermittent, limited, extensive, and pervasive supports (Hawkins-Shepard, 1994; Hourcade, 2002; Raymond, 2004). Intermittent supports are given on an as needed basis for individuals who do not always need support. Limited supports are time limited such as temporary employment training and transitional supports. Extensive supports include involvement on a daily basis and are considered long-term living support. Pervasive supports are the most involved, consisting of highly intensive, life long support (Hawkins-Shepard, 1994; Raymond, 2004). Each individual needs to be assessed to see which level of support is appropriate before placement into an academic setting. Academic support is based upon each student’s strengths, weaknesses, and level of support (Raymond, 2004).

**Instruction**

A number of factors need to be considered when delivering instruction to individuals with mental retardation. A primary focus is teaching many of these students functional skills through academic instruction, which prepares them for living more independently (Hawkins-Shepard, 1994; Holmdal & Xin, 2003; Hourcade, 2002). Holmdal and Xin (2003) studied a group of children with mental retardation who learned functional skills (e.g. counting in authentic tasks) that they may be required to do one day for a job. Specifically, these students were required to count how much milk they needed and then deliver the milk to several classes. Self-monitoring strategies were taught to students with mental retardation, which helped them carry out their job more independently. Self-monitoring strategies, therefore, should be included in the curriculum for students with mental retardation to contribute to the goal of independence.
Some students with mental retardation may never achieve complete independence regardless of instruction (Raymond, 2004). In addition to learning at a slower pace than their peers, many students with mental retardation have a number of communication problems (Hawkins-Shepard, 1994; Killu, 1999) that make it even more difficult to learn, develop personal relationships, and hold a job independently. Students with mental retardation benefit most from instruction that is direct and consistent (Raymond, 2004). All of these factors must be taken into consideration, in addition to an individual’s level of support, before delivering academic instruction.

In addition to academic problems, individuals with mental retardation tend to show a deficit in social skills (Bradley & Meredith, 1991; Raymond, 2004). A deficit in social skills can result in few or no personal relationships, poor academic achievement, and the inability to hold a job, all of which negatively affect the quality of life of these individuals (Cai, Derer, Hughes, Hwang, Lorden, Pitkin, & Rodi, 1999; Bradley & Meredith, 1991). A lack of social skills may also mean poor communication skills, which may lead to the development of serious behavioral disorders among individuals with mental retardation (Hetzroni & Roth, 2003). Because of the many negative outcomes that can occur from this deficit, the acquisition of appropriate social skills is an important goal for many individuals with mental retardation (Bradley & Meredith, 1991). Social skill training is, therefore, frequently a goal when working with individuals of all ages who have mental retardation and show a deficit in social skills. Focusing on teaching these students appropriate social skills is also important because they will be interacting more often with general education students through the movement of inclusion.

School systems are currently moving towards inclusion, which educating individuals with all disabilities in the general education classroom (Cronis, Ellis, & Wright, 1996; Douvanis
Reducing Stereotypic Behavior

& Hulsey, 2002). Because of the lack of social skills found in many students with mental retardation, social interaction with their non-disabled peers is limited, making inclusion a difficult task (Cai et al., 1999). If educators are not careful in considering how these students are to be integrated into the general education classroom, many students with mental retardation may be exposed to negative social interactions, making inclusion more harmful than helpful for these students. Research has shown that when students with disabilities are educated with their non-disabled peers, very few social interactions occur (Cronis, Ellis, & Wright, 1996). Inclusion should further emphasize the importance of teaching students with mental retardation appropriate social skills, as students with mental retardation will have to communicate appropriately with their general education peers. If these students learn appropriate social skills, they will be more capable of having appropriate interactions with general education students.

One study showed that a number of general education students intentionally do not socialize with students who have mental retardation because of the assumption that students with mental retardation lack appropriate social behavior (Cai et al. 1999). This is ironic since students with mental retardation have poor social behavior because of their lack of social interactions. Efforts have been made to increase the interactions between individuals with mental retardation and their non-disabled peers in a number of ways. Cai et al. (1999) compared social interactions between students with and without disabilities and found two interesting observations. The first was that social interactions were likely to occur between individuals who shared similar social behaviors and similar interests. The second was that general education students were models of appropriate social skills for the students with mental retardation. In conclusion, the study showed that promoting more social activities between students with mental retardation and their...
general education peers would increase the amount of social interactions among them (Cai et al., 1999).

Social skills instruction needs to include some important elements if the social skills are to be generalized for frequent use in the future. These elements include the direct teaching of appropriate behaviors, the modeling of behaviors, and constant reinforcement (Berg, McMahon, Newton, Sasso, & Wacker, 1996). The use of these elements that lead to the generalization of social skills and the positive results of peer interaction have all been successful ways of teaching social skills to individuals with mental retardation. Teaching appropriate social behaviors to individuals with mental retardation is difficult (Killu, 1999); however, a deficit in social skills has some serious negative outcomes that should not be ignored. Teaching social skills improves social relationships, increases independence, and can help these individuals maintain employment, therefore making instruction in social skills crucial to the lives of all individuals with mental retardation.

Behavioral Problems

Because of communication problems individuals with mental retardation may have, behavioral problems often develop as well (Hetzroni & Roth, 2003). One study found that individuals with severe or profound mental retardation are at the highest risk for acquiring behavioral disorders (Bodfish, Crawford, Golden, Lewis, Parker, & Powell, 1995). Of the problem behaviors displayed by these individuals, aggression, self-injury, stereotypy, and antisocial behaviors are most likely to repeat (Dekker, Einfeld, Koot, Nunn, & Tonge, 2002). Extreme behaviors such as aggression, self-abuse, and destruction, which are seen with behavioral disorders, are identified by teachers repeatedly as being the most serious problem behaviors in school (Irvin & Singer, 1987). The inappropriate behaviors demonstrated by
individuals with mental retardation are often aberrant, which means they are not reinforced socially (DeLeon, Iwata, & Kahng, 1997). Most aberrant behaviors are reinforced by sensory stimuli and include self-injurious behavior (SIB) such as hand mouthing, compulsion, and stereotypic behavior such as the repetitive movement of body rocking (DeLeon, Iwata, & Kahng, 1997). Individuals with mental retardation have also shown a tendency towards depression which may be a result of several different factors such as poor social skills, little social support, medical and physical problems, and brain damage (Bihm, Glenn, & Lammers, 2003).

In addition to depression, high levels of anxiety have also been associated with individuals with mental retardation. About two to twenty-five percent of people with mental retardation are estimated to have high anxiety (Bihm, Glenn, & Lammers, 2003). Some of the factors that may be a cause of depression and anxiety among this population group include insufficient social skills, no social support, brain damage, an environment lacking in stimulation, physical or medical problems, and a deficit in cognitive function (Bihm, Glenn, & Lammers, 2003). One study found a high positive correlation between cognition and the symptoms of depression in adults with mental retardation (Bihm, Glenn, & Lammers, 2003). Depressed individuals with mental retardation displayed feelings of self-worthlessness, failure, and pessimism (Bihm, Glenn, & Lammers, 2003). Effective treatments for these depressed individuals include social skills training, drug therapy, behavior modification procedures, and other treatments found effective for the general population (Bihm, Glenn, & Lammers, 2003).

Another problematic behavior seen in individuals with mental retardation is self-injurious behavior. Self-injurious behavior is defined as repetitive movement that causes damage to the body, which may take the form of hitting body parts, head-banging, biting, scratching, and pinching (Barron & Sandman, 1983; Bodfish et al., 2002; Bodfish et al., 1995). The frequency
and force of this behavior creates health problems for individuals with mental retardation and other people with self-injurious behaviors (Bodfish et al., 2002). About seven to nine percent of all individuals with mental retardation and about nineteen percent of institutionalized individuals with mental retardation show self-injurious behavior (Barron & Sandman, 1983). Self-injurious behavior has also frequently been observed in coexistence with stereotypy. Some even believe that self-injurious behavior may be a consequence of stereotypy (Barron & Sandman, 1983).

While the cause of self-injurious behavior is unknown, some characteristics in the individuals showing this behavior suggest that there may be a biological cause (Marion, Sandman, & Touchette, 2003). Marion et al. (2003) conducted a study to investigate the structure of self-injurious behavior. They found that the pattern of the behavior is inconsistent and that the best predictor of the behavior is the onset of a self-injurious behavior event. In another study Carey and Halle (2002) conducted a functional analysis of self-injurious behavior and found that self-injurious behavior increased when an individual wanted to escape from a task. Although little is truly understood about this behavior, many studies are being conducted to better understand its phenotype and its origins (Bodfish et al., 2002; Carey & Halle, 2002; Marion et al., 2003).

Obsessive-compulsive disorder is a psychiatric disorder also seen in individuals with mental retardation (Bodfish & Madison, 1993; Bodfish et al., 1995). Obsessive-compulsive disorder is hard to identify in these individuals because of their low intellectual functioning and because of the similarities between compulsive behaviors and other aberrant behaviors such as self-injury and stereotypy (Bodfish & Madison, 1993; Bodfish et al., 1995). Evidence exists that stereotypic behavior and compulsive behaviors are both problems that are caused by a dysfunction in the basal ganglia (Bodfish et al., 1995). Compulsive behaviors include repetitive
intentional movements such as body rocking, hair pulling, and hoarding objects (Bodfish & Madison, 1993; Bodfish et al., 1995). Medication such as fluoxetine (Prozac) is most often used to control compulsive behaviors with some success (Bodfish & Madison, 1993).

Looking at the many different characteristics of mental retardation, one can begin to understand the difficulty in meeting the many needs an individual with mental retardation may have. Throughout the course of their lives, these people may have medical problems, academic difficulties, social skill deficits, and a number of behavioral problems. Stereotypy is another aberrant behavior that is viewed as one of the most universal types of behavior in lower functioning individuals with mental retardation (Barron & Sandman, 1983). In order to understand some of the implications of stereotypy, an explanation of what this behavior is and what research has shown about this behavior will now be given.

*Stereotypy*

Stereotypic behavior is defined as the nonfunctional repetitious movement of the body or of objects (Bodfish, Crawford, Golden, Lewis, Parker, & Powell, 1995; Emerson & Howard, 1992; Millichamp & Singh, 1987). Stereotypic body movements may include body rocking, hand flapping, clapping, head-rolling, and repetitive vocal sounds (McEntee & Saunders, 1997). The manipulation of objects seen in stereotypic behavior may take the form of object twirling, mouthing objects, and object tapping (Alterson, Fisher, Lindauer, & Thompson, 1998; Bodfish et al., 1995). Some hypothesize that property destruction serves the purpose of providing an individual with objects for stereotypic behaviors such as tapping (Alterson et al., 1998). Coworkers of individuals with mental retardation who have this behavioral disorder, consider their stereotypic behavior a serious problem because it interferes with their learning, social interactions, and acquisition of social skills. This suggests that more attention needs to be given
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Reducing and stopping these stereotypic behaviors in individuals with mental retardation (Morrow & Presswood, 1984).

Stereotypic behaviors impact an individual’s independence, social acceptance, and productivity as a student or an employee (McEntee & Saunders, 1997), all of which dramatically affect the quality of a person’s life. In addition to these negative side effects, research has shown that stereotypic behaviors interfere with learned behavior (Marquis, Saunders, & Saunders, 1998; Prupas & Reid, 2001), making it difficult for individuals to acquire new appropriate behaviors. This creates a crucial need for stereotypic interventions (Emerson & Howard, 1992). One study showed that decreases in stereotypic behavior occur with an increase in appropriate social behavior (Lloyd & Rice, 1982).

Of all the abnormal behaviors displayed by individuals with mental retardation, stereotypy is occurs most frequently (Bodfish et al., 1995). Within this population, individuals with severe or profound mental retardation most often demonstrate stereotypic behavior (Lloyd & Rice, 1982; Marquis, Saunders, & Saunders, 1998; McEntee & Saunders, 1997). According to one study, more than two thirds of individuals with mental retardation living in institutions demonstrate stereotypic behaviors (Lloyd & Rice, 1982; Millichamp & Singh, 1987).

A survey conducted in a study by Bodfish et al. (1995) on the repetitious behavior of individuals with mental retardation showed that 91% of the individuals displayed stereotypy, 88% displayed self-injurious behavior, and 83% displayed compulsion. The authors examined which type of stereotypic behavior occurred most often. The study showed that stereotypic body movements were displayed 97.1% of the time, object manipulations occurred 62.5% of the time, and vocal behaviors occurred 25.7% of the time. While stereotypic behaviors are frequently
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demonstrated by individuals with mental retardation and many studies examined methods used to
decrease the occurrence of these behaviors, no treatments have been consistently effective.

**Possible Causes and Treatments**

The cause of stereotypy is unknown; however, a theory exists as to what it may be. The
theory suggests that stereotypic behaviors exist because of the sensory stimulus they provide
(DeLeon, Iwata, & Kahng, 1997; Lloyd & Rice, 1982; Prupas & Reid, 2001). Some behaviors
provide certain types of stimulation. For example, hand mouthing and object twirling produce
tactile, auditory, and visual stimulation. The resulting stimulation may be why stereotypy is so
difficult to reduce (Prupas & Reid, 2001). A neurobiological look at stereotypy has shown the
possibility of enhanced levels of endorphins during stereotypic behaviors; however, this research
is limited when compared to the research on sensory stimulation (Emerson & Howard, 1992).

Some studies have examined the sensory stimulation provided from the environment.
One study showed that stereotypic behavior displayed by college students increased either
because of a high stress environment or because of a lack of stimulation in the student’s
environment (Johnson, Laarhoven, & Repp, 2002). This study supported the theory that
stereotypic and other aberrant behavior of individuals with mental retardation changes with the
stimulation of the environment (Johnson, Laarhoven, & Repp, 2002). Stereotypic behaviors most
often observed included facial and hair stereotypies during times of high anxiety, and object
manipulation or body movement in a boring environment (Johnson, Laaroven, & Repp, 2002).

Adams, Stangl, and Tallon (1980) conducted an experiment to see which aspects of an
environment decreased or increased stereotypic behaviors of individuals with mental retardation.
They examined two types of influences, including passive environmental influences and
manipulable objects in the environment. The passive environmental influence conditions
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included music or television, both of which are often used in institutions, and a quiet environment. The manipulable object conditions included free access to toys, instructed use of toys by staff, and no toys. This study showed that there was no significant change in stereotypic behaviors during any of the manipulable toy conditions. On the other hand, there was a significant decrease in stereotypic behaviors in the passive conditions of music and quiet. Television resulted in much higher levels of stereotypic behaviors than the other passive conditions. These findings conflicted with past research that showed a dramatic change in stereotypic behaviors when using manipulable objects (Adams, Staegl, & Tallon, 1980). These incompatible findings demonstrate the difficulty in finding a general treatment to reduce stereotypic behaviors.

Another experiment tried reducing stereotypic behaviors that were thought to be maintained by visual stimulation (Lloyd & Rice, 1982). Lloyd and Rice (1982) theorized that if stereotypic behaviors were reinforced by the sensory stimulation they provide, then the removal of sensory stimulation would result in an extinction of these behaviors. Their findings suggested that the duration and frequency of stereotypic behaviors decreased during a black out condition in which there was no visual stimulation. Although the results of this study support the sensory stimulation theory of stereotypic behavior, the study only focuses on decreasing stereotypic behavior rather than replacing it with more appropriate behaviors (Lloyd & Rice, 1982). While many studies have focused on the correlation between sensory stimulus and stereotypic behavior; however, the differences in results continue to make sensory a controversial issue.

The types of treatment used to reduce stereotypy can be divided into the two categories, medication and behavioral treatment. Because there is little data on effective treatments, the type of treatment method to use is debatable (Irvin & Singer, 1987). However, behavioral treatments
have been somewhat successful. Some of these methods include using functional assessment, self-selected treatments by the participants, and knowing the different stimulation of each aberrant behavior (Adelinis, Crosland, Iwata, Kogan, Lerman, & Rainville, 1997; Hetzroni & Roth, 2003; McEntee & Saunders, 1997). Some of the other successful behavioral interventions include sensory extinction, positive reinforcement, and environmental manipulation (Prupas & Reid, 2001). Many of these interventions have been used in applied behavior analysis. Many studies analyzed the use of applied behavior analysis in treating stereotypic behavior in individuals with intellectual disabilities (Remington, 1998). In many institutions, however, pharmacotherapy is most commonly used to treat stereotypy in individuals with mental retardation (Millichamp & Singh, 1987).

A number of different medications have been used to reduce stereotypic and other aberrant behaviors. One study found that selective serotonin reuptake inhibitors, which have been used to treat compulsive behaviors, have also been effective in treating stereotypic behaviors in people with severe or profound mental retardation (Bodfish et al., 1995). Naloxone, which is an opiate antagonist, was also found to help reduce the occurrence of both stereotypy and self-injurious behavior in some individuals with mental retardation (Barron & Sandman, 1983). Another study looked at the effects of antipsychotic medication on individuals with mental retardation (Millichamp & Singh, 1987). The authors found that although this type of medication was used, the long-term effects were unknown, and there was little change in behavior when the dosage was dramatically reduced (Millichamp & Singh, 1987). Due to the lack of evidence regarding the effectiveness of medication, the effectiveness of behavioral treatments at reducing stereotypy is being studied more frequently.
Many behavior strategies have been implemented to reduce stereotypic behavior and other challenging behaviors displayed by individuals with mental retardation. Some of the implemented strategies have included positive behavior interventions, self-control, object manipulation, exercise, and applied behavior analysis. Each intervention is discussed in terms of their effectiveness in reducing stereotypy.

**Behavioral Interventions**

Positive behavior support developed from years of research on applied behavior analysis (Carr, 1997). According to Carr (1997), positive behavior support has begun to branch off into its own field of behavioral interventions. Hetzroni and Roth (2003) implemented a positive support approach, which consisted of a functional assessment followed by a positive support plan. A functional assessment assesses the function of a challenging behavior. A positive support plan is then implemented to teach appropriate behaviors to replace the problematic behavior addressed by the functional assessment.

Hetzroni and Roth’s (2003) study targeted five individuals with moderate to severe mental retardation showing challenging behaviors for positive support plans. Each participant was specifically taught appropriate behavior to replace the challenging behaviors. All five of the individuals showed a decrease in their challenging behavior after the administration of a functional assessment and the introduction of a positive behavior plan. Although the challenging behaviors did not completely stop (Hetzroni & Roth, 2003), their decrease shows the positive implications of this behavioral intervention.

Self-control is another behavioral intervention that has been used to decrease stereotypic behaviors. Self-control is described as the ability of an individual to manage his/her behavior without assistance from another individual (Morrow & Presswood, 1984). Self-control
strategies may include self-instruction, self-assessment, or self-reinforcement depending on the individual and the behaviors being addressed. One study monitored a student’s three stereotypic behaviors as he learned to control the behaviors using a self-assessment strategy. All the behaviors except inappropriate noises decreased after the self-control intervention was introduced (Morrow & Presswood, 1984).

Another study on self-control used a self-reinforcement strategy to reduce stereotypic behaviors. Three adults with developmental disabilities including mental retardation, who also displayed stereotypic behaviors, were told that if they engaged in the appropriate target behavior for a certain amount of time they would receive a reinforcer (Binder, Dixon, Hayes, Manthey, Sigman, & Zdanowski, 1998). The longer the adults engaged in the appropriate behavior, the longer the researchers provided the reinforcer. Results showed that during self-control training, all the participants demonstrated the target behavior for a longer amount of time, and continually picked the delayed and larger reinforcer (Binder et. al, 1998). Both this study and the previous one yielded positive results when using different self-control strategies to change the stereotypic behaviors of individuals with mental retardation.

Object manipulation can be considered a stereotypic behavior when the use of the object is nonfunctional. Object manipulation has also been used as a form of behavioral intervention by prompting individuals to use objects functionally, or for their intended purposes. One of these studies divided the definition of object manipulation into functional engagement of the object, and stereotypic engagement of the object, depending on what interaction was occurring between the individual and the object (McEntee & Saunders, 1997). The four participants in the study had severe or profound mental retardation and engaged in stereotypic behaviors frequently. In the study, each participant interacted with a number of different objects. Over time, objects that
produced the highest level of stereotypic engagement were continually removed until only one object remained. The results of the study demonstrated that as the number of objects decreased, the amount of time in functional engagement increased (McEntee & Saunders, 1997).

Alterson, Fisher, Lindauer, and Thompson (1998) hypothesized that if the engagement of objects produced the same sensory feedback as stereotypic behavior, then the time engaged in stereotypic behavior would decrease. This study also investigated whether the manipulation of objects served a functional purpose or a nonfunctional stereotypic purpose. When researchers introduced objects matching sensory feedback thought to be a reinforcer of stereotypic object manipulation, the participants did decrease their stereotypic behaviors as well as their property destruction behavior (Alterson et al., 1998). The two studies showed two different approaches to using object manipulation as a behavioral intervention.

Several studies indicate that the use of exercise results in an immediate decrease in stereotypic behavior and an increase in learned behavior; however, this progress may only last for an hour or two (Prupas & Reid, 2001). Exercise gives individuals showing stereotypic behavior the sensory stimulation they crave, therefore decreasing the need for stereotypy. However, research suggests that exercise needs to be intense for a change in stereotypic behaviors to occur (Prupas & Reid, 2001). This study showed an average decrease of fifty eight percent in stereotypy following exercise. Since there is such a dramatic decrease in stereotypic behavior immediately following exercise, thought should be given to the activity following an exercise session. It seems plausible that an individual may spend more time engaged in learning behavior during an activity following exercise (Prupas & Reid, 2001). Exercise shows a decrease in stereotypic behavior, but it also benefits the individual’s physical health as well.
This makes exercise a powerful tool, and the need for continued research is clear (Prupas & Read, 2001).

**Applied Behavior Analysis**

Applied behavior analysis (ABA) is a behavioral intervention that changes the behaviors of individuals with intellectual disabilities. Over the past two decades, behavioral analysis has been used on the problem behaviors of individuals of all ages with developmental disabilities (Cipani, 2002). This method includes identifying a problematic behavior and reducing it by teaching appropriate functional behaviors and skills (Alberto & Troutman, 1999; Frances & Rush, 2000; Kazdin, 1994). The Journal of Applied Behavior Analysis published more than five hundred studies on the effects of ABA on intellectual disabilities between 1968 and 1995 alone (Remington, 1998). According to Remington (1998), about half of these studies focused on severe behavior disorders such as self-injurious behavior and stereotypy, and on communication. Data does not show who benefits most from applied behavior analysis, but the increasingly positive results of its use when correcting stereotypic behaviors displayed by students with autism suggests a positive outlook for students with mental retardation (Delmolino & Harris, 2002).

Applied behavior analysis is a technique that decreases problem behavior while teaching academic skills, socially appropriate behavior, and functional skills (Alberto & Troutman, 1999; Frances & Rush, 2000; Jolivette, Nelson, & Scott, 2000). Applied behavior analysis studies the behavior of an individual in the setting where the behavior naturally occurs, and uses functional behavior assessment to find the antecedents and consequences of the behavior targeted for intervention (Cipani, 2002; Gresham, Skinner, & Watson, 2001; Kazdin, 1994). Functional behavior assessment is the procedure used in applied behavior analysis to change target
behaviors (Cipani, 2002; Gresham et al., 2001). The Individuals with Disabilities Education Act requires that students with disabilities who demonstrate behavioral problems must be given a functional behavior assessment, as it is considered a best practice in the field of applied behavior analysis (Butler, Fox, Gable, Quinn, Tonelson, Walker-Bolton, 2003; Cipani, 2002; Gresham et al., 2001; Jolivette et al. 2000). The behaviors targeted for intervention by a functional behavior assessment in applied behavior analysis must be socially significant, and a relationship between the behavior and its intervention must be confirmed (Alberto & Troutman, 1999; Butler et al., 2003; Gresham et al., 2001; Jolivette et al., 2000). Research on applied behavior during the past thirty years and contributes to the knowledge of assessment methods, interventions, and the framework of behavior analysis (Carr, 1997).

Applied behavior analysis can be broken down into two techniques including behavior-accelerating procedures and behavior-decelerating procedures (Frances & Rush, 2000; Gresham et al., 2001). Behavior accelerating procedures are those techniques that focus on the appropriate behavior being taught. Some examples of behavior accelerating procedures include social skills training, differential reinforcement of incompatible behavior (DRI), and differential reinforcement of alternate behavior (DRA). Behavior-decelerating procedures on the other hand focus on problematic behaviors. Some examples include response cost, extinction, and over correction. These behavior-decelerating procedures are always used in combination with techniques that focus on teaching appropriate behavior (Frances & Rush, 2000; Gresham et al., 2001).

Response Cost

Behavior reducing strategies can be used as an intervention. Just as there are different types of reinforcement, there are different types of punishment. A punishment is defined as an
unpleasant event that results in a decrease of behavior (Alberto & Troutman, 1999; Gresham et al., 2001; Howerton & Justen, 1993; Kazdin, 1994; Maag, 2001). In one type of punishment, the presentation of a stimulus results in a decrease in behavior. In the second type of punishment, a stimulus is removed and results in a decrease in behavior (Howerton & Justen, 1993; Kazdin, 1994). Response-cost falls under this second type of punishment in that it is used to reduce a behavior by removing a stimulus (Alberto & Troutman, 1999; Howerton & Justen, 1993). Response cost is the procedure in which reinforcers are continually removed following the occurrence of an undesired behavior (Howerton & Justen, 1993; Kazdin, 1994). Several studies have used response-cost as an intervention on certain behaviors of people with mental retardation or autism. Ellingson, Long, Miltenberger, and Ott (1999) conducted one of these studies to compare different treatments to see which worked effectively at reducing oral-digit habits such as fingernail biting. The use of response cost in this study decreased the occurrence of fingernail biting; however, the rate of the behavior went up after response cost was no longer used.

Ross (2002) also used response cost on the conversational responses of people with autism. The experimenter's attention in this study was used as a reinforcer for a participant because it resulted in an increase of behavior. The experimenter's attention was therefore removed in the hopes that the occurrence of inappropriate conversational responses would go down. These faulty conversational responses decreased one hundred percent, and correct responses increased thirteen percent when response cost was introduced. In fact, the removal of the experimenter's attention, or the response cost condition, was more effective in reducing faulty conversational responses than the other condition that was used in which tokens were given as positive reinforcement.
A study by Basili, Lancioni, and O'Reilly (1999) is one of many that used response cost on the sleep problems of individuals with severe to profound mental retardation. In this study, the participants were given a certain amount of time to fall asleep, but if they failed to fall asleep, they were removed from bed for a certain amount of time. In this case, being removed from bed was the reinforcer that was taken away to decrease the time it took these individuals to fall asleep. After eight weeks of using response cost, the average amount of disturbed sleep decreased from 1.44 hours to an average of 0.53 hours. All fourteen participants in this study showed improvement after response cost was used (Basili, Lancioni, & O'Reilly, 1999).

Response cost has shown many positive effects on problematic behaviors of individuals with mental retardation, and can be used with applied behavior analysis.

Summary

The stereotypic behaviors of individuals with mental retardation are problematic because stereotypy and adaptive behaviors are functionally incompatible (Millichamp & Singh, 1987). Stereotypy makes it difficult for individuals with mental retardation to learn the appropriate skills they need, thus impacting an individual's independence, and social acceptance (McEntee & Saunders, 1997). This form of aberrant behavior is displayed more frequently than any other among individuals with severe or profound mental retardation (Bodfish et al., 1995) and over two thirds of individuals with mental retardation living in institutions demonstrate some form of stereotypy (Lloyd & Rice, 1982; Millichamp & Singh, 1987). Although many treatments have been implemented, a consistently effective treatment for every behavior has not been found.

McEntee and Saunders (1997) conducted a study using applied behavior analysis with response selection as the treatment to reduce the occurrence of stereotypic behavior in four males with severe or profound mental retardation. This study was a replication of a study by Green and
Striefel (1988), which used response selection to reduce the stereotypic behaviors of four individuals with autism. Response selection is the same as response cost in that it focuses on reducing a behavior by removing a reinforcer (Alberto & Troutman, 1999; Howerton & Justen, 1993). This study replicated a study by Green and Striefel (1988) which used restriction analysis through the use of applied behavior analysis on the stereotypic behaviors of individuals with autism (McEntee & Saunders, 1997).

In the study by McEntee and Saunders (1997), each of the participants was given four objects to manipulate, which were removed one at a time according to which object was manipulated the most. Each of the objects had been picked based on past observations of their stereotypic use. The objects were laid out on tables and the participants were told, "Here are some things for you to play with." Interactions between the participants and the objects were video taped for ten minutes (McEntee & Saunders, 1997).

During this study, data was collected for both the functional engagement and the stereotypic engagement of the individuals with the objects (McEntee & Saunders, 1997). A single subject modified reversal design (ABCDA) was used to collect data for this study. All four objects were presented during baseline (A), and one object was removed in each phase (BCD) until only one object was left. The last phase of the study returned to baseline, as this is a reversal design (McEntee & Saunders, 1997). Results of the data as depicted in the graphs showed that each participant engaged in stereotypic manipulation of the objects the most when the highest number of materials was available (McEntee & Saunders, 1997). As objects were removed, the time engaged in functional behavior with the objects increased (McEntee & Saunders, 1997). A functional relationship was found since the treatment of response cost
resulted in a decrease in stereotypic behavior, which increased once again, when the treatment was removed (McEntee & Saunders, 1997).

More and more research is being conducted on using applied behavior analysis on the aberrant behaviors of individuals with intellectual disabilities (Remington, 1998). Several studies have used response cost as an effective treatment in applied behavior analysis to reduce problem behaviors in individuals with mental retardation (Basili, Lancioni, & O’Reilly, 1999).

Although McEntee and Saunders (1997) were able to reduce the stereotypic behaviors of four individuals with mental retardation, the participants were between the ages of eleven and fourteen so there is a need to see if this intervention would be effective on younger individuals with mental retardation. Therefore, the purpose of this study was to determine the effect of response cost on reducing the stereotypic behavior of younger individuals with mental retardation. Finding ways to reduce the stereotypic behavior of individuals with mental retardation will have many positive benefits. This study has also been conducted with the purpose of increasing functional behavior. More specifically, this study examined the following questions:

1. Is using response cost as an intervention within applied behavior analysis effective in reducing stereotypic behavior?

2. Does functional behavior increase as stereotypic behavior decreases?

3. Will the intervention in this study, which is a replication of the study by McEntee and Saunders (1997), be effective on younger individuals with mental retardation?
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Method

Design and Participants

This study was a replication of the study by McEntee and Saunders (1997) that had success in reducing stereotypic behavior in four individuals with mental retardation using response selection within applied behavior analysis. A single subject modified reversal design (ABCDA), which resembles the design used by McEntee and Saunders, was used to collect data for this study. The participants were selected using a convenience sampling method from a local elementary school. This school is located in a rural community and is comprised of pre-kindergarten classes through fourth grade classes. Approximately 1,074 students are enrolled in the school with a teacher to student ratio of 12 to 1. About 65% of the students receive free or reduced-price lunch. Sixty-one percent of the students are African American, 38% are Caucasian, and students of American Indian, Asian, or Hispanic decent make up about one percent of the student population.

Three individuals with mental retardation or severe disabilities between the ages of seven and eight who demonstrate stereotypic behaviors participated in the study. Participant 1 was a seven year old male and was labeled as developmentally delayed. He used sign language to communicate and has seizures occasionally. Participant 1 engaged in stereotypic behaviors including body rocking, object manipulation, and continual grunting noises. Participant 2 and participant 3 were labeled as having mild to moderate mental retardation and both engaged in stereotypic behaviors including body rocking, smelling objects, make grunting noises, and manipulating objects. Participant 2 would also chew on a chewing tube, hit himself, and repeat phrases orally. Participant 2 used oral language to communicate and was a very active child. Participant 3 used oral language to communicate but had speech difficulties that made it difficult...
to understand what he was saying. Participant 3 had very good attention to task and engaged in functional behavior quite often.

**Apparatus and Materials**

A video camera was used to record the sessions; a stopwatch was used to record time, and four objects for each individual were picked based on observed engagement of each participant with these materials. The four objects selected for each participant were chosen based on his/her time engaged in functional or stereotypic use of each object. Each of the objects picked showed approximately the same amount of time engaged in stereotypy.

**Procedure**

Both the school and parent's permission for the subject's participation in the study was obtained (See letters in appendix). No physical or emotional harm came to any of the participants at any time. The author of the study and a graduate student together observed each participant; however, only limited physical interaction with the participants was necessary for the experiment. The observers included the author of the study, Crystal Holmes, and a graduate student, Katie Wilkins, who was trained by the author in the recording system used in the observations. Although the sessions were video recorded, the tapes were destroyed following the experiment, and were not viewed by anyone besides the researcher, the observers, and committee members of the experimenter. Destroying the tapes and providing pseudonyms for all participants ensured anonymity and confidentiality. In addition, no names of the participants, teachers, or school divisions were included. Participation was voluntary, and participants had the option of withdrawing from the experiment without penalty at any time.

Each participant was observed manipulating several objects. Four objects were then picked for each participant. The selection of objects was based on the percentage of intervals
engaged in functional or stereotypic behavior with the objects. Before the data collection began, each object picked showed about the same percentage of intervals engaged in stereotypy. This was done so that as objects were removed, the researcher knew that any reduction in stereotypy was due to response cost rather than the participant’s natural stereotypic engagement with that particular object. Participant 1 showed stereotypical engagement with the radio 91% of the intervals, the “See & Say” 75% of the intervals, the vacuum 50% of the intervals, and the piano 66% of the intervals. Participant 2 showed stereotypical engagement with the string and shape task 44% of the intervals, the puzzles 38% of the intervals, the bear counters 22% of the intervals, and the barrel of monkeys 14% of the intervals. Participant 3 showed stereotypical engagement with the cars 66% of the intervals, the string and shape task 50% of the intervals, the bear counters 41% of the intervals, and the puzzle 38% of the intervals.

One at a time, participants were placed in a room with a table that contained their four objects selected from the observation. A video camera was used to record each of the sessions. The chief researcher and graduate student recorded the percentage of intervals each individual engaged in stereotypic use and functional use of each object. Functional engagement was defined as holding, carrying, or manipulating the object as the manufacturer intended for it to be manipulated. Stereotypic engagement was defined as any non-functional use of an object that included repetitive movement of an object, mouthing of an object, smelling an object, body rocking, and grunting while holding an object. Partial interval recording was used to record the occurrence of the behaviors in ten-second intervals. In partial interval recording, the behavior must occur at any time within the interval for it to be recorded, which results in an overestimate of the behavior's occurrence. Partial interval recording has been chosen because it provides an overestimate of stereotypic behavior as it is being reduced. Using response selection, the object
recorded as having the highest percentage of intervals engaged in stereotypic behavior was removed for the next session.

A modified reversal design (ABCDA) was used to collect and display the data. Fifteen sessions each lasting ten minutes were conducted once a day. Three sessions were recorded for each phase (ABCDA). The participant had three sessions to manipulate the four objects (A) followed by three sessions with three objects (B), three sessions with two objects (C), three sessions with one object (D), and finally three sessions with all four objects present (A) once again.

Instructions to participants

The participants were given objects at the beginning of each session and were told, "Here are some things for you to play with." If the participant tried to leave the table, the chief researcher would ask the participant to come back to the table. If a participant engaged in behavior that was dangerous to him/her or the observers, such as throwing an object, the chief researcher would stop the participant from engaging in the behavior. Also, if the participant was engaging in behavior that could have broken the objects, the participant was stopped from engaging in the behavior. These fifteen sessions lasted for ten minutes and were conducted once a day. Preceding the fifteen sessions, three to five observations were made to obtain inter-observer reliability and to determine what four objects should be used for each participant in the study.

Experimental conditions

Response selection (i.e., response cost) was the independent variable, or treatment, used to reduce stereotypic behavior. This was implemented by having one object (i.e., the one with the highest percentage of intervals engaged in stereotypic behavior) removed every three
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sessions. Response selection was used as a type two punishment in that it attempted to reduce a behavior by having a stimulus removed from the environment.

Dependent measures

Percentage of intervals engaged in stereotypic or functional use of an object constituted the dependent variable. Interval recording was used to record the number of intervals each participant engaged in functional use of the objects or stereotypic use of the objects. Functional engagement was defined as manipulating an object as the manufacturer intended it to be used. Stereotypic engagement was defined as any non-functional use of an object that included repetitive movement of an object, mouthing of an object, smelling an object, body rocking, and grunting while holding an object. Each object selected for observation was given a functional engagement definition and a stereotypic engagement definition (see Appendix B). A data recording sheet (see Appendix C) was used by observers to record the number of intervals the objects were used stereotypically and functionally during each ten-minute session using partial interval recording procedures. A third category of behavior, which was referred to as "other" behavior, was also recorded when the participants were not engaged with the objects. Two observers were used to establish interobserver reliability, which confirms that the data collected is accurate. Interobserver reliability was calculated using the formula \(\frac{\text{agreements}}{\text{agreements} + \text{disagreements}} \times 100\), which was used throughout the experiment. The formula was used to find interobserver reliability for the overall behavior in each ten minute session (i.e. all intervals). Practice attempts to collect data were made initially until interobserver agreement reached at least eighty percent accuracy.
Results

Participants

All three participants went to the same elementary school. The school and the participant's parents gave permission for participation of the students before observations began (Refer to Appendix A for letter of permission). Participant 1, who was a seven year old male, was given a label of developmentally delayed and was in a severe disability classroom. He used sign language most often to communicate rather than oral speech. Participant 1 has seizures occasionally, which tend to occur in the morning. Six other students were in his class along with the teacher and one or more teacher aids. The observations took place in the back of the classroom. On most days, the class was outside during the observations, but there were some days when the class was in the room. Distractions were kept to a minimum however, because the back of the classroom was separated by a bookshelf.

Stereotypy was manifested in different ways with participant 1. These included body rocking, head nodding, repeated humming, repeated grunting noises, tapping objects, moving objects back and forth, opening and closing his mouth, and manipulating strings such as the cord on the vacuum. Participant 1 enjoyed interacting with string objects such as jump ropes. String tasks were originally picked for participant 1; however, he was unable to do the tasks functionally without physical support so different objects were picked which he could use functionally and still demonstrated stereotypy. The four objects picked for participant 1 included a vacuum, a toy radio, a see and say, and a piano keyboard. After observing participant 1 engaging with each object, a definition of functional behavior and stereotypic behavior was created for each object (Refer to Appendix B).
Participant 2, who was a five year old male, was labeled as having mental retardation and placed in a classroom for students with mental retardation. At the time of day his observations occurred, his class consisted of about five other students, his teacher, and one or more teacher aids. More students joined the class later in the day. Participant 2 also spent time each day in the severe disability classroom, the same as that of participant 1. The observations took place in one of two rooms in which there were tables, desks, chairs, and open space. Participant 2 was very active and liked to talk a lot. He would frequently repeat phrases during the observations that did not serve a functional purpose. He also had a chewing tube around his neck, which was given to him by his teachers so he would have something to chew on rather than himself. Participant 2 would occasionally bite himself or some of the objects. He was reminded that he had his chew tube to chew on instead of objects if this occurred during the observations, which may have affected his time engaged in stereotypy. Participant 2's stereotypic behaviors included repeating phrases, chewing on objects or himself, body rocking, smelling objects, twirling string, and tapping objects. The four objects for participant 2 included a barrel of monkeys, a string and shape task, bear counters, and a puzzle. After observing participant 2 engaging with each object, a definition of functional behavior and stereotypic behavior was created for each object (Refer to Appendix B).

Participant 3 was a six year old male with a label of mental retardation. He was in the same class as participant 2, which was a class for students with mental retardation. Once again, the class consisted of about five other students, a teacher, and one or more teacher aids. The observations for participant 3 also occurred in two rooms where there were tables, desks, chairs, and open space. Participant 3 had speech difficulties and did not talk often. During the observations, participant 3 focused his attention on one task at a time and showed high functional
engagement with each object; however, he would frequently smell objects when engaged in each task. His stereotypic behaviors included smelling objects, body rocking, making grunting noises, biting himself, and pushing objects back and forth quickly on the table surface. The four objects picked for participant 3 included toy cars on a road map, a string and shape task, bear counters, and a puzzle. After observing participant 3 engaging with each object, a definition of functional behavior and stereotypic behavior was created for each object (Refer to Appendix B).

Interobserver Agreement

Before data collection began, at least 80% reliability was established for interobserver agreement with each participant. Reliability was calculated by dividing the total number of intervals that showed agreement by the total number of intervals. The author of the study, Crystal Holmes, and the graduate student, Katie Wilkins, established 93% reliability with participant 1 before data collection began. For participant 1, the graduate student observed with the chief researcher for eight of the fifteen sessions. There was only one observer for the other seven sessions. Out of the eight sessions where two observers were present, reliability ranged between 65% and 91% for participant 1 (Refer to Appendix D, Table 1). For participant 2, the two observers established 88% reliability before data collection began. The graduate student observed with the chief researcher for eight of the fifteen sessions. Reliability ranged between 81% and 93% of these eight sessions in which both observers were present (Refer to Appendix E, Table 2). Reliability was established at 85% for participant 3 before data collection began. The graduate student and the chief researcher observed ten out of the fifteen sessions for participant 3. Of these ten sessions, reliability ranged between 71% and 93% (Refer to Appendix F, Table 3).
Data for Participant I

In phase A, which consisted of the first three sessions of data collection, each participant was given four objects to play with while their stereotypic engagement, functional engagement, and 'other' engagement were recorded. 'Other' referred to the intervals in which the participants were not engaged with the objects. Participant 1 engaged in stereotypy 75% of the intervals during the first session, 61% of the intervals during the second session, and 36% of the intervals during the third session. Participant 1 engaged in functional behavior 13% of the intervals during the first session, 11% of the intervals during the second session, and 35% of the intervals during the third session. Participant 1 engaged in other behavior 11% of the intervals during the first session, 26% of the intervals in the second session, and 28% of the intervals in the third session. At the end of phase A, the object that had the highest average of stereotypic engagement from all three sessions was removed. For participant 1, the radio had an average of 41% stereotypic engagement, the see and say had an average of 1% stereotypic engagement, the vacuum had an average of 4% stereotypic engagement, and the piano had an average of 5% stereotypic engagement. The radio was therefore removed from participant 1's list of objects (Refer to graphs in Appendix D Figure 4-6).

Each participant was given three objects to play with in phase B, which consisted of sessions four, five, and six. Participant 1 engaged in stereotypy 30% of the intervals in session four, 30% of the intervals in session five, and 25% of the intervals in session six. Participant 1 engaged in functional behavior 13% of the intervals in session four, 55% of the intervals in session five, and 60% of the intervals in session six. Participant 1 engaged in other behavior 56% of the intervals in session four, 15% of the intervals in session five, and 15% of the intervals in session six. At the end of phase B, the object that had the highest average of stereotypic
engagement from all three sessions was removed. Participant I showed an average of 6% stereotypic engagement with the see and say, 13% stereotypic engagement with the vacuum, and 6% stereotypic engagement with the piano. The vacuum was therefore removed from participant I’s list of objects for the next phase.

Each participant was given two objects to play with in phase C, which consisted of sessions seven, eight, and nine. Participant I engaged in stereotypy 46% of the intervals in session seven, 25% of the intervals in session eight, and 11% of the intervals in session nine. Participant I engaged in functional behavior 48% of the intervals in session seven, 38% of the intervals in session eight, and 68% of the intervals in session nine. Participant I engaged in other behavior 5% of the intervals in session seven, 36% of the intervals in session eight, and 20% of the intervals in session nine. At the end of phase C, the object that had the highest average of stereotypic engagement from all three sessions was removed. Participant I showed an average of 8% stereotypic engagement with the see and say and 26% stereotypic engagement with the piano. The piano was therefore removed from participant I’s list of objects for the next phase.

In phase D, which consisted of sessions ten, eleven, and twelve, each participant was given one object to play with. Participant I engaged in stereotypy 51% of the intervals in session ten, 28% of the intervals in session eleven, and 8% of the intervals in session twelve. Participant I engaged in functional behavior 45% of the intervals in session ten, 53% of the intervals in session eleven, and 11% of the intervals in session twelve. Participant I engaged in other behavior 3% of the intervals in session ten, 18% of the intervals in session eleven, and 80% of the intervals in session twelve.

Sessions thirteen, fourteen, and fifteen were a return to phase A, where each participant was given all four objects to play with once again. In this phase, participant I engaged in
stereotypy 31% of the intervals in session thirteen, 35% of the intervals in session fourteen, and 53% of the intervals in session fifteen. Participant 1 engaged in functional behavior 60% of the intervals in session thirteen, 63% of the intervals in session fourteen, and 36% of the intervals in session fifteen. Participant 1 engaged in other behavior 8% of the intervals in session thirteen, 1% of the intervals in session fourteen, and 10% of the intervals in session fifteen.

**Data for Participant 2**

In the first phase A, participant 2 engaged in stereotypy 65% of the intervals during the first session, 70% of the intervals during the second session, and 61% of the intervals during the third session. Participant 2 engaged in functional behavior 1% of the intervals during the first session, 1% during the second session, and 16% during the third session. Participant 2 engaged in other behavior 33% of the intervals during the first session, 28% during the second session, and 21% during the third session. The object that showed the most stereotypic engagement was then removed. Participant 2 showed an average of 17% stereotypic engagement with the barrel of monkeys, 27% stereotypic engagement with the string and shape task, 2% stereotypic engagement with the puzzle, and 20% stereotypic engagement with the bear counters. The string and shape task was therefore removed from participant 2's list of objects (Refer to Appendix E, Figure 7-9).

In sessions four five and six of phase B, three objects remained with which participant 2 was allowed to play. Participant 2 engaged in stereotypy 56% of the intervals in session four, 43% of the intervals in session five, and 41% of the intervals in session six. Participant 2 engaged in functional behavior 11% of the intervals in session four, 26% of the intervals in session five, and 1% of the intervals in session six. Participant 2 engaged in other behavior 31% of the intervals in session four, 30% of the intervals in session five, and 56% of the intervals
in session six. The object with the most stereotypic engagement was then removed. Participant 2 showed an average of 14% stereotypic engagement with the barrel of monkeys, 8% stereotypic engagement with the puzzle, and 27% stereotypic engagement with the bear counters. The bear counters were therefore removed from participant 2’s list of objects for the next phase.

In phase C, participant 2 engaged in stereotypy 33% of the intervals in session seven, 50% of the intervals in session eight, and 35% of the intervals in session nine. Participant 2 engaged in functional behavior 11% of the intervals in session seven, 21% of the intervals in session eight, and 6% of the intervals in session nine. Participant 2 engaged in other behavior 55% of the intervals in session seven, 33% of the intervals in session eight, and 58% of the intervals in session nine. An object was then removed based on the most stereotypic engagement. Participant 2 showed an average of 22% stereotypic engagement with the barrel of monkeys and 16% stereotypic engagement with the puzzle. The barrel of monkeys was therefore removed from participant 2’s list of objects for the next phase.

In phase D, participant 2 engaged in stereotypy 31% of the intervals in session ten, 18% of the intervals in session eleven, and 16% of the intervals in session twelve. Participant 2 engaged in functional behavior 26% of the intervals in session ten, 15% of the intervals in session eleven, and 16% of the intervals in session twelve. Participant 2 engaged in other behavior 41% of the intervals in session ten, 66% of the intervals in session eleven, and 66% of the intervals in session twelve.

In the last phase A, participant 2 was given all four objects to play with once again. Participant 2 engaged in stereotypy 20% of the intervals in session thirteen, 30% of the intervals in session fourteen, and 55% of the intervals in session fifteen. Participant 2 engaged in functional behavior 21% of the intervals in session thirteen, 10% of the intervals in session
fourteen, and 3% of the intervals in session fifteen. Participant 2 engaged in other behavior 58% of the intervals in session thirteen, 60% of the intervals in session fourteen, and 41% of the intervals in session fifteen.

**Data for Participant 3**

In the first phase A, which consists of the first three sessions, participant 3 was given four objects with which to play. Participant 3 engaged in stereotypy 26% of the intervals during the first session, 20% of the intervals during the second session, and 33% of the intervals during the third session. Participant 3 engaged in functional behavior 68% of the intervals during the first session, 76% of the intervals during the second session, and 61% of the intervals during the third session. Participant 3 engaged in other behavior 5% of the intervals during the first session, 3% of the intervals during the second session, and 5% of the intervals during the third session. The object that had the most stereotypic engagement was then removed. For participant 3, the cars had an average of 1% stereotypic engagement, the string and shape task had an average of 8% engagement, the puzzle had an average of 13% stereotypic engagement, and the bear counters had an average of 3% stereotypic engagement. The puzzle was therefore removed from participant 3's list of objects at the end of phase A (Refer to Appendix F Figure 10-12).

Participant 3 then had three objects to play with in phase B, which consisted of sessions four, five, and six. Participant 3 engaged in stereotypy 68% of the intervals in session four, 35% of the intervals in session five, and 30% of the intervals in session six. Participant 3 engaged in functional behavior 20% of the intervals in session four, 55% of the intervals in session five, and 65% of the intervals in session six. Participant 3 engaged in other behavior 11% of the intervals in session four, 10% of the intervals in session five, and 5% of the intervals in session six. The object that showed the most stereotypic engagement was then removed. Participant 3 showed an
average of 8% stereotypic engagement with the cars, 17.7% stereotypic engagement with the string and shape task, and 17.2% stereotypic engagement with the bear counters. The string and shape task was therefore removed from participant 3's list of objects for the next phase.

In phase C, participant 3 engaged in stereotypy 75% of the intervals in session seven, 50% of the intervals in session eight, and 55% of the intervals in session nine. Participant 3 engaged in functional behavior 20% of the intervals in session seven, 43% of the intervals in session eight, and 40% of the intervals in session nine. Participant 3 engaged in other behavior 5% of the intervals in session seven, 6% of the intervals in session eight, and 5% of the intervals in session nine. The object that showed the most stereotypic engagement was then removed. Participant 3 showed an average of 26% stereotypic engagement with the cars and 33% stereotypic engagement with the bear counters. The bear counters were therefore removed from participant 3's list of objects for the next phase.

In phase D, which consisted of sessions ten, eleven, and twelve, participant 3 was left with one object with which to play. Participant 3 engaged in stereotypy 43% of the intervals in session ten, 38% of the intervals in session eleven, and 55% of the intervals in session twelve. Participant 3 engaged in functional behavior 51% of the intervals in session ten, 40% of the intervals in session eleven, and 41% of the intervals in session twelve. Participant 3 engaged in other behavior 5% of the intervals in session ten, 21% of the intervals in session eleven, and 3% of the intervals in session twelve.

In the last phase A, which consisted of sessions thirteen, fourteen, and fifteen, participant 3 was given all four objects to play with once again. Participant 3 engaged in stereotypy 40% of the intervals in session thirteen, 46% of the intervals in session fourteen, and 13% of the intervals in session fifteen. Participant 3 engaged in functional behavior 40% of the intervals in session
thirteen, 51% of the intervals in session fourteen, and 86% of the intervals in session fifteen.
Participant 3 engaged in other behavior 20% of the intervals in session thirteen, 1% of the intervals in session fourteen, and 0% of the intervals in session fifteen.

Functional and Stereotypic Engagement

In addition to examining the effect of response cost on reducing stereotypic behavior, this study also was examining the increase of functional behavior as stereotypy decreased.

Participant 1’s percentage of intervals engaged in stereotypy decreased from 30% to 25% while his percentage of intervals engaged in functional behavior increased from 13% to 60% in phase B. In phase C, his stereotypic engagement decreased from 46% to 11% while his functional engagement increased from 48% to 68%. In phase D however, his functional decreased from 45% to 11% while his stereotypic engagement also decreased from 51% to 8%. In phase B, participant 2’s percentage of intervals engaged in stereotypy decreased from 56% to 41%, however his percentage of intervals engaged in functional behavior also decreased from 11% to 1%. His engagement in stereotypy in phase C ranged between 33% to 50% while his functional engagement continually decreased from 26% to 16%. This inconsistency also occurred in the last treatment phase D where participant 2’s stereotypic behavior decreased from 31% to 16% while his functional behavior also decreased from 26% to 16%. In phase B, participant 3’s percentage of intervals engaged in stereotypy decreased from 68% to 30% while his percentage of intervals engaged in functional behavior increased from 20% to 65%. In addition to this, his stereotypic engagement decreased from 75% to 55% while his functional behavior increased from 20% to 40% in phase C. In the last treatment phase D, participant 3’s stereotypic engagement increased from 43% to 55% while his functional behavior decreased to 41%.
Discussion

Participant 1 did not show a consistent decrease in stereotypic engagement across each session; however, there was an overall decrease in his stereotypic engagement in each of the intervention phases. At the beginning of each phase, he showed a high rate of stereotypic engagement that decreased over the next two sessions. In the first phase A, participant 1’s stereotypic engagement started at 75%, but had decreased to 36% by the third session. Changes in the environment took place during session three, which might explain why his stereotypic behavior was much lower on this day.

In phase B, his stereotypic engagement started at 30% and dropped to 25%, which was not as much of a decrease in stereotypy compared to phase A. In phase C, however, his stereotypic behavior dropped from 46% to 11%, which was a 35% decrease in stereotypic engagement. Participant 1’s stereotypic engagement in phase D dropped from 51% down to 8%, which was a 43% decrease in stereotypic engagement. Participant 1 did show a decrease in stereotypic behavior within each phase; however, the stereotypic engagement seemed to increase at the beginning of each of these phases. When participant 1 returned to baseline in the last phase A, his stereotypic engagement began to increase. In fact, his stereotypic engagement increased from 31% to 53% between sessions thirteen and fifteen. Since participant 1’s stereotypic engagement decreased in the intervention phases B, C, and D, and then increased when returned to baseline, the data supports that his decrease in stereotypic engagement was due to the intervention of response cost.

Participant 1 showed no consistency in the increase or decrease of engagement in functional behavior. The data does show, however, that participant 1’s functional behavior in the first phase A never went above 35%. In addition to this, there were only two sessions in phases
B, C, and D where participant 1’s functional engagement dropped below 38%. In both session four and session twelve, participant 1’s functional engagement dropped to 15%. A change in the environment occurred in session twelve, which may have affected participant 1’s engagement in functional and stereotypic behavior. No changes in the environment took place during session four that would explain why his functional engagement was so low. If session four and session twelve had shown higher functional engagement, the data would show that engagement in functional behavior increased overall when the intervention of response cost was introduced.

When participant 1 returned to phase A in the last three sessions of data collection, his functional engagement decreased from 63% to 36%. In this phase, his functional engagement began high but had greatly decreased by the last session.

Participant 2 did show a consistent decrease in stereotypic engagement in each phase of data collection when response cost was introduced. In the first phase A, or baseline, participant 2’s stereotypic engagement ranged between 70% and 61%. This range of stereotypic engagement declined in each of the following phases. In phase B, participant 2’s stereotypic engagement decreased from 56% to 41%, in phase C it ranged between 50% and 33%, and in phase D it decreased from 31% to 16%. When the intervention of response cost was introduced, participant 2’s stereotypic engagement was never as high as it was in baseline. When participant 2 returned to baseline in the last phase of data collection, his stereotypic engagement began at 20% in session thirteen, but increased to 55% by session fifteen. The data shows that participant 2’s stereotypic engagement decreased continually in the intervention phases and increased dramatically when returned to baseline. By demonstrating such a high increase in stereotypic engagement during baseline, the data supports that the decrease in stereotypic engagement was due to the intervention of response cost.
There was less consistency in the increase of participant 2’s functional engagement. In participant 2’s first phase A of baseline, his functional engagement increased from 1% to 16%. Once response cost was introduced in phases B, C, and D, participant 2’s functional engagement ranged between 1% and 26%. In session six, participant 2’s functional engagement dropped to 1% and there were no changes in the environment that might explain why there was such a dramatic decrease in functional engagement. His functional engagement dropped to 6% in session nine, which was also not explained by a change in the environment.

In sessions five and ten, participant 2’s functional engagement increased to 26%. Throughout phases B, C, and D, during which response cost was being used, there was no continual increase in functional engagement similar to the continual decrease in his stereotypic engagement. When participant 2 returned to baseline in the last phase, his functional engagement dramatically decreased from 21% in session thirteen to 3% in session fifteen. Looking at participant 2’s functional engagement throughout all the phases, the data shows that there was no continual increase in functional engagement, however a dramatic decrease in functional engagement occurred when participant 2 returned to baseline in the last phase A.

Participant 3 showed an overall increase in his stereotypic engagement rather than a decrease in stereotypic engagement in the phases using response cost. In the first phase of baseline, participant 3’s stereotypic engagement ranged between 33% and 20%. In phases B, C, and D where response cost was being used, participant 3’s stereotypic engagement ranged between 30% and 75%. At the beginning of phases B and C, participant 3’s stereotypic engagement increased dramatically. His stereotypic engagement increased to 68% in session four and to 75% in session seven. Although his stereotypic engagement did not continually increase throughout these phases, his stereotypic engagement was much higher in these phases
Reducing Stereotypic Behavior

than in the first phase of baseline. In the last phase of baseline, his stereotypic engagement decreased from 46% in session fourteen to 13% in session fifteen. Implementing response cost resulted in an overall increase in stereotypic engagement and removing response cost resulted in a decrease in overall stereotypic engagement. The data supports that response cost was effective in increasing participant 3’s stereotypic engagement rather than reducing it.

Little consistency occurred in participant 3’s functional engagement in phases A, B, C, and D. In the first phase of baseline, participant 3’s functional engagement ranged between 61% and 76%; however, there was no continual increase or decrease of functional engagement in this phase. In the phases where response cost was being used, functional engagement ranged between 20% and 65%. In phase B, when response cost was first introduced, there was a continual increase in functional engagement. Participant 3’s functional engagement increased from 20% to 65% in this phase. No consistent increase or decrease in participant 3’s functional engagement occurred in phases C or D in which response cost was also being used. When participant 3 returned to baseline at the end of data collection, there was a continual increase in functional behavior. Participant 3’s functional engagement increased from 40% in session thirteen to 86% in session fifteen. Overall, participant 3 did not show a continual increase or decrease in functional engagement; however, the data does show that a dramatic increase in functional engagement occurred when response cost was removed in the final phase A, which was a return to baseline. The data shows that response cost did not increase or decrease participant 3’s overall engagement in functional behavior.

Using response cost as an intervention within applied behavior analysis had mixed results for these three participants. For participant 1, stereotypic engagement did not continually decrease in each phase when response cost was used; however, it seemed to have decreased
overall when compared to both baselines. Except for two sessions, participant 1 also showed an increase overall in functional engagement during phases that used response cost. Just like the decrease in stereotypic engagement for participant 1, this increase in functional engagement was not continual. Participant 2, however, did show a continual decrease in stereotypic engagement, when response cost was used and an increase in stereotypic engagement when response cost was removed. The data supports that the use of response cost decreased participant 2’s engagement in stereotypic behavior. Participant 2’s engagement in functional behavior was higher overall when compared to baseline; however, there was no consistent increase in functional engagement in phases using response cost. Participant 3, on the other hand, showed an increase in stereotypic engagement when response cost was used, and a decrease in stereotypic engagement when response cost was removed. Participant 3’s engagement in functional behavior, however, did not show a continual increase or decrease in any of the phases. The data supports that it is possible response cost did not punish participant 3’s stereotypic engagement, but rather reinforced his stereotypic engagement. The selection of objects in the beginning of the experiment is a factor that may have affected the data. An effort was made to pick objects that demonstrated approximately the same amount of time engaged in stereotypy, however there was a wide range of how much time each participant engaged in stereotypy with each object. Overall, however, the data in this study shows that when response cost was introduced, the stereotypic engagement of participant 1 and participant 2 decreased, but the stereotypic engagement of participant 3 increased.

Another purpose of this study besides determining whether response cost would be effective in reducing stereotypic behavior was to see if functional behavior would increase as stereotypy decreased. This study was not consistent in supporting this idea. For participant 1
Reducing Stereotypic Behavior

and participant 2, functional engagement did increase overall as stereotypic engagement decreased; however, there were several sessions where although stereotypic engagement may have gone down, functional engagement did not go up. As participant 3’s stereotypic engagement increased, there was little consistency in the increase or decrease in his functional engagement. Another factor this study considered was the young age of these participants. Since response cost as an intervention within applied behavior analysis had mixed results with these participants, it can not be said that response cost was effective in reducing the stereotypic behaviors of these young individuals with mental retardation and severe disabilities.

**Limitations**

The first limitation of this study is in regards to the number of participants. The original study from which this one is replicated used four participants, but because of time constraints and convenience sampling, permission was given for only three participants. Also, the four participants in the study by McEntee and Saunders (1997) all had severe to profound mental retardation. Although all three participants in this study demonstrated stereotypy, none of the participants had severe to profound mental retardation. Participant 2 and participant 3 had mild to moderate mental retardation, so the effects of response cost may be different on these participants since the degree of mental retardation was different from the participants in the previous study. Participant 1 had the label of developmentally delayed rather than mental retardation; however, he did demonstrate stereotypy and was therefore able to participate in the study. Before the data was collected, the two observers had to establish reliability. At least 80% reliability was established with each participant before data collection began because there was not enough time to establish at least 90% reliability. If the operational definitions of functional and stereotypic behavior for each participant had been more adequately defined, the percentage
of reliability may have remained higher throughout the study. In addition to this, some sessions only had one observer rather than two. The reliability tables show 'not established' for sessions where the second observer was not available.

When participant 1 engaged with the radio, piano, and see and say, some of the behaviors that were recorded as stereotypy may also be considered dance moves. These behaviors include when he would nod his head repeatedly and tapping his hand on various surfaces. Because stereotypy was defined as nonfunctional repetitive motion, these behaviors were therefore recorded as stereotypy although they may be behaviors seen as a result of hearing music. Another limitation for participant 1 was the environment in which he was observed. Although he was observed in the back of the classroom away from the other students and teachers, the interactions may still have occasionally distracted participant 1 and resulted in a change in natural behavior. During session 12 for participant 1, the observation took place in a different room. There was a switch in environment because of distractions in the classroom; however, the data shows a dramatic change in behavior on this day, which may be a result of switching environments for the first time. Changes in environment also took place during session three, which may have affected participant 1's natural behavior.

The chief researcher had to communicate at times with the participants during sessions either because the participant was engaging in dangerous behavior, the participant was trying to leave the area, or because the participant could have broken one of the objects. If participant 2 were chewing on himself or a small object, he was stopped and then reminded that he had his tube to chew on. Interaction with the participants during the sessions was kept to a minimum; however, it did happen on occasion for these reasons, which may have affected the data.
This study focused more attention on punishing stereotypic behavior through response cost more than on reinforcing functional behavior. Perhaps if more attention had been on reinforcing functional behavior rather than punishing stereotypic behavior, there would have been more of an increase in functional behavior.

**Future Research**

Because of the mixed results of this study, future research should focus on using response cost as an intervention within applied behavior analysis on a greater number of participants between the ages of five and seven. The study by McEntee and Saunders (1997) focused on four individuals with severe to profound mental retardation between the ages of eleven and fourteen. The focus of this study was on younger participants, and since there were only three participants used, it would be beneficial to see how more participants of a young age would respond to this treatment. Also, the participants in this study were labeled as having mild to moderate mental retardation and developmental delay, as opposed to the individuals in McEntee and Saunders (1997) study who had severe to profound mental retardation. Future research should, therefore, examine the effects of response cost on the different degrees of mental retardation. All of the participants in this study and the study by McEntee and Saunders (1997) were male, so future research may also consider using female participants in their study. One component that was added in this study that should be considered in the future involves how to pick the four objects for each participant. Before the study begins, each object picked should show about the same amount of time engaged in stereotypy. That way, as objects are removed in each phase, the researcher will know that any reduction in stereotypy is due to response cost rather than the participant's natural stereotypic engagement with that particular object. In addition to adding this variable, future research should consider focusing more attention on reinforcing functional
behavior while punishing stereotypy through response cost. A final component that future research should consider was presented by McEntee and Saunders (1997) in their study. Their suggestion was that future researchers look at the topographies of the different stereotypic behaviors to determine which stereotypic behaviors respond better to response cost. Due to limited data collection technology, this component was not added to this study.

The data collected in this study added to previous research on response cost and applied behavior analysis. Although results are limited, the data does suggest that research on response cost within applied behavior analysis may be effective for young children with mental retardation who show stereotypy. Future research will help determine the effectiveness of this treatment on the stereotypic behavior of many young individuals with mental retardation, developmental delay, autism, or other disabilities. If research on response cost within applied behavior analysis continues to reduce stereotypy, this intervention may help many children to learn more tasks, live independently, and fit into society.
References


cognitions in persons with mental retardation. *Journal of Autism and
Developmental Disorders, 33, 69-76.*

Using a self-control training procedure to increase appropriate behavior. *Journal
of Applied Behavior Analysis, 31, 203-210.*

School decisions on referred students with subaverage general intelligence.
*American Journal on Mental Retardation, 101, 161-174.*

of self injurious behaviors: Impact forces and limb motions. *American Journal on
Mental Retardation, 107, 60-68.*

Compulsions in adults with mental retardation: Prevalence, phenomenology, and
comorbidity with stereotypy and self-injury. *American Journal on Mental
Retardation, 100, 183-192.*

Bodfish, J., & Madison, J. (1993). Diagnosis and fluoxetine treatment of compulsive
behavior disorder of adults with mental retardation. *American Journal on Mental
Retardation, 98, 360-367.*

children classified as educable mentally retarded. *Education and Training in
Mental Retardation, 26, 130-141.*
Reducing Stereotypic Behavior


Appendix A

Letters of Permission
School Letter of Permission

Crystal Holmes

October 4, 2004

Dear

My name is Crystal Holmes and I am a graduate student at Longwood University. In the fall, I will be doing my thesis research on the stereotypic behaviors of students with mental retardation. To conduct this experiment, I would need four students between the ages of three and ten who have been labeled as having mental retardation. The students would be observed individually for fifteen sessions lasting only ten minutes a day. These observations will be video recorded and the tapes will be destroyed once the experiment is finished. Anonymity and confidentiality will also be established by omitting the names of the students, teachers, and the school system from the experiment. Participation will be voluntary and participants may withdraw from the experiment without penalty at any time.

I was hoping to find the four participants I need through your school system. If you grant me this permission, I will seek parental permission for the students. The experiment will be conducted following permission from the Longwood University Human Subjects Research Committee.

Thank you for your consideration of this study. I appreciate your time, and look forward to hearing from you soon.

Thank you,

Crystal Holmes
Graduate Student
Longwood University

We give permission for four of our students to participate in the study by Crystal Holmes. We reserve the right to withdraw the students from the experiment without penalty at any time.

X____________________
Parent Letter of Permission

Crystal Holmes

October 12, 2004

Dear

My name is Crystal Holmes and I am a graduate student at Longwood University. In the fall, I will be doing my thesis research on the stereotypic behaviors of students with special needs. To conduct this experiment, I would need four students between the ages of three and ten who receive special education services. The students would be observed individually for fifteen sessions lasting only ten minutes a day. These observations will be video recorded and the tapes will be destroyed once the experiment is finished. Anonymity and confidentiality will be established by omitting the names of the students, teachers, and the school system from the experiment.

I would like to include your child as a participant in the study. Participation will be voluntary and participants may withdraw from the experiment without penalty at any time. The experiment will be conducted following permission by the Longwood University Human Subjects Research Committee and by the school. I am available to give further information about the study and can answer any questions you may have. Please sign and return the attached sheet if you give permission for your child to participate in this study. I appreciate your time and assistance.

Thank you,

Crystal Holmes
Graduate Student
Longwood University

I give permission for my child, __________________________ to participate in the study by Crystal Holmes. I reserve the right to withdraw my child from the experiment at any time.

X_________________________
Appendix B

Stereotypic Engagement and Functional Engagement Definitions
Stereotypic Engagement and Functional Engagement Definitions

Participant 1

Object 1 Radio
Stereotypic Engagement- Nodding head while holding, opening and closing mouth, tapping radio, moving radio back and forth on surface, making continued grunting noise
Functional Engagement- Pushing buttons on radio, holding radio by handle

Object 2 See & Say
Stereotypic Engagement- Nodding head while holding, opening and closing mouth, tapping, moving back and forth on surface, making continued grunting noise
Functional Engagement- Pulling handle, moving arrow, turning plastic page

Object 3 Vacuum
Stereotypic Engagement- Making humming noise, making continued grunting noise, opening and closing mouth, wrapping cord around hand or swinging cord.
Functional Engagement- Pushing vacuum over floor, moving objects out of the vacuum’s way, wrapping cord up on back of vacuum, turning switch off and on

Object 4 Piano
Stereotypic Engagement- Nodding head while holding, opening and closing mouth, tapping piano on surface
Functional Engagement- Pushing buttons and keys, turning switch on and off

Participant 2

Object 1 Barrel of Monkeys
Stereotypic Engagement- Smelling, biting, or tapping monkeys, body rocking while holding monkeys
Functional Engagement- Hanging monkeys together or on barrel, putting monkeys in our out of barrel, putting lid on barrel

Object 2 String and Shapes
Stereotypic Engagement- Smelling or biting shapes or string, body rocking while holding shapes and string, twirling string in air.
Functional Engagement- Taking shapes or string out of container, putting shapes on string, connecting string ends together, pulling string ends apart, putting shapes or string back in container.
Reducing Stereotypic Behavior 71

Object 3 Puzzle
Stereotypic Engagement - Smelling, biting, or tapping puzzle pieces, body rocking while holding puzzle pieces
Functional Engagement - Putting puzzle pieces in puzzle board, taking them out of puzzle board

Object 4 Bear Counters
Stereotypic Engagement - Smelling, tapping, or biting colored cups or bears, body rocking while holding bears or colored cups
Functional Engagement - Putting bears in colored cups, putting bears back in container, stacking or unstacking colored cups, putting cups back in container

Participant 3

Object 1 Cars
Stereotypic Engagement - Smelling cars, body rocking while holding cars, pushing cars back and forth quickly on table surface, making grunting noises while engaged with cars.
Functional Engagement - Pushing cars on road map

Object 2 String and Shapes
Stereotypic Engagement - Smelling shapes or string, body rocking while holding shapes and string, making grunting noises while engaged with string or shapes.
Functional Engagement - Taking shapes or string out of container, putting shapes on string, connecting string ends together, pulling string ends apart, putting shapes or string back in container.

Object 3 Puzzle
Stereotypic Engagement - Smelling or tapping puzzle pieces, body rocking while holding puzzle pieces, making grunting noises while engaged with puzzle.
Functional Engagement - Putting puzzle pieces in puzzle board, taking them out of puzzle board

Object 4 Bear Counters
Stereotypic Engagement - Smelling colored cups or bears, body rocking while holding bears or colored cups, making grunting noises while engaged with bears or cups.
Functional Engagement - Putting bears in colored cups, putting bears back in container, stacking or unstacking colored cups, putting cups back in container
Appendix C

Data Recording Sheets
### Participant 1 Data Recording Sheet

**Participant:** 1  
**Observer:**

**Date:** _______  
**Session:** _______

**Time Start:** _______  
**Time End:** _______

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<th>40''</th>
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</tr>
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</tbody>
</table>

**Stereotypic Behavior** – (S) Body rocking, tapping object repeatedly, opening and closing mouth, repetitive movement that is nonfunctional, humming, making continual grunting noises, head nodding.

**Functional Behavior** – (F) Using the object as it was intended to be used by the manufacturer.

**Other Behavior** – (O) Not engaged with the objects

- Engaged with radio – (R)
- Engaged with see and say – (S)
- Engaged with vacuum – (V)
- Engaged with piano – (P)
Figure 2

Participant 2 Data Recording Sheet

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<th></th>
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</table>

**Stereotypic Behavior** – (S) Chewing on chew tube or objects, tapping objects, body rocking, grunting noises, repeating phrases, swinging feet, hitting self, pushing object back and forth quickly on table surface, watching string swing in air, smelling objects

**Functional Behavior** – (F) Using each object as it is intended to be used by the manufacturer.

**Other Behavior** – (O) Not engaged with the objects

Engaged with barrel and/or monkeys – (M)
Engaged with string and/or shapes – (S)
Engaged with puzzle – (P)
Engaged with bear counters – (B)
Figure 3
Participant 3 Data Recording Sheet

Participant: 3  Observer: ______

Date: _________  Session: _______

Time Start: _________  Time End: _______

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</table>

**Stereotypic Behavior** – (S) smelling objects, making grunting noises, body rocking, tapping objects, pushing object back and forth quickly on table surface, random bursts of laughter, swinging legs back and forth repeatedly

**Functional Behavior** – (F) Using each object as it is intended to be used by the manufacturer

**Other Behavior** – (O) Not engaged with the objects

Engaged with cars and/or road map – (C)
Engaged with string and/or shapes – (S)
Engaged with puzzle – (P)
Engaged with bear counters – (B)
Directions for Data Recording Sheets

**Directions:** In each ten second interval, the observer will mark on the top half of the box what object or objects the student is engaged with using the above coding system. In the lower half of the box, the observer will mark in each interval whether any stereotypic, functional, or other behavior as defined above, has occurred.
Appendix D

Data for Participant 1
Table 1

Reliability for Participant 1

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<th>Session</th>
<th>Percentage of Reliability</th>
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<td>Session 14</td>
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<tr>
<td>Session 15</td>
<td>65%</td>
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</table>
Figure 4

Participant 1
Stereotypic Engagement

Percent of Intervals Engaged in Stereotypy

A  B  C  D  A

Session 1  Session 2  Session 3  Session 4  Session 5  Session 6  Session 7  Session 8  Session 9  Session 10  Session 11  Session 12  Session 13  Session 14  Session 15
Figure 5

Participant 1
Functional Engagement

Percentage of Intervals Engaged Functionally

Session 1  Session 2  Session 3  Session 4  Session 5  Session 6  Session 7  Session 8  Session 9  Session 10  Session 11  Session 12  Session 13  Session 14  Session 15
Figure 6

Participant 1
Stereotypic Engagement with Each Object

<table>
<thead>
<tr>
<th>Percentage of Intervals Engaged in Stereotypy in Each Phase</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>A</th>
</tr>
</thead>
<tbody>
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<td>Object 1 Radio</td>
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<tr>
<td>Object 2 See &amp; Say</td>
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<tr>
<td>Object 3 Vacuum</td>
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<tr>
<td>Object 4 Piano</td>
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<tr>
<td>Object 1 Radio</td>
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<td>Object 3 Vacuum</td>
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<tr>
<td>Object 4 Piano</td>
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<tr>
<td>Object 2 See &amp; Say</td>
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<td>Object 3 Vacuum</td>
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<td>Object 4 Piano</td>
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Reducing Stereotypic Behavior 81
Appendix E

Data for Participant 2
Table 2

Reliability for Participant 2

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</table>
Reducing Stereotypic Behavior 84

Figure 7

Participant 2
Stereotypic Engagement

A B C D A

Percentage of Intervals Engaged in Stereotypy

Session 1 Session 2 Session 3 Session 4 Session 5 Session 6 Session 7 Session 8 Session 9 Session 10 Session 11 Session 12 Session 13 Session 14 Session 15
Figure 8

Participant 2
Functional Engagement

Percentage of Intervals Engaged Functionally

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<th>Session 2</th>
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<th>Session 4</th>
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<th>Session 13</th>
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<th>Session 15</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>A</td>
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</table>

Reducing Stereotypic Behavior 85
Figure 9

Participant 2
Stereotypic Engagement with Each Object

A B C D A

Object 1 Monkeys
Object 2 String & Shapes
Object 3 Puzzle
Object 4 Bear Counters
Object 1 Monkeys
Object 3 Puzzle
Object 1 Monkeys
Object 3 Puzzle
Object 1 Monkeys
Object 3 Puzzle
Object 2 String & Shapes
Object 3 Puzzle
Object 4 Bear Counters
Object 4 Bear Counters

Percentage of Intervals Engaged in Stereotypy in Each Phase:
Appendix F

Data for Participant 3
### Table 3

Reliability for Participant 3

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Figure 10

Participant 3
Stereotypic Engagement

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<th>Session 10</th>
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<th>Session 12</th>
<th>Session 13</th>
<th>Session 14</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>A</td>
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</table>

Percentage of Intervals Engaged in Stereotypy

- 80%
- 70%
- 60%
- 50%
- 40%
- 30%
- 20%
- 10%
- 0%
Figure 11

Participant 3
Functional Engagement

Percentage of Intervals Engaged Functionally

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Session 1 Session 2 Session 3 Session 4 Session 5 Session 6 Session 7 Session 8 Session 9 Session 10 Session 11 Session 12 Session 13 Session 14 Session 15
Figure 12

Participant 3
Stereotypic Engagement with Each Object

<table>
<thead>
<tr>
<th>Object 1 Cars</th>
<th>Object 2 String &amp; Shapes</th>
<th>Object 3 Puzzle</th>
<th>Object 4 Bear Counters</th>
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Percentage of Intervals Engaged in Stereotypy in Each Phase