Creating Stimulus Control

In a Classroom for Children with Autism

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~~This is wonderful, best in the class, doesn't need editing….very very good.~~

Abstract

Human behavior, throughout the day, is guided by certain stimuli that signal a person what response or action is required. The term “stimulus control” is used to describe the situation when a behavior occurs in the presence of some stimuli and not others (Cooper, Heron, & Heward, 2006). Stimulus control can be created through differential reinforcement. It is commonly used with children with autism during discrete trial lessons. Stimulus control can be used in a classroom environment to increase the on-task behavior of the students.

Keywords: stimulus control, differential reinforcement, classroom, autism

Creating Stimulus Control: In a Classroom for Children with Autism

It is estimated that one in 110 children in the United States have autism spectrum disorder (Centers for Disease Control and Prevention, 2011). Autism is a developmental disability that affects most children by the age of three years (American Psychiatric Association [DSM-IV-TR], 2000). There is no known cause for autism. The three main characteristics for a diagnosis of autism are deficits in language, deficits in social interactions, and restrictive, repetitive behavior.

The field of Applied Behavior Analysis (ABA) implements a behavioral model that is acknowledged as an empirically validated treatment for children with autism **(**Schreibman, 2000). This behavioral model composes about two-thirds of the established, effective treatments for children with autism as found in the National Standards Project by the National Autism Center (2009). The field of Applied Behavior Analysis uses a technique known as stimulus control to demonstrate that behaviors are affected by stimuli in their environment.

Human behavior, throughout the day, is guided by certain stimuli that signal a person what response or action is required. For example, a person may open the oven door when the oven timer beeps or open the front door when the doorbell chimes. The term "stimulus control" is used to describe the situation when a response or behavior occurs in the presence of some antecedents or stimuli and not others (Cooper, Heron, & Heward, 2006). In the example above, a person is more likely to engage in the behavior, opening the oven door, more often when the discriminative stimulus, the beep, is present. The beep is said to have stimulus control over opening the oven door. Many of our everyday behaviors are under such control.

"A stimulus acquires control only when the responses emitted in the presence of that stimulus produce reinforcement more often than responses in the absence of stimulus" (Cooper, et. al., 2006, p. 393). When an oven timer beeps, a person opens the oven, and is reinforced by a

ready-to-eat meal. If a person opens the oven before the timer beeps, the reinforcement of a ready-to-eat meal is not there or not ready to be eaten.

Differential Reinforcement

Reinforcement and extinction of behaviors are the fundamentals in creating stimulus control. When the stimulus is present, the desired behavior is reinforced. When the stimulus is absent, the behavior is ignored or put on extinction. The field of Applied Behavior Analysis defines "reinforcing one response class and withholding reinforcement from another response class" as differential reinforcement (Cooper, et. al., 2006, p. 470).

There are four commonly used variations of differential reinforcement to decrease problem behaviors. They are differential reinforcement of alternative behavior (DRA), differential reinforcement of low rates (DRL), differential reinforcement of incompatible behavior (DRI), and differential reinforcement of other (DRO). Differential reinforcement increases the rate of the desirable behavior while decreasing the problematic behavior.

Drasgow, Halle, & Ostroskey (1998) used differential reinforcement of alternative behavior to increase language mands in children with autism. The participants were reinforced for using the word "please," and behaviors such as reaching and yelling were put on extinction or ignored. The behaviors of saying "please" and reaching or yelling were differential reinforced.

Shaw and Simms (2009) combined response marking with differential reinforcement of low rates and positive punishments to decrease attention-maintained problem behavior. Participants earned tokens and a verbal correction for every two problem behaviors. The first criterion was chosen based upon baseline data. If, at the end of the day, they still had positions available for tokens, they received their reinforcer. They were reinforced for engaging in the behavior less than baseline levels. If their tokens filled up all of the positions, the picture of the

reinforcer was removed. The criterion was continuously increased, in that there were less token positions available (e.g. 10, 8, 6, 4, 2). The changing criterion design showed that challenging behavior was decreased in all participants.

Creating Stimulus Control

When creating stimulus control, one uses differential reinforcement of the target behaviors depending upon the presence or absence of the stimulus. One can develop stimulus control through a procedure known as stimulus discrimination training (Cooper, et. al., 2006). This training requires two antecedent stimuli and one behavior. In the presence of the first stimulus, the behavior is reinforced. In the presence of the other stimulus, the behavior is not reinforced.

Maglieri, DeLeon, Rodriguez-Catter, and Seven (2000) created stimulus control through discrimination training to help a girl with Prader-Willi syndrome refrain from covert food stealing. They used an orange sticker correlated with prohibited foods. They used three trials to train the discriminative stimulus. The intervention included reprimands if cookies were eaten from the jar with an orange sticker. If cookies were eaten from the unlabeled jar, no consequences took place. Next, stickers were put on both jars with the refrigerator left unlabeled with a sticker. The same consequence was given as in the prior phase. Covert food stealing can be reduced through stimulus control training and punishment.

Using Stimulus Control Procedures with Children with Autism

Rapp, Patel, Ghezzi, O'Flaherty, and Titteringtol (2009) established stimulus control of vocal stereotypy in 3 children with autism. Whenever a red card was present, the children were punished (vocal reprimand or toy removal) when they engaged in verbal stemming. During the presence of a green card, there was no punishment for the stereotypy. Stimulus control was

successfully created because verbal stereotypy was reduced during the presence of the red card but variable and often high during the presence of the green card.

Kaplan-Reimer, Sidener, T., Reeve, and Sidener, D. (2011) taught indoor rock climbing to children with autism through stimulus control procedures. In rock climbing, there are varying levels of routes differentiated by different color rocks or handles. In terms of stimulus control, the color of the rock serves as the discriminative stimulus. When the color of the rock matches the route one is on, the behavior of reaching and grasping increases. The participants in this study included two children with autism, ages six and eleven. Participants were rewarded with their chosen reinforcement being placed inside a cup for each correct rock they grabbed. If they grabbed the wrong rock, they were taken down from the rock wall, and their reinforcers were poured back into the container. If participants were not successful after three attempts, then a break was given. After the break, another three attempts were given. If still unsuccessful, colored bracelets were put on the participant's wrist to make the color of the route more salient. The color of the route was very salient in the beginning of the intervention and slowly faded out during the latter phases of the intervention. Both participants learned how to successfully follow and climb routes. Stimulus control procedures were used to teach a recreational sport to children with autism.

In another study, manipulation of antecedent conditions was used to gain stimulus control over problem behaviors (Kennedy, 1994). Tasks demands were decreased and social comments were increased. This manipulation of antecedent conditions lowered problem behaviors and increased social affect. Systematically, tasks demands were increased and problem behaviors continued to stay at low levels. Correct responding also increased above baseline levels.

Stimulus Control in a Classroom

A person can use stimulus discrimination training to not only change the behaviors of an individual but also of a group. Cammilleri, Tiger, and Hanley (2008) found teachers could create stimulus control in an elementary classroom. In this study, they created stimulus control in three different classrooms using different colored leis. When the teachers wore green leis, attention was given to students. When the teachers wore red leis, attention was not available to students. In all three classrooms, levels of approaches to the teacher stayed at baseline levels during the wearing of the green leis, and approaches to the teacher dropped below baseline levels during the extinction phase, the wearing of the red leis.

Considerations

When creating stimulus control, the reinforcement and extinction of behaviors must be consistent. If reinforcement takes place when extinction should be used, the stimulus control may weaken. Stimulus control can also be interrupted by a change in the appearance of stimuli. Railton, Foster, and Temple (2010) found hens could discriminate between two stimuli on a TFT (flickerless) screen, but were not able to discriminate the same stimuli on a CRT screen. The flickering on a CRT screen was enough to interrupt the stimulus control that was present with a TFT screen.

Stimulus Control in Discrete Trials

According to Schreibman (2000), one aspect of the behavioral model consists of intensive behavioral intervention, many hours a day and in many of the child's environments. This treatment involves discrete trial training, which focuses on repetitive teaching and orderly trial presentations. A trial consists of the teacher presenting a stimulus (question or instruction) and the child responding. The child is then reinforced for the correct response or is corrected.

For example, when teaching a child to differentiate the color yellow from two choices, the child is reinforced with a piece of candy for choosing the color yellow. In terms of stimulus control, the probability of the child choosing the color yellow increases because it has been previously reinforced during training.

Green (2001) explained that the purpose of all instruction is to get specific responses consistently under certain antecedent conditions. Therefore, instructional techniques involve the manipulation of antecedent stimuli and the consequent stimuli. This manipulation happens in every discrete trial. By creating stimulus control in discrete trials, many skills can be taught to children with autism. Most of the discrete trial lessons focus on discrimination and matching skills. "Discrimination and matching skills are components of many (arguably all) cognitive, communication, social, academic, work, and self-care skills, so this emphasis is understandable and appropriate" (Green, 2001, p. 74).

Skill Deficits that Hinder Discrete Trial Lessons

One marker of intellectual and developmental disabilities (IDD) is behavioral disorders (Neidert, Dozier, Iwata, & Hafen, 2010). Some of the common behavior problems include tantrums, aggression, self-injurious behaviors, stereotypy, non-compliance, and elopement. These behaviors are considered "learned" behaviors, in that they came about through reinforcement. Behaviors such as these can make it difficult to run discrete trial lessons.

In addition to behavioral disorders, social deficits are commonly seen in children with autism. Social deficits have been included in the diagnostic characteristics of autism from the original 1943 definition by Kanner to the recent Diagnostic and Statistical Manual of Mental Disorders (Weiss & Harris, 2001). These deficits can be seen in joint attention, understanding facial expressions, and responding to other's distress.

Behavioral and social deficits can hinder discrete trial lessons in which the child needs to be attending to the teacher. When running discrete trials in a classroom setting, it is essential for the child to engage in on-task behavior such as sitting in their chair, orienting to teacher, and listening. Off-task behaviors can hinder discrete trial lessons, thus hindering the learning that can result from the lessons.

Using Stimulus Control to Increase On-Task Behavior

West (2008) notes the importance of teaching children with autism independence and self-management skills. It is imperative that teachers use prompt fading strategies in order to allow for independence. A common way to decrease reliance on teacher prompting is to use visuals. West (2008) researched whether it was easier to transfer stimulus control from the instructor's prompts to verbal or pictorial cues. Participants included four children with autism in an inclusive classroom setting. The alternating treatment within a multiple baseline across participants design consisted of four phases: baseline, pre-assessment, verbal cue, and pictorial cue phase. For three of the participants, the pictorial cue was the more efficient way to teach the task. Total errors across all participants were less during the pictorial cue phase. Stimulus control was successfully transferred from instructor assistance to pictorial cues.

The findings above support the contention that children with autism are visual learners. When teaching children with autism, teachers need to be aware of the types of prompts being used during instruction. When creating stimulus control to teach new skills and behaviors, one can use visual cues as the discriminative stimulus.

Nikopoulos, Canavan and Nikopoulou-Smyrni (2009) also used a visual stimulus, video modeling, to create instructional stimulus control in children with autism. During baseline, when given the verbal instruction "play is finished," there was no change in behavior among the three

participants. Video modeling was successfully used to create stimulus control over the behavior of cleaning up toys.

Along with using the proper stimulus to create stimulus control of the on-task behavior, one must also know the stimulus that has stimulus control over the off-task behavior. Asmus, Wacker, Harding, Berg, Derby, and Kocis (1999) found that their participants were engaging in aberrant behaviors when task instructions were given. Task instructions had stimulus control over aberrant behaviors.

It is also important to be aware of the rate and accuracy of reinforcement. Thompson and Iwata (2000) compared the difference in task completion using direct and indirect reinforcement. The task was opening up different containers. In the direct reinforcement phase, the reinforcer was placed inside the container. In the indirect reinforcement phase, the reinforcer was handed to the participant once the container was opened. Five of the six participants were more accurate with direct reinforcement. The sixth participant was 100% accurate in both conditions. During the indirect reinforcement phase, there were a lot of other behaviors (e.g. reaching for reinforcer) that occurred. These behaviors occurred due to a different stimulus control. When increasing on-task behavior, one must be aware of the rate and accuracy of reinforcement. If not, off-task behaviors may come under the stimulus control of something else.

Stimulus control can be used to increase desired behaviors and decrease problematic behaviors. When teaching children with autism in discrete trial lessons, attending skills are necessary. Stimulus control can be created to increase attending behaviors such as sitting, looking, and keeping hands down. It is important to use the proper stimulus, reinforce accurately, and understand the stimulus controlling the off-task behaviors.

Summary of Findings

Autism is a prevalent developmental disorder, affecting one out of 110 children in the United States (Centers for Disease Control and Prevention, 2011). The field of Applied Behavior Analysis (ABA) implements a behavioral model that is acknowledged as an empirically validated treatment for children with autism **(**Schreibman, 2000). The field of Applied Behavior Analysis uses a technique known as stimulus control to demonstrate that behaviors are affected by stimuli in their environment. The term "stimulus control" is used to describe the situation when a response or behavior occurs in the presence of some antecedents or stimuli and not others (Cooper, Heron, & Heward, 2006).

In order to create stimulus control, differential reinforcement must be used (Cooper, et. al., 2006). When the stimulus is present, the behavior is reinforced. When the stimulus is absent, the behavior is ignored. Cammilleri, Tiger, and Hanley (2008) created stimulus control using different colored leis. When the teachers wore green leis, attention was given to students. When the teachers wore red leis, attention was not available to students. Students came under the stimulus control of the color of the leis.

Stimulus control procedures are often implemented with children with autism. Rapp, Patel, Ghezzi, O'Flaherty, and Titteringtol (2009) established stimulus control of vocal stereotypy in 3 children with autism. Whenever a red card was present, the children were punished when they engaged in verbal stemming. During the presence of a green card, there was no punishment for the stereotypy. Stereotypy was reduced during the presence of the red card but not the green card.

Stimulus control can be used to increase desired behaviors and decrease problematic behaviors. When teaching children with autism in discrete trial lessons, on-task behaviors such

as sitting, looking, and keeping hands down are necessary. West (2008) found visual stimuli, rather than verbal prompts, can establish stimulus control over certain behaviors in children with autism. Along with using the proper stimulus to create stimulus control of the on-task behavior, one must also know the stimulus that has stimulus control over the off-task behavior. Asmus, Wacker, Harding, Berg, Derby, and Kocis (1999) found that their participants were engaging in aberrant behaviors when task instructions were given. Knowing which stimulus is controlling the off-task behavior is important when trying to increase on-task behavior.

The rate and accuracy of the reinforcement of the on-task behavior is essential to decreasing the chance the off-task behavior comes under stimulus control of another stimulus. Thompson and Iwata (2000) found participants were more accurate with direct reinforcement rather than indirect reinforcement. During the indirect reinforcement phase, there were a lot of other behaviors that occurred. These behaviors occurred due to a different stimulus control.

When creating stimulus control to increase on-task behavior, it is important to use the proper stimulus, reinforce accurately, and understand the stimulus controlling the off-task behaviors. When a child engages in on-task behaviors during discrete trial lessons, more learning can take place. It would be worthwhile for future research in the area of stimulus control to increase on-task behaviors during discrete trial lessons.

Conclusion

Stimulus control affects human behavior on a daily basis. When a stimulus is present, the behavior increases because it has been previously reinforced. When the stimulus is absent, the behavior does not occur. It can be purposely created through differential reinforcement. It is often implemented with children with autism to increase desired behaviors and decrease

problematic behaviors. Stimulus control can be created to increase on-task behaviors that are necessary to carry out discrete trial lessons with children with autism.

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