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THE IMPACT OF GAME PLAY ON CHILDREN'S IMPULSE CONTROL IN EARLY EDUCATION SETTINGS

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by

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Executive functioning skills, especially impulse control, have been widely studied and interventions have been developed to improve impulse control in young children. Play has also been studied for its benefits to young children's development. Play skills have also been taught to students with autism spectrum disorder and attention deficit hyperactivity disorder. However, play has not often been utilized to teach impulse control directly. The current study attempted to define the components of impulse control as conditional discrimination, and to apply those discrimination skills in early childhood settings for students with no diagnosis. Kindergarten children participated in baseline measuring of conditional discrimination through the game "Simon Says." Intervention involved increasing salience of stimuli for responding in the game "Freeze Dance." Outcomes were mixed, with some students demonstrating increased impulse control during baseline, while others demonstrated increased impulse control during intervention.

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CHAPTER 1

INTRODUCTION

Definitions

Executive functioning is an umbrella term used within the field of cognitive psychology for a set of skills that allow a person to set goals, demonstrate flexible thinking, and control impulses (Dawson & Guare, 2010). Najdowski et al. (2014) describes them as a comprehensive set of flexible behaviors that can be accessed at any time, which are needed throughout life in tasks involving memory, planning ahead, and inhibiting undesired behaviors in various settings. One skill within this complex set of behaviors is the inhibition of an immediate impulse for one which better matches the given setting. Behavior analysis defines self-control as emitting a response that will produce a larger or higher quality reward over a more immediate smaller reward (Rachlin & Green, 1972). This has been coined as the term delay discounting.

Other definitions of self-control define it not in terms of the reinforcer involved but based on the stimulus being attended to within the environment. Barkley and Lerner (2000) described attention deficit hyperactivity disorder (ADHD) not as difficulty with attention, but in perceiving incoming stimuli, and incorrectly responding to the stimulus, or responding to the stimulus at an inappropriate time. Radu et al. (2011) described that the difficulty in responding correctly was due to their discounting future projections. Their research described the difficulty in shifting attention between what is occurring at the moment from what is not occurring at that moment, either in the past or could occur in the future. According to Saini et al. (2016), applied research has increasingly investigated the use of conditional discrimination to gain stimulus control over behavior that is appropriate in one setting but not in another. Stimulus control refers to a behavior occurring in the presence of one stimulus and not the other (Cooper et al., 2020; Saini

et al., 2016). Conditional discrimination can also describe the application of appropriate responding in a given context or inhibiting undesired or inappropriate responding in another. Halbur et al. (2021) describes the importance of highly salient stimuli to increase correct responding. Tominey and McClelland (2011) define impulse control in children as starting and stopping a behavior in response to different auditory and visual cues, as well as performing a described opposite behavior to the same cue. Based on the above definitions of conditional discrimination and self-control, this study will use the term impulse control as correctly responding to a given stimulus, and impulsivity as incorrectly responding to a given stimulus.

Many children's games are simple demonstrations of impulse control through conditional discrimination. Children must quickly respond in the appropriate way to one discriminative stimulus, and not respond in the presence of a different stimulus. Often, the result of appropriate responding is winning the game and receiving reinforcement through general praise and attention. Combining a play-based intervention with discrimination training appears to be a developmentally appropriate intervention with a basis in behavior analysis concepts and principles.

Development and Importance of Impulse Control

Impulse control, or the ability to inhibit an initial response in favor of a more adaptive and socially acceptable one, is an essential skill for lifelong success (Dawson & Guare, 2010; Najdowski, et al., 2014; Savina, 2021). Impulse control skills are developed beginning in infancy, with a large jump in skills in early childhood through adolescence (Dawson & Guare, 2010). The importance of children increasing impulse control or decreasing impulsivity has led to numerous studies in behavior analysis addressing these impulse control skills, including delay fading (Dixon et al., 1998; Staubitz et al., 2020) and adding signals to the delay fading, resulting

in longer delays and larger reinforcer selection (Vessels et al., 2018). Executive functioning skill deficits are often seen in those with autism spectrum disorder (ASD) or ADHD (Dawson & Guare, 2010; Najdowski et al, 2014). However, since executive functioning skills begin developing before school age, deficits may show up before any official ADHD or ASD diagnosis (Najdowski, 2014). Also, impulsivity may occur without any diagnosis, especially in young children, who demonstrate impulsivity within a normal range as impulse control is developed (Neef, et al, 2005). Therefore, it is important to develop treatments and interventions for young students showing executive functioning deficits, whether or not they have any formal diagnosis.

Impulsivity has been demonstrated to be a precursor for later problem behaviors, including aggression (Espy, 2011). Romero-Lopez et al. (2020) describes impulse control as being an essential component of executive functioning at a young age. The development of the ability to inhibit a dominant response in favor of a more socially acceptable behavior serves an important role in development for young children through adulthood (Romero-Lopez et al., 2020). When analyzing the effect of the components of executive functioning, impulse control stands out as an important skill that can lead to other important academic or life skills.

The relationship between impulse control skills and improved outcomes is very well studied and has been observed for many behaviors, such as aggression in early childhood (Raaijmakers, 2008). Many studies have been conducted that have demonstrated how impulse control delays correlate with physical aggression toward others, especially in early childhood populations (Raaijmakers, 2008; Wahlstedt, 2008). However, Wahlstedt et al. (2008) also noted that some degree of impulsive behavior by young children is considered normative, but that high levels at a young age do predict later behavioral problems. Schoemaker et al. (2013) conducted a meta-analysis to determine whether impulsivity was found in preschool children with

externalizing behavior problems and determined the two were closely related. Given the importance of improving impulse control at a young age, early intervention for these skills is desirable. Also, simple games are conducive to early education settings, so determining the impact of play on impulse control would be a beneficial addition to the behavior analytic literature.

Effect of Play on Academics

There has been a push to improve academic skills at earlier ages, at the expense of play (Fesseha & Pyle, 2016; Pyle et al., 2020). A longitudinal, randomized control study by Durkin et al. (2022) studied the long-term effects of a state preschool program. A sample of 2,990 children was used to compare outcomes for children who attended preschool to those who did not. Statistical outcomes were measured using state achievement tests, evidence of school rule violations, instances of major discipline infractions such as possession of drugs, theft, or fighting, the percentage of students who received services through an Individualized Education Program (IEP), attendance, and grade level retentions. The children who attended preschools which had an academic readiness focus showed improvement in academic skills at kindergarten, as well as marginal benefits in all areas by third grade. However, this same cohort by sixth grade had reduced academic achievement, higher rates of rule violations, a higher rate of special education placements, and a higher rate of aggressive or violent behavior. This study is an example of a strong case against pushing academic content at early ages.

Other studies have found a benefit to early programs that emphasize impulse control skill improvement rather than academics. A randomized trial by Duncan et al. (2018) studied the effects of a kindergarten summer readiness program which focused on increasing impulse control. Three cohorts of preschool children (n = 125, 163, 159) were placed either in a program

that included the standard school readiness program, or the standard program plus an impulse control training called Red Light, Purple Light (Tominey & McClelland, 2011). Measures used included standardized intelligence testing components from the Woodcock-Johnson Psycho-Educational Battery-III (Woodcock & Mather, 2000) such as applied problems for math achievement and letter-word identification for literacy, as well as the Head, Toes, Knees, Shoulders measure (HTKS; Tominey & McClelland, 2011). The HTKS task is a validated, direct measure of impulse control in which tasks are switched to test children's impulse control. For instance, at first the child would match their responding to the given task *touch your head*, and in later trials would respond in an opposite way as directed (i.e., they would touch their shoulder when the trial prompt is *touch your head*.) Statistical analysis showed the equivalence of four months of expected development in impulse control for those who attended the program that included the impulse control training.

Play as an Intervention

Impulse control skills can be seen in several commonly used games in children's play. Play has been widely studied regarding early childhood and is generally found to benefit childhood outcomes in various ways, including academics and school readiness (Pelletier & Corter, 2019). Pelletier and Corter (2019) assessed students as the city moved from a half day, academic focused program, to full day kindergarten, which included higher amounts of play and inquiry-based learning. The study included 592 three- to four-year-old students in a longitudinal study which tested each cohort in the spring of each school year through grade two. Participants were measured on receptive vocabulary using the Peabody Picture Vocabulary Test III, early reading using the Test of Early Reading III, number sense through a developmental assessment, writing and drawing samples using a rubric, as well as the HTKS task and standardized

achievement tests. Children were randomly assigned to either the control group of half-day kindergarten with an academic focus, or a full-day kindergarten that was a play- and inquiry-based program. The researchers found that children who attended the full day play-based kindergarten program showed improved outcomes in impulse control and academic areas, based on the achievement tests and the HTKS measure (Pelletier & Corter, 2019). The students who attended the half-day program with less play and more academic focus showed less improvement in impulse control and academic areas (Pelletier & Corter, 2019).

Play has been used in several ways as an intervention for impulsivity. Active play, especially outdoors, has been shown to improve overall executive functioning skills, especially impulse control and emotional regulation. Becker et al. (2013) included 51 preschoolers in a study of the effect of active play on academic and impulse control measures. Participants were tested for impulse control using the HTKS task, and academic measures using the Woodcock-Johnson III (applied problems for math problem solving and letter-name identification for literacy). The study included a control group who received no additional active play, and an intervention group who received additional active play. Children wore an accelerometer during active play to measure their activity level. The results of the study showed that increased active play had a significant influence on direct measures of impulse control on the HTKS test. Also, their research showed that impulse control increase had an indirect positive effect on math and literacy skills.

Healey and Haperin (2015) utilized a play program developed as a parent-child intervention in which parents played prescribed games with their child daily for five to eight weeks. Enhancing Neurobehavioral Gains with the Aid of Games and Exercise (ENGAGE) was a novel intervention that targeted impulse control, emotional regulation, and increased

neurocognition. Games were designed to increase impulse control and are described in Appendix A. Participants were 25 children aged three to four and their parents, who were recruited from the community. Participants were included if they rated in the 92nd percentile or higher on the hyperactive subscale on the Behavior Assessment System for Children (BASC-2; Reynolds & Kamphaus, 2004). Pre-test and post-test measures included ratings on the BASC-2 and intelligence measures using the Developmental Neuropsychological Assessment (NESPY-2; Korkman & Kirk, 2007). The intervention consisted of five 90-minute weekly play sessions at a clinic. Parents were in one room learning the games, and the children were in another room learning and playing the games. The families were encouraged to play the games daily in-between sessions, and parents reported playing the games daily for 10-35 minutes. The participants' results on the follow-up BASC-2 ratings were compared to a sample of students from another study by the authors who did not score highly on the BASC-2 and did not receive the intervention. At the end of the study, parents reported decreased impulsivity in their children based on the BASC-2 follow up scores.

In another study by Healey and Healey (2019), the ENGAGE program was directly compared to a behavioral intervention for parenting skills called Positive Parenting Program (Triple P) utilizing a randomized control trial. Sixty families with children aged three to four were included based on parent rating their children in the 84th percentile or higher on the BASC-2. Baseline and post-intervention measures of impulse control included the HTKS task (Tominey & McClelland, 2011) and intelligence measured by the NESPY-2 (Korkman & Kirk, 2007). Teacher ratings on the BASC-2 (Reynolds & Kamphaus, 2004) were also included for pre- and post-test. Families in the ENGAGE program received four weeks of 90-minute weekly sessions, two weeks of follow up phone calls with parents, and one week of a booster session. The games

used for the ENGAGE program are described in Appendix A. The Triple P group received four weeks of 90-minute weekly sessions in which the parents were taught parenting skills and ways to manage child misbehavior through the use of antecedent and consequence strategies. Following four weeks of training, the Triple P group received three weekly phone calls and then a maintenance session in week eight. Both programs were shown to have similar benefit in decreasing impulsivity as measured on the HTKS task at follow-up and showed maintenance of skills at 12 months according to the parent ratings on the BASC-2. The researchers determined that one-on-one time playing games daily with children had the same effect as the evidence-based parent training program (Healey & Healey, 2019.)

Williams and Berthelessen (2019) implemented a movement and rhythm intervention in preschoolers to demonstrate it was a feasible approach to improve impulse control. This was an eight-week intervention using 16 play sessions lasting for 30 minutes. The intervention included children moving their bodies or playing musical instruments to the tempo or beat of a given song, and then matching that speed to different characters that appeared in a song. The intervention showed some improvement in impulse control based on statistical analysis of tasks from the Early Years Toolbox, a selection of iPad tasks that measure various components of executive function (Howard & Melhuish, 2016). The authors concluded more research was required to fully determine benefits of the intervention.

Rothlisberger et al. (2012) utilized a small group intervention for 135 children who were preschool age at pre-test and kindergarten age at post-test. Executive functioning was measured during pre- and post-test using E-prime. Tasks measured reaction time to a target stimulus, reaction time with an interference stimulus, flexible action with shifting stimuli, and object recall measuring working memory. Intervention included games for the entire class (such as a game

like Simon Says), games for pairs of students (such as card sorting), and games for individual students (such as a maze memory game). Two days per week students played the game with a trained experimenter, and 3 days per week the games were played with the participants' teacher who was given basic training in the games as well. Games are described in more detail in Appendix A. Daily 30-minute sessions were implemented for six weeks during the school day. The study found significant training effects for both ages in differing components of executive functioning, promoting the value of training in impulse control using games.

Another method of implementation of play in classrooms is through teacher-led games that are played during whole group instruction, such as circle time or morning meeting. Tominey and McClelland (2011) utilized games in preschool classrooms that involved conditional discrimination tasks hypothesized to improve children's impulse control. Games were included if they involved conditional discrimination in which children must engage in specific behavior based on the stimulus given. Sixty-five children who were entering kindergarten the following year were randomly assigned to the control group or the intervention group. The games were played twice a week for eight weeks in 30-minute sessions. The intervention included six games that increased in difficulty by adding new rules throughout the intervention. A description of the games is included in Appendix A. The children were tested on impulse control using the HTKS task (Tominey & McClelland, 2011) in the fall and spring, as well as in academic areas including letter-word identification, applied math problems, and picture vocabulary subtests from the Woodcock-Johnson III (Woodcock & Mather, 2000). Within the intervention group, participants with impulsivity showed large improvements based on results of the HTKS tasks. Those students who demonstrated impulse control at pre-test did not show as much improvement in impulse control based on the HTKS task.

Tominey and McClelland (2013) conducted an extension of their game intervention from their 2011 study, which is detailed in Appendix A. Participants were the same group of students from their 2011 study, and the intervention was the same 8-week small group intervention. Measures included a parent questionnaire, the HTKS task (Tominey & McClelland, 2011), and observations of participant classroom behavior. Results from the HTKS task showed that students who scored the lowest at pretest showed higher growth (16.9 points) than those who already scored higher (6.1 points growth).

Schmitt et al. (2015) was an extension of Tominey and McClelland (2011) that evaluated the efficacy of the game intervention in a whole classroom rather than in groups of children. Schmitt et al. (2015) utilized the same eight-week format and games as in the 2011 study and included a larger sample size and a randomized control design, including a pretest, intervention, and posttest, and an evaluation of the effects on the student's academic skills. Similar measures were utilized as previous studies by Tominey and McClelland (2011) and Tominey and McClelland (2013) including the HTKS task and academic measures from the Woodcock-Johnson III (Woodcock & Mather, 2000). The researchers determined that the games intervention was comparable to other interventions for impulse control and was effective at improving impulse control in those children who displayed impulsivity at pre-test.

Behavior Analytic Interventions Surrounding Play

Stromman (1973) utilized the game Simon Says to determine whether age or gender has an influence on the development of impulse control or impulsivity, which at that time was based on Luria's study of activation and inhibition (1961). Stromman argued that the game Simon Says is more complicated than the simple task of bulb pressing utilized in Luria's study. In Simon Says, the task to be inhibited is presented as a command to act, therefore requires disinhibition of

the given action. Stromman also stated that a different motor response is required on each trial, adding a layer of complexity, and the stimuli to be discriminated are both given vocally, which lessens the discriminability of the stimuli. In Stromman's study, 34 preschool children and 132 kindergarten, first, second, and third grade children were participants in a study to determine the influence of age on the ability to conditionally discriminate a variety of vocal stimuli. Children were first tested individually to determine if they were able to learn the game rules and follow the given instructions and engaging in the correct motor response. Following instruction, two 10-block trials of Simon Says were played with each child. Half of the trials were randomly assigned to be "Simon Says" trials and no more than three in a row were "Simon Says" trials. Following the instruction and practice, those children who could not demonstrate the inhibition response were not included in the analysis. Results demonstrated that older children were more capable of inhibited responding, while preschool age children and kindergarten boys did not improve with practice. Stromman also noted that knowledge of the game's rules did not have an effect on their ability to inhibit responding and that the younger children did not seem to demonstrate awareness that they were responding incorrectly.

Teaching play skills has also proven to be effective for students with ASD, through structured play groups (Wong et al., 2014). These play groups use small groups of students and include having a defined area and activity, clear directions given by an adult supporting the group, and prompting or scaffolding to support the activity. Leaf et al. (2016) utilized an extension of the cool or not cool procedure to teach appropriate game skills to children with ASD. The cool or not cool procedure (Leaf et al., 2012b) is a method of teaching what behavior is appropriate or inappropriate depending on the situation. Teachers demonstrate a behavior then describe whether the behavior is cool or not cool. Participants then practice describing behavior

as cool or not cool and receive feedback from their teacher. The cool or not cool procedure design in the 2016 study was a multiple baseline design across behaviors, replicated across participants. Eight adolescents with ASD were participants in the study, which was held in a social skills group in a clinic setting. The games played included conditional discrimination, as participants were to wait for the appropriate stimulus to engage in the desired behavior. Games are described in Appendix A. The purpose of the study was to demonstrate the steps needed to teach play skills to students with ASD; however, it reported that future studies could focus on other components of impulse control, including waiting, conditional instructions, conditional discrimination, and environmental awareness of discriminative stimuli. This study was used to teach game play skills to students with ASD, but it could be extended to students with high levels of impulsivity without any diagnosis.

Bay-Hinitz et al. (1994) described the effect of cooperative versus competitive games on aggressive and cooperative behavior of preschool children. Teachers of each classroom were given directions on how to play cooperative and competitive games and led the class in both types of games for 30 minutes each day. Specific games played are described in Appendix A. Games were either competitive, in which students play games that have winners and losers, or cooperative games in which players work toward a collective goal. Four groups of children completed several differing phases of competitive or cooperative games. The dependent variable included the percentage of aggressive versus cooperative behavior. Results of the study showed that the groups varied in their responsiveness to each type of game; however, they generally displayed fewer aggressive behaviors when playing cooperative games. The researchers also found that three of the groups showed more cooperative behavior when playing cooperative games, and more aggressive behaviors while playing competitive games. The authors also noted

that the changes in behavior could have been due to contingent teacher attention, and that the games acted as a setting event that increased the probability of cooperative behavior occurring.

Present Study

Developing treatments and interventions for impulsivity at a young age is highly important for children, because the impact of impulsivity can have a lifelong effect on a person's functioning, as delays in impulse control are precursors to aggression and other externalized behavior problems (Raaijmakers et al., 2008; Espy et al., 2011; Shoemakers et al., 2013). Controlling an initial impulsive response is an essential skill to improving impulse control and conditional discrimination.

Play is essential to young children's development and has been utilized effectively in various ways to improve impulse control skills (Healey & Healey, 2019; Williams & Berthelessen, 2019; Tominey & McClelland, 2011; 2013; Duncan et al., 2019; Pelletier & Corter, 2019; Schmitt et al., 2015; Stromman, 1973). However, the components of play that are beneficial for impulse control are less well-defined. Play has been applied to improve impulse control through parenting skills (Healey & Healey, 2019), and increase controlled movement to music (Williams & Berthelessen, 2019). Researchers have also evaluated the effect of teacher-led games on impulse control (Tominey & McClelland, 2011; 2013). Most of these studies utilized the games or play as the intervention, however they did not break down the components of the play that were impacting the controlled responding. From a behavior analytic view, the common skill appeared to be related to conditional discrimination or responding to environmental cues with behavior appropriate for the given environment.

Much of the literature was found to relate to children with ASD or ADHD, whose diagnosis typically co-occurs with deficits in executive functioning (Najdowski, 2014). Further,

since impulsivity is common in children who have no formal diagnosis, it is beneficial to determine if those games can be applied to increase appropriate responding for typically developing children and increase impulse control in multiple settings. The aims of this study were to determine 1) to what extent is a play-based intervention utilizing salient environmental stimuli effective at improving impulse control skills in early elementary children? and 2) to what extent do those impulse control skills extend to the classroom setting?

CHAPTER 2

METHOD

Participants

Participants were six kindergarten students aged five to six years old, in a public elementary school, which is part of a large, urban district in the Midwest. The school houses a bilingual Spanish program; each grade level has one Spanish bilingual classroom. Participants were not previously identified as in need of specialized instruction through an Individualized Education Program (IEP) or accommodation through a Section 504 plan. Consent was obtained from the students' parent or guardian, and assent was obtained from the student. This study was approved by the Southern Illinois University Carbondale Human Subjects Committee before any data were collected.

Inclusion criteria for inclusion were the participants not having an identified special education eligibility or Section 504 plan and being enrolled in kindergarten. Exclusion criteria included having an IEP or 504 plan or being in a grade other than kindergarten. All students were fluent English speakers and used vocal verbal language to communicate. One session of Simon says was conducted with individual students as an inclusion probe, and the students were put into pairs based on their accuracy in responding. Students who scored at or above 80% accuracy in one session of Simon Says were considered the model peer, and students who scored below 80% accuracy were considered the target peer.

Sandy, a model peer, was a 5-year-old Caucasian female student. Sabrina, a target peer, was a 5-year-old African American female student. Sandy and Sabrina became pair one. Travis, a model peer, was a 5-year-old Hispanic male student. Carlos, a target peer, was a 5-year-old African American male student. Travis and Carlos became pair two. Laura, a model peer, was a

5-year-old Caucasian female student. Owen, a target peer, was a 6-year-old Caucasian male student. Laura and Owen became pair three. Two other participants began the study but withdrew consent or assent and were removed from the study.

Setting

Sessions were held just outside the kindergarten classroom during the school day, as determined with input from the classroom teacher. A student desk and chair were set up just outside the classroom in the hallway, to avoid some distractions from noise and music in the classroom. The student desk was placed against one wall and held data sheets, student surveys, stickers, and a tripod holding the researcher's phone for recording. The students stood in the middle of the hallway in view of the video and facing the phone's camera. The researcher sat in a student chair next to the table, facing the students to provide the prompts, and was partially visible by the recording. For a few sessions, the table was in use by other staff and students, so the tripod was set up in a different area of the hallway, and the researcher stood facing the students.

Materials

Materials used for this study are included in the Appendices. The parent recruitment letter that was utilized is in Appendix B. Data sheet examples are located in Appendix C. All data were collected using paper and pencil, then transferred for graphing into an Excel spreadsheet on the researcher's laptop. All sessions were recorded using the researcher's smartphone set on a tripod and transferred to OneDrive (Version 22.196.0918.0001) to allow for treatment integrity and second observer data checks. Consent forms for parents and assent forms for participants are included in Appendix D. Green-colored and red-colored 10 cm by 15 cm cards were utilized during the intervention phases as visual stimuli to increase accuracy in responding. Following the

completion of all data collection, a survey was given to each participants' parent or guardian to determine if there was a perceived improvement in impulse control. The parent social validity survey is included in Appendix E, which included seven Likert scale questions regarding their satisfaction with the study and whether they saw an improvement in their child's impulsivity. Students were surveyed following each session asking if they had fun during the session. Examples of that survey is displayed in Appendix F. Stickers were given to students for participation following each session. Interobserver agreement (IOA) data sheets are located in Appendix G.

Design

The experimental design was an ABAB reversal plus treatment extension in the classroom (Barlow et al., 2009). While a multiple baseline across participants design was considered to demonstrate learning conditional discrimination, Cooper et al. (2020) stated that time factors should be considered when determining appropriate design, which was a limiting factor for this study. Also, although a multiple baseline is appropriate when an intervention would be difficult to withdraw or reverse due to learning of a skill (Cooper et al., 2020), the reversal design was chosen in order to more easily determine if increasing salience of stimuli helps participants acquire the desired conditional discrimination. Thomas et al. (1985) used a reversal design when studying the effect of the environmental context on conditional discrimination of pigeons, utilizing changing auditory and visual elements in varying combinations. While inconclusive in pigeons, the application of varying stimuli to increase discrimination in children has some merit. The reversal also more easily allowed the inclusion of a treatment extension in the classroom, in order to better answer the second research question, based on the time allotted for data collection. The dependent variable was accuracy of

responding to auditory cue-prompted responses, measured for each participant, and displayed as a percentage of accuracy for each session. Examples of correct responding included the participant touching their nose within two seconds of the auditory cue "Simon Says touch your nose," or stopping all bodily movement within two seconds of the auditory cue "Freeze." Each session included 20 trials, and the number of correct responses was divided by 20 and multiplied by 100 to determine the percentage of accuracy.

Procedures

Inclusion probe

Pairs of children participated in games that included conditional discrimination of the presence or absence of an auditory stimulus. Before each session, participants were asked if they would like to play a game, and the rules of the game were explained. Game rules are listed at the top of each data sheet as shown in Appendix H. The inclusion probe included 20 trials per session of the game Simon Says, and one game was played per session. Responding was measured for each participant as "+" if correct and "0" if incorrect. Students who scored at or above 80% accuracy in one session of Simon Says were considered the model peer, and students who scored below 80% accuracy were considered the target peer.

During each trial, participants were presented with either an auditory stimulus to engage in a motor response preceded with the prompt "Simon Says," or an auditory cue to engage in a motor response without the Simon Says prompt. One of the two prompts were presented in a variable, pre-determined order, with a non-Simon says prompt occurring every three to five trials, using five separate data sheets with the prompts rearranged in a variable order. A correct response included touching their nose following the auditory prompt "Simon Says touch your nose." An incorrect response included touching their nose in response to the prompt "Touch your

nose." A correct response included if the participant made a false start to a non-Simon Says trial. A false start involved the student initially moving to engage in the motor task, but not completing the motor response. A correct response also included approximations of the motor response to a Simon Says trial such as doing incorrect jumping jacks (i.e., jumping and clapping hands but not simultaneously) or touching the wrong body part (i.e., touching elbow at the prompt Simon says touch your shoulder). Each prompt was given once students completed the prior motor response, or two seconds elapsed without responding, depending on trial conditions. If the students made an error on a trial, the trial was marked as incorrect and the next trial began. No error correction was provided to an incorrect response in any trial and all previous correct responses were placed on extinction.

Baseline

Baseline sessions were identical to inclusion probe sessions, with the exception that baseline sessions were conducted with a model peer and a target peer in pairs rather than individually. Sessions were conducted once or twice daily and lasted no more than five minutes per session. Five data sheets for Simon Says were created to include the same number and ratio of non-Simon says trials across sessions. To prevent behavioral chains being established through repeated prompt sequences, the same 20 motor movements were used to ensure the participants were familiar with them. To prevent confusion between trial prompts and general game instructions and attention-gaining prompts, the researcher used the cue, "Ready?" in a question tone, or a physical prompt such as a tap on the shoulder in order to gain participants' attention. The attention-gaining prompts were only used when participants were looking away from the researcher, to ensure they heard the next prompt clearly, first as a verbal prompt and then as a physical prompt if participant attention was not redirected to the researcher. Data were not taken

on the use of those prompts. Baseline sessions continued until responding was at stable levels across three sessions, whether at high or low accuracy. Participants who demonstrated mastery during baseline, which was defined as responding at or above 90% accuracy across three consecutive sessions, did not continue into intervention. Students received their choice of a sticker for playing the game after each session.

Intervention

Intervention included several components to increase correct responding to the discriminative stimulus. A game similar to Simon Says was utilized: the Freeze Dance. In this game, the same pairs of target peer and model peer were expected to respond (dance or move) when the music was playing and were expected to stop moving when the song was no longer playing. This game was chosen in order to continue utilizing an auditory stimulus similar to baseline. However, the Freeze Dance is a simpler conditional discrimination of only two motor movements: move or freeze. This allowed components to be added for increased salience of the stimulus. One component of the intervention was to make the stimulus more salient to the participants through visual and additional auditory cues. A green-colored card was held up by the researcher when the music was playing and participants were expected to be moving, and a red-colored card was held up when they were expected to stop as the music was paused. Visual prompts were added to create an additional modality to which participants could respond. An additional auditory stimulus included the calling of *freeze* when the music was paused, and the calling of *dance* or *go* when the music restarted, which allowed three stimuli to encourage accurate responding. Responding was measured as accurate if the participants stopped moving within two seconds of the music stopping or began moving within two seconds of the music beginning. Twenty trials from three to 10 seconds each were included in each session, which

lasted no more than five minutes total. Students received intermittent behavior-specific praise throughout trials and a sticker for playing the game, but no other reinforcement was provided. Sessions continued daily until responding was at a steady level. Mastery during intervention was the same as during baseline: at or above 90% accuracy in responding for three consecutive sessions.

Following intervention, the same procedures were utilized in a second baseline and intervention phase before the treatment extension phase.

Treatment Extension

Following the second intervention phase, a treatment extension was implemented. This extension included one session of the intervention game (Freeze Dance) in which the classroom teacher used the intervention features while playing Freeze Dance with the whole class. The session was held three school days following the end of the second intervention phase, with the group that completed all phases of the study. During the session, the teacher held up the red card when music was paused and students should freeze, and she held up the green card when the music resumed and students should dance or move. The music was paused at random intervals throughout the song, for a total of ten trials of discriminated responding. The researcher observed participants, both the model peer and the target peer, and recorded their accuracy in responding to the prompts in the same manner as during the intervention phases.

Interobserver Agreement and Treatment integrity

IOA sessions were recorded for purposes of viewing and scoring by a second observer at a later date. IOA was measured by a graduate student, using the data sheets in Appendix G. The IOA formula used was trial by trial calculation per session (Cooper et al., 2020), calculated by dividing the number of trials in which the observers agreed by the total number of trials (20) and

multiplying by 100. IOA data was collected on 38% of sessions (14/36 sessions). The range of IOA scores was 70% to 100%. One of the two sessions that scored 70% agreement was an inclusion trial, in which the first observer counted more trials as inaccurate whereas the second observer counted more trials as accurate. This disagreement could have been scoring of the wrong video, as there was some confusion among the observers as to which videos to score. Overall, IOA average was 91%, indicating high agreement of data collection procedures among the observers. Treatment integrity data was collected on 38% of session (14/36 sessions). The range of data was 82% to 100% and was an average of 95.5%. This result demonstrates a high degree of integrity and reliable results. Treatment integrity checklist is shown in Appendix I.

CHAPTER 3

RESULTS

Pair One Results

One pair of students (Sandy and Sabrina) completed all phases of the study. Sandy, the model peer, responded with 90% accuracy in the inclusion probe. Sabrina, the target peer, responded with 75% accuracy in the inclusion probe. Sabrina's results are shown in figure one. Throughout baseline sessions, Sandy scored at or above 90%. Her responding remained stable throughout baseline. Her partner, Sabrina, the target participant, had an initial spike in responding but she then stabilized in sessions four through six at an average of 75% accuracy. Following the stabilization of both participants' responding, they progressed to the first intervention phase.

During intervention phase one, Sandy and Sabrina demonstrated highly accurate and stable responding. They both demonstrated 100% mastery during intervention other than one outlier of 80% from Sandy in session nine. Due to their accurate and stable responding across three sessions, they moved on to baseline two in session eleven.

During the second baseline phase, Sandy scored an average of 80% accuracy, and Sabrina scored in a range of 75% to 80%. Both participants demonstrated a stable level of responding across sessions. Due to neither participant demonstrating mastery level responding, they moved on to the second intervention phase. During the second intervention phase, Sandy and Sabrina both demonstrated mastery level responding at an average of 95% in each session and therefore continued on to the treatment extension phase.

One treatment extension session was held three school days following the end of the second intervention phase for Sandy and Sabrina. They both performed the Freeze Dance with 100% accuracy in the classroom setting.

Pair Two Results

Travis, the model peer, responded with 85% accuracy, and Carlos, the target peer, responded with 65% accuracy during the inclusion probe. Carlos' results are shown in figure two. During baseline sessions, Travis scored an average of 99% accuracy, ranging from 95% to 100%. His responding was stable and highly accurate across baseline. Carlos, the target participant, scored an average of 91% ranging from 65% to 100%. Due to this increase to mastery level and stable responding of both participants during the first baseline phase, pair two did not move on to the intervention phase.

Pair Three Results

Laura, the model peer, responded with 95% accuracy, and Owen, the target peer, responded with 65% accuracy during the inclusion probe. They became pair three, and Owen's results are shown below in figure three. During baseline sessions, Laura scored an average of 96% accuracy during the first baseline phase, ranging from 95% to 100%. Owen scored an average of 75%, ranging from 65% to 85%. Laura and Owen moved on to intervention after demonstrating stable responding in sessions three through five.

During the first intervention phase, Laura and Owen demonstrated mastery in accuracy of responding at 100% for three consecutive sessions. The moved to the second baseline phase due to the high and steady level of responding. During the second baseline phase, Laura scored an average of 96%, ranging from 95% to 100%. Owen scored an average of 86% accuracy, ranging from 65% to 95%. His responding in baseline was initially on an increasing trend and then

stabilized in sessions 11 through 13. Because they both demonstrated mastery level responding during the second baseline phase, they did not move on to the second intervention phase.

Social Validity

Based on student validity survey results, the students did not seem to strongly prefer one game over the other, though most sessions were highly positive experiences for the students. Across 64 total sessions, overall results were favorable. Simon Says sessions had 67 responses, of which 83.5% were *happy,* 0.5% were *neutral,* and 9% were *sad.* Freeze Dance sessions had 20 total responses, of which 75% were *happy*, 20% were *neutral*, and 5% were *sad*. Responses were slightly higher for *happy* and *neutral* following Simon Says trials. Student validity data was collected on all sessions. One parent survey was returned, and each item was marked *strongly agree*.

CHAPTER 4

DISCUSSION

The aims of this study were to determine 1) to what extent is a play-based intervention utilizing salient environmental stimuli effective at improving impulse control skills in early elementary children? and 2) to what extent do those impulse control skills extend to the classroom setting?

Overall, results of the study were somewhat inconclusive. Pair one, Sandy and Sabrina, were the only pair to complete all phases of the study, which helped confirm research question one regarding increasing environmental stimuli to enhance conditional discrimination. This pair, both the model and target peer, demonstrated decreased accuracy during baseline conditions, and highly accurate responding during intervention, with the additional stimulus of the red or green card and additional auditory stimuli. The return to lower accuracy during baseline two suggests that salient stimuli in the environment support accurate responding and improved discrimination, even for the model peer, who would be expected to retain high levels of accuracy. This period of lower responding with the removal of the red and green card visual prompt may have been an important factor in the increased discrimination in intervention phase one. Barkley and Lerner (2000) describe impulsivity as incorrectly responding to environmental stimuli or responding to a stimulus at the wrong time. Sandy, the model peer in pair one, responded correctly to several *freeze* prompts according to the red card being displayed, despite the researcher saying *go*. Sandy pointed out after the session that she was looking at the red card and that was how she knew to freeze. This suggests the visual prompt was more salient than either of the auditory cues.

The second pair, Travis and Carlos, did not show the same responding pattern that pair one did. They both demonstrated increased accuracy during baseline one, without any

intervention. Both participants demonstrated that some overall learning of conditional discrimination occurred during baseline, which helps support the attainment of increased impulse control through learning processes such as peer modeling, or through rule-governed behavior. These two participants may have learned the rule for the discriminated responding to the differing prompts and did not require the additional visual stimuli to respond accurately.

Laura and Owen, pair three, both demonstrated mastery in baseline two, after demonstrating mastery during the first intervention phase. They did not demonstrate the reduced baseline level responding that would confirm the intervention was the most effective factor in their improvement. Again, this may have been due to skill practice and peer modeling, rather than conditional discrimination of environmental factors, or a previous learning history with the game Simon Says. Also, despite both students responding above mastery levels, their responding was universally accurate during intervention with the added environmental stimuli. Owen, despite demonstrating mastery in intervention phase one, first demonstrated a lower accuracy for two trials (nine and ten) before demonstrating mastery. This removal of the visual prompt of the red and green cards may have been a factor before practice and peer modeling took effect again.

Sandy and Sabrina were the only pair to complete all phases, including the treatment extension. Their accuracy in responding during this phase supports the second research question regarding treatment extension to the classroom. Although the extension included only one session, the results demonstrate that the stimuli in the environment can be enhanced to improve conditional discrimination skills.

Overall, this study was a useful addition to the behavior analytic literature surrounding play and impulse control. It demonstrated the importance of increasing environmental stimuli to help young children develop improved conditional discrimination skills. Although not all pairs

completed all phases of the study, all six students did demonstrate mastery of the conditional discrimination skills, whether in baseline or intervention. This outcome is not ideal in a reversal design due to limiting the demonstration of the impact of the intervention's effectiveness. Also, the use of different games during baseline and intervention limited the demonstration of experimental control. Comparisons could only be made among phases with the same game, to demonstrate replication of results in those phases. During intervention phases, the students all demonstrated nearly universal responding, and demonstrated a replication of those results among pairs one and three with target peers Sabrina and Owen.

The learning of the conditional discrimination among all participants supports the use of games and play-based interventions in the early education years as effective teaching strategies. Also, the use of enhanced environmental stimuli in these games shows the value of utilizing visual strategies in early education classrooms. Also, sessions were not longer than four minutes, so this intervention could be included in a busy classroom and not take much time or effort by the teacher.

One challenge to completing this study was the timing of the study in relation to the academic year. The study began at the very start of the school year when students were not known to teachers, especially in kindergarten, their first year in the elementary setting. Ideally, the inclusion criteria would have started with a teacher referral for students demonstrating impulsivity in the classroom. Also, it would have included a direct measure of impulsivity using baseline observations of the participants before and after the game intervention to determine if the games themselves were the training needed to demonstrate impulse control in other settings. Time limitations were also a factor in this study due to a later start of the school year two weeks into the semester. This later start left limited time for recruitment and data collection.

Recruitment also took longer than expected and several rounds of recruitment were required to complete the study.

One other important factor to note in the current study was the definitions used. While the term impulse control was utilized in the current study to aid in simplification of the various terminologies used in researching this topic, a note should be made regarding what the term means and what was measured in this study. The current methods addressed conditional discrimination (e.g., responding to differing stimuli with responses that are considered contextually appropriate for the current environment). This skill, conditional discrimination, can be quantified and measured. Impulse control, while a useful theoretical concept, is less able to be measured due to the effect of private events. While the researcher (or parent, teacher) may see a moment in which a child begins to act but then refrains from acting, and call it self-control or "changing their mind," this moment is a private event and not one that can easily be described operationally and counted. Other behavior analytic research has studied this phenomenon and called it self-control, and has intervened using several foundational concepts, namely delay discounting and delay fading (Dixon et al., 1998; Rachlin & Green, 1973). While this study did not address the impact of reinforcement on impulse control, its importance in learning new skills cannot be understated. The continually evolving research on stimulus equivalence originally had its start in studies on conditional discrimination and effective schedules of reinforcement. In the current study, some of the motor skills were new to the participants, and they did not initially respond accurately to the differing cues. Some students had previously played the game and knew how to adjust their responses based on previous experiences, while the game was wholly new to others, and they did not have the benefit of previous learning through reinforcement.

Limitations

One limitation in this study was that the games were played as pairs in both baseline and intervention conditions, so observational learning during baseline could have been a factor rather than salience of stimuli during intervention. The design may have been more effective for all pairs if the model participant had not been brought into the design except during intervention, which would have supported the peer modeling factor on improved impulse control, although the current research questions did not address the effect of peer observation and modeling. The current study utilized peer partners in order to replicate a natural setting more closely: games are typically played with friends or classmates. However, the peer model could have been used as a true observational model for the target peers at a differing point in the study, such as during intervention only.

Also, the use of two different games during baseline and intervention serve to add a confounding factor as they are not identical, though they may have similarities in game mechanics. The intervention game had a simpler response to either move or refrain from moving, and the baseline game had more complex responding due to differing motor responses. This difference in the games may have been partly why experimental control was not demonstrated.

Also, data collection methods could have been refined to include more trials of the conditional discrimination, or non-Simon Says trials. All students, whether model or target participants, rarely missed a Simon Says trial. Including more than five in twenty non-Simon Says trials in an equal number of trials to the intervention game would have made a wider variation in data collection and may have demonstrated a clearer experimental control in all pairs. Finally, some students did not know all of their body parts. Many participants had difficulty locating their elbow, and a few had trouble with pointing to their shoulder. Including

one or two practice trials before or during the inclusion or excluding participants who did not know their body parts may have helped to ensure the participants could demonstrate the accurate responses. Also, for this study false starts were counted as correct. False starts could have been counted as incorrect, which would have slightly impacted the results. Also, error correction procedures were not utilized, however they could have been used if Simon Says had been the intervention game, as another method of improving student responding.

Attempts were made to limit distractions for the participants during the sessions. One inclusion probe was held in the classroom, but the setting was determined to be too distracting, and the sessions were then moved to the hallway setting as described. Despite these attempts to limit distractions, they were not completely eliminated, and some sessions had to be paused while a class walked through the setting. This factor necessitated adding the attention-gaining prompt, to ensure the participants were attending to the researcher.

One final limitation in the current study was that the use of red and green cards in other school settings was not included in a generalization component. The original idea was to determine whether impulse control skills could be learned through games in one setting and then displayed in another context. However, time limitations as well as attempts to more accurately define and measure the target behavior led to the treatment extension more closely resembling the intervention conditions in a different setting.

Future Directions

Peer modeling was a strong component of the current study that was not as thoroughly researched as other components. Further studies could use component analysis to compare the effects of modeling or observational learning on conditional discrimination, by including some games with peer models during intervention phases, or playing some games with differing

numbers of students, such as what was used by Rothlisberger et al. (2012). The use of model peers involving different types of play could also be used to determine what other impact peer play might have on impulsivity. The games utilized in this study were also non-competitive. Bay-Hinitz et al. (1994) found that competitive games increased children's aggressive behavior toward peers, so continued study to determine the effect of competitive games on impulsivity and not just aggression would also be beneficial.

Although rule-governed behavior and instructions were not addressed in-depth in this study, games typically include rules for how to play the game. Including an intervention component with changing rules, changing prompt levels, or increased difficulty of the task may have helped answer the question of the importance of skill practice and rule-governed behavior on impulse control. The current study utilized very simple games with minimal rules, but more complex games could have been added to the treatment extension in order to determine further what is impacting impulse control. Tominey and McClelland's (2011) game intervention included games that had changing rules, such as changing the colors in the game "red light, green light" to "red light, purple light" in order to support the complexity of the conditional discrimination. Also, the red and green cards could be utilized at differing times during the school day. For example, the red card could be displayed when children are expected to be attending and focusing on the teacher, such as when giving instructions or a group lesson, and the green card could be displayed when free responding is expected, such as during free play, group activities, or recess. Games and rules could also be expanded to include gamification of the classroom or school setting.

Another future direction would be the inclusion or development of more direct measures of impulse control. The current research on game play for preschool students utilized direct

group methods, including the HTKS task (Tominey & McClelland, 2011), as well as indirect measures such as parent rating scales. The HTKS measure was not designed to be used for individual or small numbers of students but rather in larger group design studies. Larger groups of students could be included in order to use the direct measure of impulse control, or other direct measures of impulse control could be developed for future research.

Also, while there is a growing field supporting the use of games and play in preschool settings, many these studies have been conducted in the education and psychology fields, so additional behavior analytic studies specifically using play would be an interesting addition to the body of research. It would also be beneficial to determine if other populations, such as those with autism or ADHD respond to the interventions used here.

Another future direction would be the use of a different single subject design measuring impulse control. While a reversal was useful given the time constraints, a multiple baseline design would also be helpful to help demonstrate the effect of environmental stimuli on participants' impulse control, and demonstrate more clearly the learning on conditional discrimination, and further studies could research the application of those skills into their classroom or home environments.

Overall, interventions utilizing play and games appeared to be a highly acceptable strategy for students to learn conditional discrimination skills. While more research is needed to verify the impact of play on impulse control, continuing this line of research into early elementary classrooms would be simple and acceptable to students and teachers. The effect of play on children's outcomes is becoming more and more clear (Durkin et al., 2022; Pelletier & Corter, 2019). Limiting play in favor of academics appears to limit the time children have to spend on learning important skills while playing with their peers. Since play has a beneficial

effect on future learning, schools would be wise to introduce or continue simple games to teach children improved impulse control.

EXHIBITS

Figure 1

Sabrina

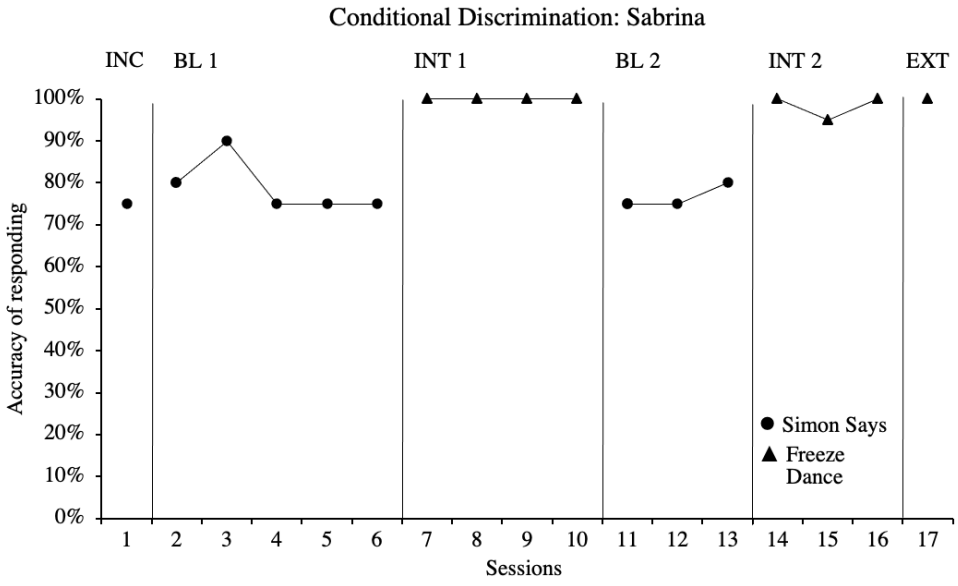


Figure 2

Carlos

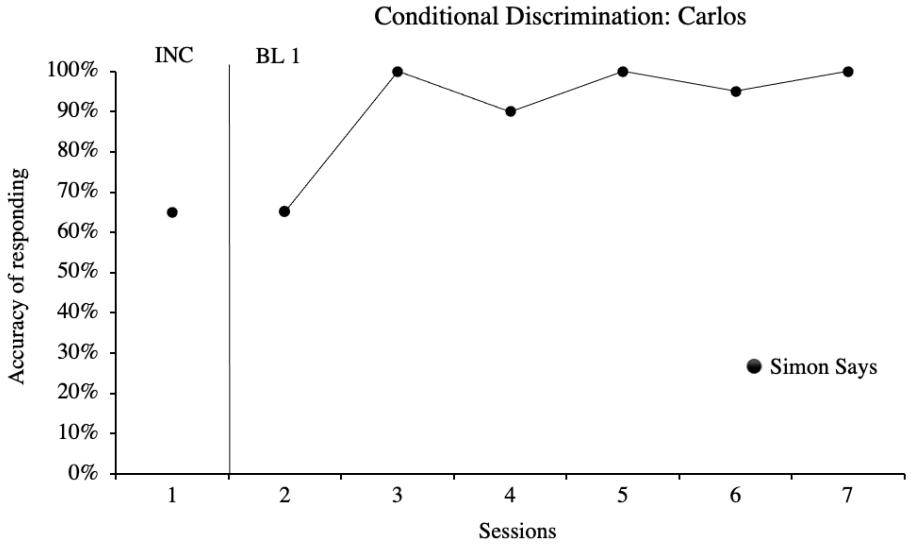
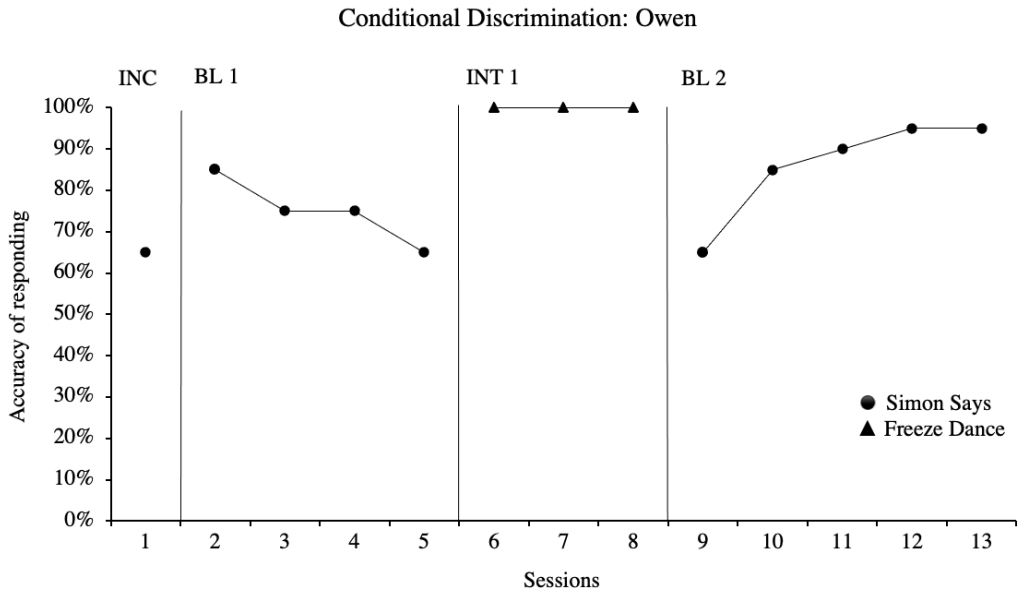


Figure 3

Owen



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APPENDIX A

GAME DESCRIPTIONS

ENGAGE program games:

Healey, D. M. & Halperin, J. M. (2015). Engaging neurobehavioral gains with the aid of games and exercise (ENGAGE): Initial open trial of a novel early intervention fostering the development of preschoolers' self-regulation. *Child Neuropsychology, 21*(4), 465-480. https://doi.org/10.1080/09297049.2014.906567

- Musical Statues, in which children move while music plays and freeze when the music stops
- Animal Speeds, in which students move at a slow, medium, or fast pace based on the stated animal
- Skipping at different speeds.
- Ball and Spoon race, in which children hold a ball in a spoon and move at different speeds
- Simon Says, in which students repeat an action if Simon says to do so, and do not do the action when Simon does not say to do so
- Snap card game, in which children place their hands on cards that are identical and call "snap."

Red Light Purple Light program games

Tominey, S. L. & McClelland, M. M. (2011). Red light, purple light: Findings from a randomized trial using circle time games to improve behavioral self-regulation in preschool. *Early Education and Development, 22*(3), 489-519. https://doi.org/10.1080/10409289.2011.574258D

- Red Light, Purple Light, in which children had to start and stop moving based on the cues. The colors were frequently changed and switched so the children had to learn changing stimuli
- Freeze Game, in which children had to move fast or slow depending on whether the music tempo was fast or slow
- Color Match Freeze, in which children had to dance until the music stopped and then find a color spot on the floor that matched the visual cue color presented by the adult
- Sleeping game, in which children pretended to be sleeping and would pretend to wake up and imitate whatever animal was called out by the adult
- Conducting Orchestra game, in which children had to start, stop, and change tempo depending on how fast the adult moved their conductor baton
- Drumbeats game, which included children matching their movements or instrument playing to the changing tempo of the music, as well as playing the opposite tempo when signaled to do so (i.e., moving fast to slow music or slow to fast music).

Cool versus Not Cool procedure games:

Leaf, J. A., Leaf, J. B., Milne, C., Townley-Cochran, D., Oppenheim-Leaf, M. L., Cihon, J. H., Taubman, M., McEachin, J., & Leaf, R. (2016). The effects of the cool versus not cool procedure to teach social game play to individuals diagnosed with autism spectrum

disorder. *Behavior Analysis in Practice, 9*(1), 34-49. https://pubmed.ncbi.nlm.nih.gov/27606237/D

- Fruit Salad, in which participants were given a name of a fruit and only respond when their fruit was called out
- Sleeping Game, in which participants were to respond only when the sound a dog makes is announced and not at other animal sounds
- Mouse Trap, in which students were only to respond when their own name is called.

Competitive versus Cooperative games:

Bay-Hinitz, A. K., Peterson, R. F., & Quilitch, H. R. (1994). Cooperative games: A way to modify aggressive and cooperative behaviors in young children. *Journal of Applied Behavior Analysis, 27*(3), 435-446. https://doi.org/10.1901/jaba.1994.27-435

- Cooperative games: Max®, Harvest time®, and Granny's House® Other cooperative games included Freeze De-freeze tag, Cooperative Musical Hugs, and Bean Bag Freeze
- Cooperative versions of Simon Says and Musical Chairs
- Competitive games: Board games such as Candy Land®, Chutes and Ladders®, and Aggravation®.
- Competitive versions of Musical Chairs, Simon Says, and Tag.

Individual, partner, and group play-based interventions:

Rothlisberger, M., Neuenschwander, R., Cimeli, P., Michel, E., & Roebers, C. M. (2012). Improving executive functions in 5- and 6-year-olds: Evaluation of a small group intervention in prekindergarten and kindergarten children. *Infant and Child Development,* 21(4), 411-429. https://doi.org/10.1002/icd.752D

- Anthony does: Perform only the commanded action if the experimenter says 'Anthony does. . .'
- Pattern movement game: Show the movement sequences according to the symbols on the movement cards
- Hand movements: Make opposite gestures compared with the experimenter
- Cotton wool game Whisper a child's name and blow a piece of cotton wool in his hand
- Fruit & vegetable game: Different fruit/vegetable names are assigned to each child; whenever a fruit/vegetable name is called, the corresponding children have to change their seats. If 'fruit salad' is called, all children have to change their seats.

APPENDIX B
PARENT RECRUITMENT LETTER

My name is Sara Rodehaver. I am a graduate student in the School of Psychological and Behavioral Sciences at Southern Illinois University Carbondale, and a teacher at Conklin Elementary School in Rockford Public Schools.

I am asking you and your child to participate in my research study. The purpose of my study is to find out if children can be taught to be less impulsive by teaching them simple games in their classroom (games such as Simon Says and the Freeze Dance).

Participation in this study is voluntary. If you do choose to have your child participate in the study, it will require 15 minutes of your time to complete a survey at the end of the study. Your child will participate in the games in their classroom daily for 10-15 minutes, for up to 6 weeks.

You were selected to participate in this study because your child is in kindergarten, which is the required age for participation.

There is no penalty for you or your child for not participating or for withdrawing from the study. There will be no impact on your child's grade if you choose to have them participate or not.

You will be contacted again with this request 2 more times during the next 2 weeks. If you would prefer not to be contacted again, please write OPT OUT on this form and return it to your child's teacher.

If you have any questions about the study, please contact me or my advisor using the information below.

To participate in this study, please respond to this email or send the attached consent form back to your child's teacher. Your child will also be asked if they would like to participate in the study.
Thank you for taking the time to assist me in this research.

Sara Rodehaver
Behavior Analysis and Therapy
Southern Illinois University – Carbondale
(815) 654-4860
Sara.Rodehaver@siu.edu

Deija McLean, PhD, BCBA
Clinical Assistant Professor
School of Psychological and Behavioral Sciences -SIUC
Deija.McLean@siu.edu
618-536-2302

APPENDIX C

DATA SHEET EXAMPLES

SIMON SAYS
Rules (to be read aloud before every session): This is a fun game where you have to listen carefully. When I say, "Simon Says," you do the thing Simon says to do. If I DON'T say Simon Says, you DON'T do the action, because Simon didn't say. Only do what Simon says to do!

	Participants			
Date: Observer:	#1	#2	#3	#4
Simon says touch your nose				
Simon says touch your knees				
Simon says turn in a circle				
Touch your ears				
Simon says stand on one foot				
Simon says put your foot down				
Close your eyes				
Simon says touch your elbow				
Simon says do a jumping jack				
Simon says touch your shoulder				
Thumbs up				
Simon says pat your knees				
Simon says jump up and down				
Simon says sit down				
Simon says stand up				
Clap				
Simon says Jump				
Simon says touch your stomach				
Touch your head				
Sit down				
Total accurate responses:				
Divide total by # trials, then multiply by 100				

FREEZE DANCE

Rules: (To be read aloud before each session): This is a fun game where you get to dance! While the music is playing, dance around this area. But listen carefully, because I pause the music, you stop dancing and FREEZE as soon as you can! Then I'll tell you when to dance again. But listen for when I pause the music, so you know when to FREEZE!

Time/Date:	Participants			
Mark √ when responding within 2 seconds, mark – when longer than 2 seconds	#1	#2	#3	#4
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Call "Dance!"				
Play music, then pause				
Total accurate responses:				
Divide total by # trials, then multiply by 100				

APPENDIX D

CONSENT AND ASSENT FORMS

Parent/Guardian Informed Consent Agreement

My name is Sara Rodehaver. I am a graduate student at Southern Illinois University-Carbondale, and a teacher at Conklin Elementary School in Rockford Public Schools. I am asking for permission for your child to participate in my research study. Please read this consent agreement carefully before you decide to allow your child to participate in the study. Your child will also be asked to agree (assent) to participate in this project.

Purpose of the research study: The purpose of the study is to determine if children can be taught to be less impulsive in their classroom by teaching them to discriminate among cues signaling when to respond or not.

What your child will do in the study: Your child will spend a few minutes every day playing games that hopefully teach them to be less impulsive, including Simon Says and the Freeze dance. While they play the freeze dance, I will be adding more visual and auditory cues to help them learn to discriminate when they should respond or not. The games we will play will be integrated into their normal school day and will be inside their normal classroom, so they will not miss any instructional time or be excluded from their usual environment.

What you will do in the study: Following the study, you will be asked to fill out a survey about the study and whether you felt it was important or helpful to your child. When completing the survey following the study, you may skip any questions you would not like to answer.

Time required: Time required will be minimal for you as parent, as the study will be integrated into your child's school day routine. The study is expected to last about 5-6 weeks. Following the study, a survey taking about 10 minutes to complete will be requested.

Risks: This study involves minimal risk to participants. The main risks involved may be social, including possible stigma from other peers who are not playing the game or from the peer model who is able to play the game successfully. Psychological risk may come in feelings of anger or disappointment in not playing the game correctly. Non-participants may be aware of who is in the study, but sessions will not be played in front of everyone. They will most likely occur during a part of the day in which students do activities around the classroom and they rotate through the activities. Other groups who are not participating will have the opportunity to play the same games as their peers in the study.

Safety measures against Covid-19: At this time, there are very few Covid restrictions in place, including masks to be worn or social distancing. However, this situation could change at any time before or during the study. Guidelines of the Rockford Public Schools and/or the Winnebago County Health Department will be followed. If new guidelines are required, that

information will be communicated to you, with a new opportunity to evaluate your child's participation in this study.

Benefits: The potential benefits of the research are adding to what is already known on the value on play in the early grades, as well as determining effective procedures in improving impulsivity in young children. Your child could learn skills to help them learn to be less impulsive, which could help them succeed in school.

Confidentiality: The information that you or your child give in the study will be handled confidentially. Your child will be given a pseudonym for the study, a unique code which would only be accessible by the researcher and advisor. Names will not be used in the results.

Video recordings will also be obtained in the current research, which will be stored on a digital file sharing platform (OneDrive) which will be password protected. The subscription being utilized complies with HIPAA requirements and has strict security in place. The video will only be viewed by the researcher, thesis chair, and an independent observer who is measuring agreement to the data measurement. The video will be deleted 3 years after the study is completed, in line with ethics requirements. Despite these precautions, full confidentiality cannot be guaranteed. It is possible that others may view this information.

Exceptions to Confidentiality: Under Illinois law, an exception to confidentiality is incidents of child abuse or neglect. If, in the course of my research, I develop reasonable cause to believe such an incident has occurred, I am required to contact the Illinois Department of Children and Family Services (DCFS).

Voluntary participation: Your child's participation and/or your participation in the study is completely voluntary. There will be no impact on your child's grades or services rendered if you choose not to have your child participate.

Right to withdraw from the study: You have the right to withdraw your child and yourself from the study at any time without penalty. If you decide to withdraw your child from the study, any video up to that point will be kept for 3 years, in line with the SIU ethics board requirements, and then will be deleted promptly.

How to withdraw from the study: If you and/or your child want to withdraw from the study, please contact the principal researcher, Sara Rodehaver, at (815) 654-4860 or via email at Sara.Rodehaver@siu.edu There is no penalty for withdrawing.

Payment: You and your child will receive no monetary payment for participating in this study. Your child may receive small tokens such as stickers for participation in the study sessions.

If you have questions about the study, please contact me or my advisor:

Sara Rodehaver
Behavior Analysis and Therapy
Southern Illinois University – Carbondale
(815) 654-4860
Sara.Rodehaver@siu.edu

Deija McLean, PhD, BCBA
Clinical Assistant Professor
School of Psychological and Behavioral Sciences -SIUC
Deija.McLean@siu.edu

Agreement:

- I am the legal guardian authorized to provide consent for this child.
- I agree_____ I disagree _____ that Sara Rodehaver can audio/video record my child for her research study.
- I have read the material above, and any questions I asked have been answered to my satisfaction. I understand a copy of this form will be made available to me for the relevant information and phone numbers. I realize that I may withdraw at any time without penalty.

Child's name: _____
Signature: _____ Date: _____
You will receive a copy of this form for your records.

This project has been reviewed and approved by the SIUC Institutional Review Board. Questions concerning your rights as a participant in this research may be addressed to the Institutional Review Board Chair, Office of Research Compliance, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618)-453-4534. E-mail: siuhsc@siu.edu

Assent to participate

Hi, my name is Sara Rodehaver. I am a college student learning how people learn and why they do what they do. I am trying to learn how children learn and how they can learn to stop and think by playing games. I would like you to help me by playing some games with some other students in your classroom and then we will try new ways to help us stop and think.

Your parents or guardians have already given permission for you to participate.

Agreement:

- I agree to participate in the study with Sara Rodehaver.
- I agree to do my best in the games.
- I understand that these games will not hurt me.
- I understand that if I want to stop, I can without getting in trouble.
- I understand the researcher will not tell anyone about what I tell them without my permission.
- I understand the researcher may have to tell someone who protects children if there is something that could be unsafe for me or is causing me harm, even if it isn't about the games we are playing.
- I understand that my personal information will be between me and the researcher as much as the researcher is able.

Mandatory reporting. In Illinois, it is the law (rules that people must follow) that an adult will not tell anyone what a child tells them while working together, unless the child tells an adult that they are being hurt or uncared for by another person. If someone working with a child believes that he or she is unsafe in anyway, the person in charge of their project with have to call the Department of Children and Family Services (DCFS), to inform them.

Name of participant: _____

Witness of assent: _____ Date: _____
Researcher: _____ Date: _____

This project has been reviewed and approved by the SIUC Institutional Review Board. Questions concerning your rights as a participant in this research may be addressed to the committee chairperson, Office of Research Compliance, SIUC, and Carbondale, IL 62901- 4344. Phone (618)-453-4534. E-mail: siuhsc@siu.edu

APPENDIX E

PARENT SOCIAL VALIDITY SURVEY

	Strongly disagree (5)	Somewhat Disagree (4)	Neither agree nor disagree (3)	Somewhat Agree (2)	Strongly Agree (1)
I understand what this study was working to improve.					
The study was helpful for my student.					
The study helped my student/child with their impulsive behavior.					
The study focused on important skills for my students.					
The study helped improve my child/student's impulsive behavior.					
Given the choice to participate in the study again, I would do so.					
I am satisfied with the intervention overall.					

APPENDIX F

STUDENT SOCIAL VALIDITY SURVEY

Did you have fun playing Simon Says today?			

Did you have fun playing Freeze Dance today?			

APPENDIX G

INTEROBSERVER AGREEMENT FORM

Simon Says

Behavior occurred both participants= +
Behavior did not occur for both participants= 0

Session:	Observer 2	Observer 1	Agree or non-agree
Trial 1			
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Trial 6			
Trial 7			
Trial 8			
Trial 9			
Trial 10			
Trial 11			
Trial 12			
Trial 13			
Trial 14			
Trial 15			
Trial 16			
Trial 17			
Trial 18			
Trial 19			
Trial 20			
Total trials agree = _____ / 20 = _____ x 100 = _____% agreement			

Freeze Dance
Behavior occurred both participants= +
Behavior did not occur for both participants= 0

Session:	Observer 2	Observer 1	Agree or non-agree
Trial 1			
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Trial 6			
Trial 7			
Trial 8			
Trial 9			
Trial 10			
Trial 11			
Trial 12			
Trial 13			
Trial 14			
Trial 15			
Trial 16			
Trial 17			
Trial 18			
Trial 19			
Trial 20			
Total trials agree = _____ / 20 = _____ x 100 = _____% agreement			

APPENDIX H

SCRIPTS AND RULES FOR GAMES

SCRIPTS FOR BASELINE GAME: SIMON SAYS

READ ALOUD: We're going to play Simon Says! The rule is to only do what Simon says to do. If Simon Says clap your hands, you should clap your hands. Another rule is do NOT do the action if Simon doesn't say. If I say only "clap your hands," don't clap!

Let's try that together. Simon says, "clap your hands." *[Allow time to respond.]* Good job on clapping! You followed the rule to do what Simon Says. Let's try another one. Clap your hands. *[Allow time to respond*.] Did you remember the rule that we don't do the action unless Simon says. Now we will play more. Be sure to listen and only do the action when I say Simon Says.

[Read the following prompts and put a plus (+) if they responded accurately and a zero (0) if they did not.]

(Read the order of prompts as given by the data sheet for that day)

Good job on listening for Simon Says!

SCRIPTS FOR INTERVENTION GAME: FREEZE DANCE

We are going to play the Freeze Dance game. The rule for this game is to move or dance while the music is playing and stop right away when you hear the music stop. I will pause the music and call "freeze" so you will know when to stop moving or dancing. Then when the music starts again, I will tell you to dance. Listen carefully for the music stopping and stop right away!

[After each specified interval, call "freeze" and then call "Dance" when the music starts again.]

APPENDIX I

TREATMENT INTEGRITY FORM

During the session, did the researcher:

Yes or No	Action
	Begin the recording?
	Gain the students' attention?
	Read the game script (Simon says or freeze dance depending on experimental phase?
	Read the prompts clearly?
	Wait 2 seconds following the prompt before recording data?
	If Simon Says: NOT do the motor movement with the students?
	If Freeze Dance: also hold up the appropriate card color?
	Recorded data fully for each session?
	Following all prompts, prompt students to fill out a student survey?
	Following the survey, prompt students to take a sticker?
	Prompt the students back to their designated area in the classroom?
	Stop the recording?
Total yes: _____/12 = _____%	

VITA

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Southern Illinois University Carbondale

Sara Rodehaver

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Illinois State University
Bachelor of Science, Special Education, May 2002

Thesis Paper Title:
THE IMPACT OF GAME PLAY ON CHILDREN'S IMPULSE CONTROL IN EARLY EDUCATION SETTINGS

Major Professor: Dr. Deija McLean, PhD, BCBA