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The Use of Antecedent-Based Interventions to Increase Compliance Related to Physical Activity in Children with Down Syndrome

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Master of Science

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ABSTRACT

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Children with Down syndrome often have high body mass index scores, brought on by hypothyroidism, poor mastication, decreased metabolic rates, and inconsistent physical fitness routines. Along with various genotypic characteristics, several behavioral tendencies accompany the diagnosis of Down syndrome. People with this condition often engage in noncompliant behaviors in an attempt to escape work-related tasks such as exercising. A lack of a consistent fitness regimen may result in additional health complications for this particular group of people, as well as ensuing concerns from the parents or guardians who care for them. Because of the propensities for poor physical health in people with Down syndrome, it is imperative that this group of people include exercise-related activities in their health-care routines to help promote a positive well-being from childhood to adulthood.

The purpose of this study is to report on the results of an intervention which utilized high-probability tasks and principles of generalization to address noncompliant behaviors in a 9-year-old boy who had Down syndrome and a history of engaging in refusal towards exercise-related activities. Gross motor skills adapted from the Test of Gross Motor Development assessment were used throughout the study to evaluate both compliance and accuracy of the pre-selected movements. This study used a changing conditions design to assess John's growth throughout 5 distinct phases. Results from both the high-probability tasks and generalization interventions showed an overall increase in the participant's compliance and accuracy of skill development throughout all stages of the experiment. Implications from this study provide positive support for using antecedent-based interventions to help individuals with Down syndrome engage in exercise-related activities.

Keywords: Down syndrome, noncompliance, exercise, antecedent interventions, high-probability requests, generalization

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DESCRIPTION OF THESIS STRUCTURE

The Use of Antecedent-Based Interventions to Increase Compliance Related to Physical Activity in Children with Down Syndrome is written in a hybrid format. This specific format draws together traditional thesis requirements with journal publication formats. The introduction, statement of purpose, and research questions are described in the first section. Next, the method section outlines the experiment and is followed by a presentation of intervention data in the results section. Thirdly, the discussion section analyzes the findings from the study. A list of the references used in the previous four sections is included before the individual appendices. A review of the current literature is included in Appendix A and is followed by a list of references used in this section. Appendix B contains the study's parental survey, Appendix C includes an example of the consent form used in the experiment, and Appendix D consists of the assent form. Finally, Appendix E contains an example of the data sheet used during the evaluation.

Introduction

Individuals with Down syndrome often engage in noncompliant and avoidant behaviors when asked to participate in low preference activities (Rubin, Rimmer, Chicoine, Braddock, & McGuire, 1998). This behavioral characteristic of defiance is especially problematic because of additional genotypic risk factors that accompany a Down syndrome diagnosis. Due to a unique genetic makeup, people with Down syndrome have a high risk of becoming obese, as well as acquiring various comorbidities associated with being overweight. Body mass index (BMI) scores, measuring body fat based on height and weight, continue to be worrisome figures for caregivers as these numbers continuously increase for individuals with Down syndrome up until the age of 30 (Rubin et al., 1998). A lack of a consistent fitness regimen may result in overall health complications for this particular group of people, as well as an ensuing concern from the parents or guardians who care for them (Coe et al., 1999). Because of the propensity for poor physical health in people with Down syndrome, it is imperative that exercise-related activities be included as part of a healthcare routine to help promote positive health from childhood to adulthood.

To address health-related complications and obstinate behaviors that accompany a Down syndrome diagnosis, parents can work with behavioral practitioners to learn how to help their child participate in fitness-related activities. Practitioners can teach caregivers how to implement antecedent-based interventions that will aim at reducing their child's avoidant and noncompliant behaviors related to fitness activities. Interventions such as utilizing high-probability (high-p) requests and generalized stimuli (GS) are behavior analytic concepts, that when implemented with fidelity, can help increase a child or adult's participation in exercise programs. A high-p request involves the delivery of a single demand or sequence of demands that a target individual

is likely to complete, before delivering a low-probability demand that the individual typically has a difficult time finishing (Banda, Neisworth, & Lee, 2003). Along with high-p tasks, the concept of generalization can act as an antecedent-based intervention to reduce noncompliance and increase positive behavior. Generalization can involve changing the physical stimuli used in an intervention so that the participant can perform a particular action with any object (Persicke, 2014).

In 2014, The National Institutes of Health published a report outlining the need for further research on the topic of Down syndrome. The document, “Down Syndrome Directions” (2014), outlines goals that have been developed to encourage researchers to study certain aspects of the syndrome that may be lacking in scientific analysis. Among these goals is that of exploring new behavioral support interventions to promote positive health practices amongst people affected by this disability. According to the plan, further research is needed "...for use in family, school, and residential environments to help individuals with Down syndrome enhance learning, increase physical fitness and maintain healthy weight, and improve quality of life" (Eunice Kennedy Shriver National Institute of Child Health and Human Development, NIH, DHHS, 2014, p.10). Because people with Down syndrome are more susceptible to adverse health conditions, this goal would encourage researchers to explore behavioral interventions that may assist individuals in leading healthier lives. Few studies have specifically addressed the use of applied behavior analysis (ABA) techniques to address noncompliance towards physical activity for individuals with Down syndrome; this article summarizes some of these available research experiments.

Statement of Purpose

This study is specifically designed to help The National Institutes of Health reach their goal of furthering research on the topic of Down syndrome. The purpose of this study is to report on the results of two antecedent-based interventions that were implemented in an attempt to reduce noncompliant behaviors in a child with Down syndrome. This article explains how the specific behavioral interventions of high-p requests and generalization can enable all individuals with Down syndrome to participate in physical activity, and by doing so, allow them to gain access to a more active and healthy lifestyle.

Research Questions

This study addresses the following research questions:

1. What are the effects of using high-probability tasks as an intervention to address noncompliance towards exercising?
2. What are the effects of using generalized stimuli tasks as an intervention to address noncompliance towards exercising?
3. What are the effects of using antecedent-based interventions to teach gross motor skills?

Method

To help address the aforementioned research questions, the authors conducted an in-home experiment to measure and evaluate the effectiveness of multiple antecedent-based interventions. This section describes the participant, setting, measures, and procedures used to implement these techniques.

Participant

To take part in this study, the target participant needed to be between the ages of 6-12, have the diagnosis of Down syndrome and have no cardiovascular or respiratory comorbidities that would affect involvement in the experiment. In order to find a suitable applicant, a mass email stating the purpose of the research experiment was sent out to members of the Utah Down Syndrome Foundation. Multiple parents showed interest in having their child participate in the study, stating a desire to increase their child's involvement in any form of physical activity. All candidates were invited to complete an online survey which allowed them to describe their child's maladaptive behaviors (if applicable) as well as their son or daughter's current functional and adaptive abilities. The survey consisted of demographic questions such as the child's birthdate, race, and family's place of residence. Other questions about the target individual's physical fitness-related hobbies and abilities to perform those tasks were listed in the survey. Finally, parents were asked to state their child's overall propensities to follow simple directions on a numerical scale of 1-5 (with a score of one denoting "never follows directions" and a score of five denoting "almost always follows directions").

Initial intake. From these completed surveys, John (given pseudonym) was selected to participate in the study based on his ability to perform physical-fitness related tasks and his inability to follow simple directions under any condition. A member of the research team (the lead practitioner) visited both John and his parent in their home to receive additional information about the child's level of compliance in various settings and situations (school, home, community). Once enrolled in the study, John's mother provided documentation of her son's most recent IQ scores (special education re-evaluation reports) as well as his current

individualized education program (IEP). She provided written consent and John provided verbal assent to participate in the study.

Participant's academic history. At the time of the study, John was a 9-year-old Caucasian male in fourth grade. John had the diagnosis of Down syndrome, with a resulting classification of "intellectual disability" which qualified him for special education services. In his class at school, John was placed in a self-contained classroom and received approximately 370 minutes of special education services each day. As stated in his most recent special education re-evaluation report, when John was 8-years and 4-months-old he passed a hearing screening with results showing adequate cochlear functioning, normal hearing in his right ear, and mild/moderate hearing in his left. The report also noted that a full-scale IQ from the Wechsler Nonverbal Scale of Ability could not be obtained due to John's refusal to participate in the assessment. However, at age 5-years and 7-months John participated in the Wechsler Preschool and Primary Scale of Performance and performed in the low average range in verbal and performance categories. John's mother completed the Adaptive Behavior Assessment-Third edition when John was 8-years and 4-months-old. Scores from this assessment showed that he was in the extremely low range on his general-adaptive composite, conceptual, social, and practical scores (T-score= 55). John's functional skills were assessed by way of the Brigance Inventory of Early Development. According to assessment scores, John was able to identify all colors and most areas of the body. He was able to count to the number 10, identify 3 shapes, and label the correct names of 14 out of 26 objects on various picture naming cards.

Participant's physical education goals. As stated in his most recent IEP, John received 30 minutes of adapted physical education services weekly. As written in this individualized plan, John was able to catch an 8-inch ball with 40% accuracy and was able to throw that same

size ball in a functional pattern (while shifting his weight correctly), with 40% accuracy. His goals included throwing a 4-inch ball with an overhand arc and catching an 8-inch playground ball with his arms near his chest. John's physical education teacher noted that John needed modified rules and support during small group activities. These adaptations were put into place to reduce John's engagement in any maladaptive behaviors such as running away or engaging in off-task activities.

Participant's past behavior plan. As expressed by parents and teachers in interviews, John had a history of engaging in maladaptive behaviors in both the classroom and home setting. Many of these behaviors included throwing, hitting teachers, standing on tables, laying on the floor, elopement from group instruction, and general noncompliance. Anecdotal data from past functional behavior assessments indicated that John engaged in these maladaptive behaviors to escape academic work or other non-preferred activities. Consequently, a behavior intervention plan (BIP) was implemented when John was 9-years and 4-months-old to address most of these target behaviors. The BIP included antecedent-based interventions such as a token economy system and a visual schedule. Two months after the BIP was implemented, John's teacher reported that data had shown a slight reduction in target behaviors in the classroom; however, the frequency and intensities of these behaviors were still being seen by parents in the home setting.

Review of gathered information. The lead practitioner thoroughly reviewed John's past audiologic, cognitive, and academic reports to ensure that the results of this study would not be affected by hearing or verbal comprehension deficits. As previously mentioned, John's past audiology report showed that his hearing was adequate; thus, ruling out any noncompliance related to poor auditory perception. John's verbal comprehension score was unavailable for

analysis because of his refusal to participate in IQ tests in previous years; however, John's adapted physical education teacher communicated in his IEP that John was able to follow through on simple verbal directions related to physical activity with prompting and modified rules. Likewise, John's physical education goals of throwing and catching conveyed that he could recognize and perform basic fitness-related activities. In the initial survey that John's mom filled out, she noted that her son could perform all of the motor skills from the Test of Gross Motor Development-Second Edition (TGMD-2). These reports and interviews helped verify to the research team that John had adequate verbal comprehension when performing specific gross motor skills.

Setting

This experiment was conducted in the participant's backyard when weather permitted, and in his home's basement when weather conditions were poor. John's backyard was approximately 0.25 acres and consisted of a large grass field with a few trees and a swing set. His basement was 20x30 feet in area and contained a couch, a bookshelf, and a sizeable carpeted area. The specific location used in each session was noted in the data session notes. Before each session, the chosen area was cleared of any distracting items or people to allow an attentive climate for John to focus on the requests and tasks that were to be completed. Along with a clear space, the practitioner ensured that there was a large enough area to allow the individual plenty of room to complete all assignments.

Measures

For this study, the lead practitioner assessed and measured progress on the participant's abilities to both attempt and accurately complete specific gross motor tasks obtained from the TGMD-2. The TGMD-2 is an assessment used to evaluate gross motor functioning in children

ages three through ten and is often used to assess individuals who have deficits in the area of gross motor skill development (Ulrich, 2000). To evaluate interventional progress of skills found in this assessment, a typical data collection session consisted of a predetermined practitioner going to the child's home twice a week for approximately thirty minutes each visit. When the practitioner arrived at the child's house, she set up activities, delivered task demands derived from the TGMD-2, collected data on the target individual's willingness to perform given instructions, and scored the participant's gross motor performance on the assigned tasks.

Pre-assessment. Before data collection sessions began, the practitioner used the TGMD-2 to evaluate whether or not John was capable of performing all tasks found on the assessment. This specific test was utilized in this experiment because it was used in prior studies with individuals who had Down syndrome, and was deemed reliable and valid with this particular population (Frey & Chow, 2006; Valentini & Rudisill, 2004). The third edition of the TGMD is available; however, it is currently being normed with typically developing individuals (Therapro, 2019). All evaluated tasks were derived and adapted from the TGMD-2 assessment and included the following: Running, galloping, hopping, leaping, jumping, sliding, striking a stationary ball, stationary dribbling, catching, kicking, overhand throwing, and underhand rolling. The testing took place outside, as the lead practitioner asked John to attempt to carry out preselected skills consecutively. The assessment requires specific equipment and materials to assess the gross motor skills of participants. To complete the evaluation, the practitioner brought a TGMD-2 assessment protocol, exercise cones, tape, beanbags, 4-inch baseballs, batting tees, baseball bats, basketballs, soccer balls, tennis balls, and softballs to the first visit with the child. All items were easily accessible, as to not disrupt or pause work sessions.

Data collection observations. Each session consisted of fifteen gross motor trials during the baseline phase and five additional high-p trials during the intervention phases. One individual low-p trial included the practitioner telling a child to show her one of three gross motor skills, while one individual high-p trial consisted of the practitioner asking the child to complete a simple task. The low-p motor skills that the child practiced weekly for the duration of the study were leaping, sliding, and jumping. The researchers' explanation for choosing these three skills and a description of each task is outlined in the Interventional Procedures section. A frequency data collection method was utilized to record compliance and accuracy for each trial. A mark of positive compliance occurred when the participant completed the task within ten seconds of the given instruction. Inversely, a mark of negative compliance or noncompliance occurred when the participant did not attempt the skill within ten seconds of the given direction. With each compliance data point, the practitioner took data on the accuracy of the skill tried in each trial. Whenever the child complied with a demand to leap, slide, or jump the practitioner noted whether or not the skill was completed correctly based off of an adapted definition of that particular skill found in the TGMD-2.

Data collection form. Results of each session were recorded on a data collection form created by the research team. At the start of each session, the practitioner filled out the blank lines on the top of the form which provided spaces for the date, their name, the location of the session (inside or outside), and the names of any other individuals present. This document allowed practitioners to write down what type of low-p or high-p skill they asked John to complete; additionally, they could circle a "yes" or "no" if the child attempted the task within ten seconds and if the trial was completed successfully. If John needed prompting to complete a task

either because of noncompliance or an incorrect attempt, the data collection form provided space for the practitioner to note which prompts were given (verbal, model, physical).

Observer training. All therapists evaluating the participant were trained on how to implement and score the experimental interventions correctly. Each visit was video recorded by either the practitioner or parent, which allowed for review and interobserver agreement comparisons after the completed sessions.

Interobserver agreement. After the entire experiment was completed, another trained practitioner watched the video recordings from 7 out of 18 visits and scored data from the recordings based off of the same scoring system utilized during direct sessions with John. Results were compared, and interobserver agreement (IOA) data matched with 90% of the data points between both practitioners. The IOA percentage was calculated by taking the number of data agreements between both practitioners that were the same and dividing that number by the total amount of possible data points.

Interventional Procedures

The interventions used in this study consisted of antecedent-based techniques that were created based off of data gathered from initial TGMD-2 testing. The implementation of interventions used to address the noncompliant behaviors both seen in the pre-assessment and described by parents can be categorized into five distinct phases; this section explains these stages in detail.

Phase 1: Lead practitioner and CS. After John was assessed on adapted TGMD-2 items, the lead practitioner evaluated the test results to choose three activities that would be labeled as low-probability tasks (low-p). Following a thorough review, the practitioner selected the skills leaping, sliding, and jumping because during pre-assessment John was noncompliant

when initially asked to try them, but was able to accurately perform these skills after additional prompting. For data collection purposes, leaping was defined as the individual standing on one side of a cone with two feet firmly planted on the ground. The child would then jump to the other side of the cone by leaving the ground with their lead foot first, and their second foot following behind. They would then land on the other side of the cone with their lead foot hitting the ground first and their trailing foot second. Sliding was defined as the individual standing directly to the side of a cone, with their body turned sideways so that their shoulders were aligned with another cone approximately twenty feet away. They would then step sideways with their lead foot and allow their trailing foot to slide to the same spot as their lead foot. The feet would continue in this motion until the individual slid to the second cone. Finally, jumping was defined as the child starting with two feet on the floor, bending both knees, pushing off from the floor with their feet, momentarily leaving the ground, and landing with both feet simultaneously. Orange cones utilized for the three skills acted as contrived stimuli (CS) in the baseline phase and in phases three, four, and five.

The baseline phase of the experiment consisted of three sessions which all took place in John's backyard. Each session included the practitioner telling John to complete five blocks of the three low-p skills. All three tasks in a block were delivered in the same order: leaping first, sliding second, and jumping last; these blocks of three skills were completed five times each session (15 trials in total). Additionally, due to John's limited receptive language skills, the requests were kept to simple two-to-three word requests (Davis, Brady, Williams, & Hamilton, 1992). When delivering the task demands, the practitioner would tell the child to engage in one of the three skills and would provide verbal praise as soon as the child attempted the assignment. If the child did not try to comply with the demand after ten seconds, the practitioner

would provide him with a verbal prompt by repeating the instruction. If the individual still did not attempt to complete the skill after the verbal prompt and a ten second wait time, the practitioner would give John a model prompt by saying "do this" as she completed the skill. After ten seconds, if John still did not attempt the skill, the practitioner would deliver a touch prompt by putting her hands around John's waist and physically guiding him through the task. If at any time John attempted the given task but did not perform it correctly, the practitioner would praise him for his attempt and would move through the prompting hierarchy by giving him a verbal, model, or physical prompt, stopping and giving praise once the skill was completed correctly.

Phase 2: Lead practitioner, high-p tasks, and GS. The second phase of the experiment involved the usage of high-p tasks and generalized stimuli. All conditions from the baseline stage remained in effect; however, five interventional high-p trials were added, and the former CS were altered in each session.

High-p trials were defined as any task that John had successfully and frequently completed in the past. Prior to phase one, the lead practitioner gathered a list of these tasks through an interview with John's mother. Additionally, during the pre-assessment, the practitioner asked John to randomly complete the list of high-p tasks while they were playing a preferred game. John finished the entire list of high-p tasks with no additional prompts, which verified to the practitioner that these skills could be considered valuable high-p trials for the experiment. The list of these skills included John giving the practitioner high fives or fist bumps, John looking at the practitioner when told to do so, completing simple motor actions such as clapping hands or stomping feet, and John touching any part of his body when asked to locate a specific body part.

During phase two, the lead practitioner asked John to complete one of the high-p tasks before each low-p leaping request. The high-p demand was always delivered before the leaping request as it was the first low-p skill in each block of the three low-p tasks (leaping, sliding, and jumping); thus, the child was asked to complete at least five high-p skills each day because of the five blocks. For example, at the start of the session, the practitioner would say, "John, give me a high five." As soon as John followed through with the request, the practitioner would praise and continue by asking John to show her leaping. Once this trial was completed, the practitioner would again praise and move to the next low-p task telling John to, demonstrate a sliding skill and provided him with words of encouragement after successfully sliding to the cone. For the final skill in the block, the practitioner told John to "jump," and again praised him for the correct response. After the completion of the first block (one high-p and three low-p trials), this same sequence repeated four more times with the practitioner delivering random high-p task demands at the start of each block. If at any time John was noncompliant or inaccurate after ten seconds of either a high-p or low-p request, the practitioner moved through the stages of praising and prompting as noted in the baseline section.

In addition to the high-p tasks, the CS were removed during this phase of the intervention. In the baseline phase, cones acted as CS to aid the participant in completing the low-p skills of leaping and sliding; however, they were removed in the second phase, and the practitioner utilized objects in the surrounding area such as trees, preferred objects, and household items. For example, instead of saying "leap over the cone" the practitioner might have said, "leap over that green snake" as she pointed to a green water hose on the ground.

Phase 3: Lead practitioner, high-p tasks, and CS. In the third phase, all conditions from the baseline stage remained in effect; however, the stimuli used in the leaping and sliding tasks (GS such as household items) reverted to the cones from phase two.

Phase 4: Novel practitioner, high-p tasks, and CS. The fourth phase of the experiment introduced a new practitioner for three consecutive sessions. The new practitioner was trained in all aspects of the experiment and in how to implement the intervention. All conditions from phase three remained the same as both the high-p tasks and cones remained in use.

Phase 5: Lead practitioner, high-p tasks, and CS. In the final phase of the experiment, the original lead practitioner returned to John's home and replaced the novel practitioner. High-p tasks were still applied as the practitioner asked John to complete one of the simple tasks before each leaping trial. Similar to previous phases, cones were again implemented as CS for the low-p tasks.

Design and Analysis

This study used a changing conditions design to evaluate the effectiveness of each intervention. Each of the five conditions summarized in the intervention phase section represented individual phase changes. The arrangement was as follows: Baseline (A); Lead practitioner, high-p tasks, and CS (B); Lead practitioner, high-p tasks, and GS (C); Novel Practitioner, high-p tasks, and CS (D); Lead practitioner, high-p tasks, and CS (C). Visual analysis was used to analyze the level, trend, and variability of within-phase patterns, as well as the immediacy of the effects and consistency across similarity phases.

Results

This section addresses the three research questions outlined in the introduction section. The first question, "What are the effects of using high-probability tasks as an

intervention to address noncompliance towards exercising?" is answered by examining John's rate of compliance in all five phases. The second question, "What are the effects of using generalized stimuli tasks as an intervention to address noncompliance towards exercising?" is answered by analyzing John's compliance rate data from phase two. Finally, the third question, "What are the effects of using antecedent-based interventions to teach gross motor skills?" is answered through examination of John's percentage of accuracy throughout all five phases of the experiment. The figures described in this section are located after the reference pages found in this article.

Percentage of Skill Compliance

The first two research questions focus on John's compliance rate during specific phases of the experiment. Figure 1 shows John's percentage of compliance throughout all five phases and amongst all three skills (leaping, sliding, and jumping). As previously mentioned, phase changes occurred at the same time for all three skills as shown in each figure.

Leaping. During the baseline phase (three sessions), John complied with leaping task demands an average of 53.3% of the time (range= 40-60%). Throughout the second phase (seven sessions) where the antecedent-based interventions of high-p tasks and GS were implemented, John's compliance increased to an average of 94.3% (range= 60-100%). In the third phase of the study (three sessions), CS were again utilized in place of GS. In this phase, John followed directions for 100% of the tasks that he was asked to complete. Data from the fourth phase (three sessions), with the novel practitioner replacing the lead practitioner, showed that compliance slightly decreased in the first two sessions but then increased back to 100% in the last session (average 86.7%; range= 80-100%). In the fifth and final phase of the experiment (two sessions), compliance returned to 100% with no variability amongst sessions.

Sliding. John's rate of compliance with the skill of sliding was very similar to that of leaping. In phase one, John complied with the practitioner's requests an average of 53.3% of the time (range= 40-60%). During phase two, compliance increased to 92.9% (range= 50-100%). Similar to results from phase three's leaping tasks, John complied with 100% of requests to complete sliding actions; this occurred with no variability over all three sessions. In the next phase where the novel practitioner conducted sessions, the compliance average dropped slightly to an average of 93.3% (range= 80-100%). Finally, when the lead practitioner returned for the final phase, the average compliance rate increased to 100%, with no variability.

Jumping. During the first session of the baseline phase, John showed complete noncompliance when asked to engage in the skill of jumping; however, his rate of compliance increased to 60% by the third session with the average rate being 46.6% throughout the entire phase (range= 0-80%). During the first intervention phase, the average rate of compliance increased to 90% (range= 50-100%). Similar to the leaping and jumping skills, when cones were used in the next phase compliance remained high at 100% with no variability. When the novel practitioner was present, compliance slightly decreased to 86.7% (range= 80-100%). Finally, in the last phase, the rate of compliance increased to 100% with no variability for both sessions.

Percentage of Skill Accuracy

The third research question pertains to John's percentage of accuracy for each skill, throughout all five phases. John's percentage of accuracy towards exercise-related demands is plotted in Figure 2.

Leaping. During the baseline phase, John correctly completed the skill of jumping 53.3% of the time (range= 40-60%). When the first intervention of high-p tasks and GS were implemented, accuracy increased to 94.3% amongst all seven sessions (range= 60-100%). In the

third phase of the intervention with the original cones, accuracy rose to 100% across all three sessions with no variability. When the novel practitioner was present, accuracy decreased slightly to 53.3% (range= 20-100%). During the final two sessions with the lead practitioner, the percentage of accuracy remained at 100% with no variability.

Sliding. John accurately performed the skill of sliding 53.3% of the time throughout the baseline phase (range= 40-60%). During the first interventional phase, John's sliding accuracy increased to 90% amongst all seven sessions (range= 50-100%). When cones were used during phase three, accuracy remained at 100% with no variability. While in the penultimate phase with the novel practitioner, accuracy decreased slightly to an average of 93.3% (range= 80-100%). Finally, when the lead practitioner conducted the final two sessions, accuracy climbed to 100% with no variability.

Jumping. Throughout the baseline phase, John's jumping accuracy was highly variable, and data showed an average of 26.7% accuracy throughout all three sessions (range= 0-80%). During phase one, accuracy increased for this skill to 90% (range= 50-100%). When cones were not in use, accuracy remained high at 100% with no variability. John's jumping accuracy somewhat decreased to 80% during the time period that he was with the novel practitioner. When the lead practitioner returned to John's home for the final two sessions, John correctly performed the skill of jumping 100% of the time with no variability.

Parental Satisfaction

In the initial survey that John's mother completed, she indicated her concern for her child's health due to a lack of a regular exercise routine. Because this issue carried much social importance for John's family, it was essential to the research team that the results of the intervention positively affected the child. After the experiment, the lead practitioner met with

John's mother to review John's physical and behavioral progress since the start of the study to the time of the interview. John's mom spoke of her overall satisfaction with the experiment. She stated that since the study, John was more apt to comply with directions related to exercise and would often show other family members, teachers, and classmates his leaping, sliding, and jumping skills. She stated that she would continue to apply some of the antecedent-based interventions that were utilized in the study to help John more readily engage in fitness-related activities.

Discussion

The experiment in this study utilized two antecedent-based interventions to help reduce noncompliant behaviors in a child with Down syndrome. The outlined experiment focused on using high-p tasks and GS to increase compliance towards exercise-related skills. The findings from the various phases of the interventions suggest that antecedent-based techniques are an effective and low-cost method for helping individuals learn and practice simple gross motor skills.

Reflections of Experiment and Literature

According to Patti and Tsiouris (2006) the most common problem behavior amongst individuals is that of noncompliance (Patti & Tsiouris, 2006). This was deemed true for John as his parents and teachers saw multiple occurrences of this type of refusal behavior throughout the day. The experimenters adapted and utilized Davis, Brady, Williams, and Hamilton's (1992) definition of noncompliance to help practitioners recognize when John engaged in this type of problem behavior. For purposes of this experiment, noncompliance was defined as the failure to follow through on any given instruction within ten seconds (Davis et al., 1992). This definition allowed for all practitioners to collect accurate and reliable data during each session. The

experimenters did not have enough time to complete a thorough functional behavior assessment to find a possible function of John's noncompliance before beginning the experiment. Because of this, they interviewed teachers and parents to find the possible function of his refusal type behavior. After discussing this topic with adults who knew John, researchers labeled John's noncompliant behavior as escape-maintained. This function was also chosen because, according to an article written by Patterson (1982), children become unresponsive and noncompliant to gain control in social situations and to escape demands (Patterson, 1982).

This experiment was modeled after Davis, Brady, Williams, and Hamilton's (1992) experiment on the effects of high-p requests on children with behavior disorders. Davis and colleagues demonstrated the positive effects or using high-p requests on two individuals with intellectual disabilities. Authors noted that further research could be done to see if high-p tasks would, "…benefit physical or occupational therapists in their delivery of motor instruction and activities, or their encouragement of students to try tasks they perceive as unpleasant (e.g., stretching to prevent contractures)" (Davis et al., 1992, p. 913). The current study outlined in this report aimed at addressing the possibilities of using high-p tasks to address physical skills as is mentioned in Davis et al (1992). According to the data gathered, because John was able to successful learn and participate in certain gross motor skills, the intervention of utilizing high-p tasks may be beneficial for physical or occupational therapists as Davis and colleagues hypothesized.

Limitations

Although the experimental intervention outlined in this study was conducted with fidelity, there are a couple of limitations that must be noted. First, it would have been advantageous to have more data points for the final experimental phase; this would have ensured

an accurate analyzation of phase five. The final phase only included two data sessions due to unforeseen circumstances. The day after the last data collection day, John had to receive a tonsillectomy due to his recent inability to sleep through the night. The surgery was unexpected, and because of a long recovery time, practitioners had to end data collection altogether. Had the experiment been able to continue, the lead practitioner would have carried on with the data collection process for up to five more sessions.

This study would have also benefited from having multiple participants instead of just one single subject. Multiple individuals would have allowed the lead practitioner to test the experiments on various children to understand how the interventions would have affected different age groups. The idea of having multiple participants was discussed amongst the members of the research team. However, they decided that in order to measure treatment fidelity it would be best to have a single team member act as the lead practitioner for all children involved in the study. Because of time constraints, the lead practitioner was only able to visit one child each week.

Throughout the entire experiment, the lead practitioner and John built a positive rapport that should be noted when analyzing all compliance data points. When the practitioner first met John, he had a very reserved affect and appeared reluctant to speak; this hesitant demeanor remained constant for the first few sessions, as noted by the lead practitioner and as seen in videos recorded from relating sessions. As the practitioner continued to meet with John on a weekly basis, John's affect changed to excited and energetic. Other members of the research team noted this demeanor shift during IOA video comparisons. To ensure that the high-p tasks and GS were the variables truly affecting John's compliant behavior, a novel practitioner was introduced in phase four. The novel practitioner noted a similar reserved affect that the lead

practitioner witnessed in her first few sessions with John. The research team also noticed this emotion change in later video review meetings. Although John had an unfamiliar relationship with the novel practitioner, his level of compliance only slightly decreased in the first session, and then later increased in the two final sessions. Because of John's fairly consistent behavior for both practitioners, it is unlikely that his compliant behavior increased because of a strong relationship built between the participant and lead practitioner. However, as with any experiment, it is important to consider all possible correlating variables of change when evaluating progress.

Recommendations for Further Research

Although this experiment only consisted of eighteen sessions, John showed an overall increase in his compliance and accuracy towards leaping, sliding, and jumping exercises in a relatively short amount of time. Experimenters interested in replicating this study to see overall increases in compliance may also consider measuring additional health indicators such as participants' BMI scores, tolerance towards exercise, heart rate variability, and weight change. Additionally, further research is needed to help determine how antecedent-based interventions can help individuals with Down syndrome become more motivated to exercise independently. Because individuals with Down syndrome are at risk for acquiring health comorbidities into their adult years, it is crucial that this group of people learn how to exercise by themselves. Possible studies may include using principles of high-p tasks by teaching adults in this demographic how to complete simple anaerobic tasks before engaging in high-intensity cardiovascular exercises.

Conclusion

Individuals with Down syndrome make up a large population in need of both physical and behavioral intervention. Because of their genotypic makeup, they are at risk for developing

various dangerous comorbidities such as obesity. Phenotypically, this group of people often show signs of noncompliant behavior related to non-preferred activities. Several studies have been completed which show the promising effects of using high-p sequences to increase compliance and also reduce problem behavior. The use of generalization has also been a valuable intervention to help individuals learn, transfer, and retain skills in a more natural environment.

This study proved to be beneficial in reducing noncompliant behaviors related to exercise. The results of this experiment suggest that asking a child to complete a high-p task before a non-preferred task can result in an increase in compliance and accuracy amongst non-preferred or low-p skills. Results also provide positive outcomes for utilizing generalized stimuli as antecedent-based interventions in a home setting. Because of a lack of funding due to little research on the subject, people with Down syndrome are not able to receive adequate behavioral and adaptive therapy. There are several research studies available that show the positive effects of using ABA therapy on individuals with autism and other related disorders (Foxx, 2008); however, there are few experiments that specifically address the use of ABA to help individuals with Down syndrome (Feeley & Jones, 2006). Further research is needed to augment the literature regarding the use of ABA principles to increase compliance and physical fitness for children with Down syndrome.

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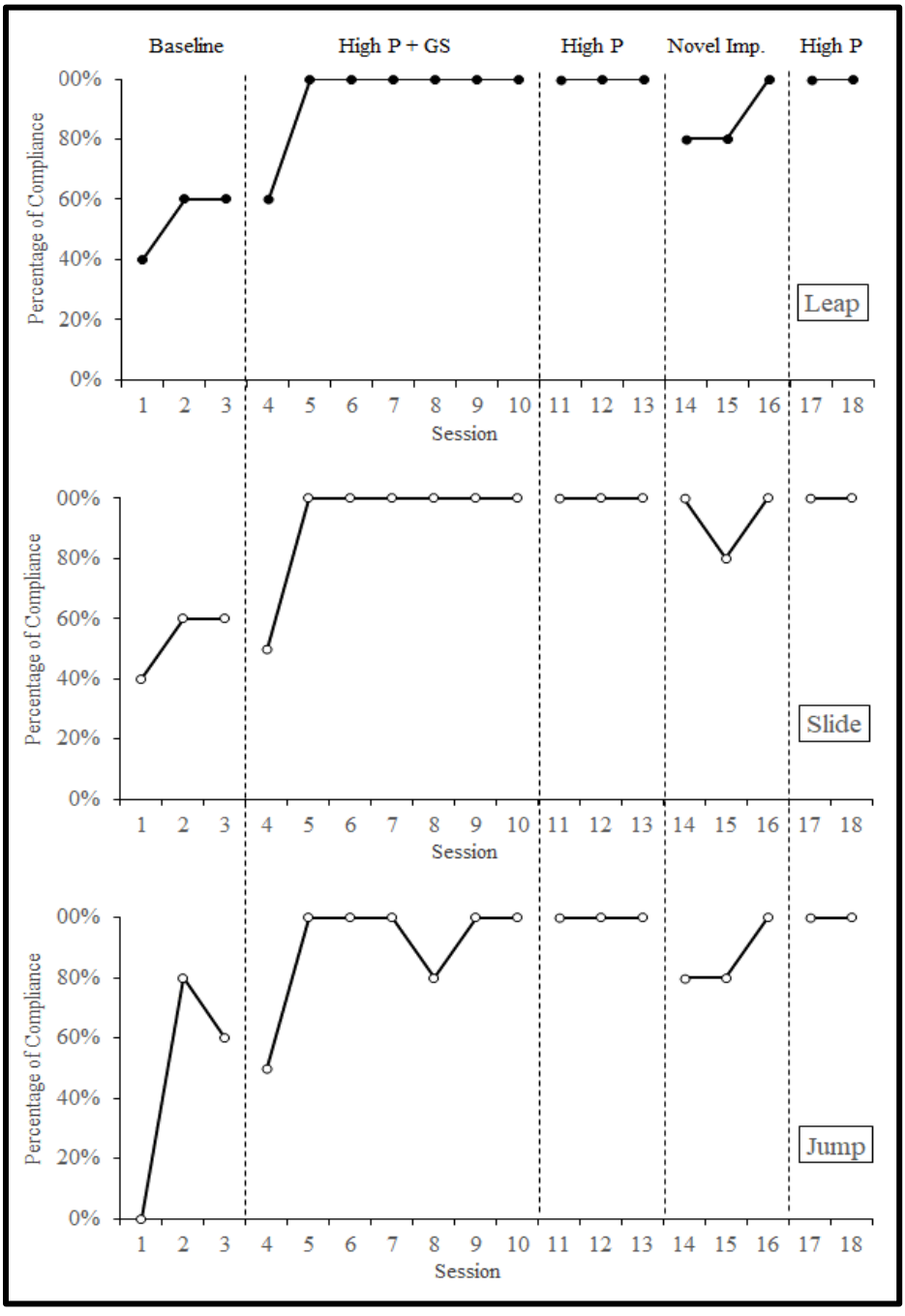

Figure 1. Percentage of John's compliance towards exercise-related skills.

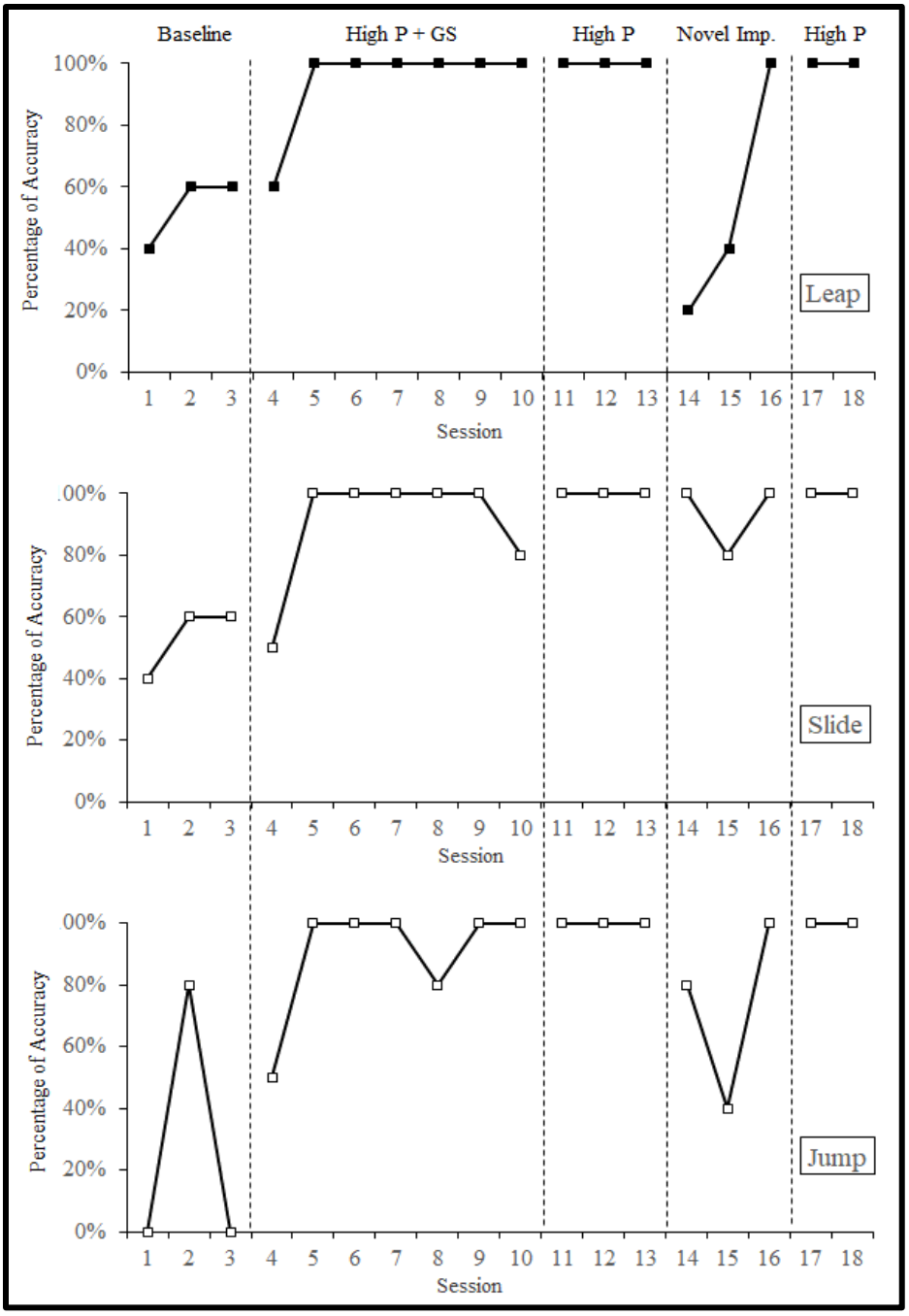

Figure 2. Percentage of John's accuracy towards exercise-related skills.

APPENDIX A

Review of the Literature

This literature review introduces and outlines the genotypic characteristics, health-related concerns, and phenotypic traits found in persons with Down syndrome. A summary of past studies involving participants with Down syndrome is provided, as well as a list of current possible therapeutic options for individuals with this disability. Noncompliance, the problem behavior exhibited by the experimental participant, is described and possible interventions to address this behavior are noted. Finally, this section expounds on the specific behavioral interventions listed in the method section.

Down Syndrome and Health-Related Concerns

Down syndrome is a genetic disorder caused by an extra copy of the 21st chromosome on an affected individual's genomic makeup (Silva et al., 2017). This condition is one of the most common causes of developmental disabilities as it affects approximately 1 in 700 live births in the United States each year (Xanthopoulos et al., 2017). Down syndrome is associated with moderate-to-severe cognitive delays along with a variety of congenital anomalies (Kanode & Payne, 1989). Individuals with this disorder are marked with dysmorphic features, and they often struggle with psychomotor development (Weijerman & De Winter, 2010). In addition to various birth defects, people with Down syndrome may develop other medical conditions throughout their lives such as congenital heart disease, hematologic abnormalities, obstructive sleep apnea, and cardiac valvular irregularities (Jensen, Taylor, & Davis, 2013). They often have high body mass index scores, brought on by hypothyroidism, poor mastication, decreased metabolic rates, and inconsistent physical fitness routines (Murray & Ryan-Krause, 2010). Likewise, these individuals have an increased risk of developing obesity, with adolescents in this

group being two to three times more likely to be obese than youth in the general population. According to a recent report by Rimmer, Yamaki, Lowry, Wang, and Vogel (2010), from a sampling of 81 adolescents with Down syndrome, 55% of these individuals were considered overweight, and 31.2% deemed obese (Rimmer et al., 2010). In a study that compared the physical activity of children with Down syndrome amongst their neurotypical siblings, demographic figures showed that on average the child affected with the syndrome was heavier, shorter, and younger than their unaffected brother or sister. Experimenters in this study also recorded and analyzed the daily amount of minutes exercised by both the child with Down syndrome and their sibling. Fitness trackers were given to both parties while parents were instructed to have their children wear their devices as they went about their daily activities. After a week of the participants wearing the monitors, researchers reviewed the results to find that the neurotypical sibling exercised more frequently than their brother or sister who had a disability. On average, those individuals with Down syndrome accumulated approximately 49.5 minutes of daily vigorous physical activity, while their typically developing siblings averaged 68.6 minutes a day (Whitt-Glover, O'Neill, & Stettler, 2006). These troubling statistics prove the need for further research as to how individuals with Down syndrome can follow directions to help them exercise more regularly.

Down Syndrome and Noncompliance

In addition to possible health concerns, specific behavioral phenotypic characteristics are common amongst individuals with Down syndrome. Aggression, antisocial behavior, property destruction, self-injury, and noncompliance are all maladaptive behaviors that have been observed in both children and adults with this intellectual disability (Chapman & Hesketh, 2000). In a study aimed at evaluating psychopathology in adults with Down syndrome, the

challenging behaviors of 206 qualifying participants were observed and recorded. An analysis of the gathered data showed that the most common problem behavior shared amongst all individuals was that of noncompliance (Patti & Tsiouris, 2006). Furthermore, Wilder, Fischetti, Myers, Leon-Enriquez, & Majdalany (2013) found that this target behavior is one of the most common behavior problems found amongst individuals with any type of intellectual or developmental disability (Wilder et al., 2013). Noncompliance is defined as the failure to follow through on any given instruction within a specified period of time (Davis, Brady, Williams, & Hamilton, 1992). The topography of noncompliant behavior displays itself differently amongst every individual. When engaging in this behavior, some people will merely ignore directions, while others may become self-injurious, use discrepant language, or perform stereotypic actions (Davis et al., 1992). This behavioral concern has shown to be challenging because it not only inhibits work completion, but it also prevents other crucial positive behaviors from occurring (Wadsworth, Hansen, & Wills, 2015). Refusal behavior impedes learning, disrupts peer relationships (Banda, Neisworth, & Lee, 2003), and limits opportunities to participate in normal activities such as exercising.

To determine the perceived function of an individual's avoidant behavior, practitioners should perform a functional behavior assessment. This process helps determine whether there is a relationship between a person's behavior and the environment, and also assists practitioners with understanding why the individual is engaging in a specific response. Functional assessments provide this and other information about the problem behavior to help practitioners implement an intervention that will correctly address the function of a behavior (Scott & Cooper, 2017). In general, children become unresponsive and noncompliant to gain control in social situations and to escape demands (Patterson, 1982). Given the impact that this target behavior

has on individuals, parents of children with Down syndrome should seek behavioral support to address this problem behavior.

Down Syndrome and Exercise Interventions

Currently, there is limited available research to support the topic of using antecedent-based interventions to help individuals with Down syndrome increase compliance towards exercise-related activities. On a broader scale, research strictly focused on using principles of behavior analysis to assist children with Down syndrome is available, but limited (Feeley & Jones, 2006). However, there are available studies that examine the use of certain behavioral analytic principles on participants who have non-specified intellectual disabilities (Roizen, Hyman, & Levy, 2005). Additionally, studies have also been completed to show the possible effects of helping individuals with Down syndrome lower their BMI scores through organized exercise programs.

Ordonez, Rosety, and Rosety-Rodriguez (2006) implemented a 12-week exercise program for 22 adolescent males who had Down syndrome. Resulting findings indicated that the intervention contributed to significant decreases in fat mass amongst all adults in the study (Ordonez, Rosety, & Rosety-Rodriguez, 2006). In a similar experiment which utilized the same demographic of participants, a 21-week exercise program that combined conditioning and plyometric jumps showed improvements in participants' lean mass, but no decreases in fat mass (Gonzalez-Agüero et al., 2011). One meta-analysis of similar interventions showed a comparable conclusion in five high-quality randomized controlled trials. Moderate to high effect sizes on improving muscular strength and balance were observed. However, little to no effects on body composition or cardiovascular health was seen in participants (Li, Chen, Meng How, & Zhang, 2013).

Some indicators in available studies related to physical fitness in Down syndrome point to participant samples that might exclude children with Down syndrome who engage in high levels of noncompliance. For example, Shields et al. (2013) conducted a randomized controlled trial of a strength training program that led to increases in strength and physical activity in 34 adolescents and young adults with Down syndrome. Participant selection required participants to "follow simple verbal instructions in English" and excluded participants with a history of "violent outbursts, absconding, aggressive behavior or antisocial behavior" (Shields et al., 2013, p. 4387). Thus, behaviors associated with noncompliance would be excluded from the study. Given that few studies have addressed compliance in physical activity and fitness programs for individuals with Down syndrome, the literature on noncompliance interventions should be explored in greater detail.

Down Syndrome Therapy

Applied behavior analysis (ABA) is the science of adapting and modifying human behavior; similarly, ABA therapy is the application of these behavioral principles in a therapeutic setting. According to an article written by Myers and Johnson (2007), "ABA is the process of applying interventions that are based on the principles of learning derived from experimental psychology research to systematically change behavior and to demonstrate that the interventions used are responsible for the observable improvement in behavior" (Myers & Johnson, 2007, p. 1164). The goals of this type of treatment are to maximize functional independence, ease family stress, aid in learning and development, promote socialization, and reduce maladaptive behaviors. ABA relies on progress monitoring and data collection to drive future behavioral interventions. Therapeutic principles can be utilized in the home, school, or community setting as children receive behavioral treatment to make gains in areas such as language, academic

performance, and social communication (Myers & Johnson, 2007). Numerous research studies are available that outline the effectiveness of ABA therapy for children with autism spectrum disorder (Foxx, 2008). Individuals with autism can turn to government funding, or their own private insurances to receive financing for this costly treatment approach. Because the use of ABA therapy for children with Down syndrome has not been studied extensively (Feeley & Jones, 2006), individuals with this disability and their families often receive little assistance when attempting to address behavioral and adaptive skill development.

Since behavioral support for people with Down syndrome is either limited or unfunded, caregivers of these individuals may turn towards other types of therapies to help their child with academic, functional, and adaptive skills. Massage, animal, chiropractic, speech, occupational, and physical therapy are all examples of some of the treatments that are currently available for children with Down syndrome (Roizen et al., 2005). Although these options may be beneficial for some, they often lack the evidence-based practices used to treat maladaptive behaviors. Parents should review researched principles of applied behavior analysis, or seek help from a licensed behavioral practitioner to know how to address their child's maladaptive actions.

Strategies for Addressing Noncompliance

Practitioners will often rely on punishment-based strategies in an effort to reduce problem behavior. However, these aversive strategies can inadvertently reinforce noncompliance which may also increase avoidant behavior (Belfiore, Basile, & Lee, 2008). More recently, practitioners have utilized antecedent-based interventions to reduce problem behavior and improve compliance by focusing on changing the context in which a request is delivered (Davis et al., 1992). Antecedent-based strategies are preventative interventions which target stimuli that

occur just prior to the child engaging in challenging behavior (Kern, Choutka, & Sokol, 2002). These strategies aim to decrease the target individual's aversion towards antecedent stimuli. Some examples of strategies involve providing choices, maximizing preferred items as distractors, using high-probability (high-p) tasks or sequences, and generalizing stimuli (Feeley & Jones, 2006).

High-p requests. Using high-p tasks as an intervention increases compliance, decreases latency to initiate, and reduces time spent completing a given request that would have previously resulted in noncompliance. A high-p request involves the delivery of a single demand or a series of demands that a target individual is likely to complete. After successfully finishing the task demand or demands, the practitioner will then ask the individual to complete a more difficult, lower-probability (low-p) task (Banda et al., 2003). This low-p task would be one that the individual has shown noncompliance towards in the past; additionally, it may be a skill that typically triggers the target individual to engage in maladaptive behaviors (Feeley & Jones, 2006). According to Mace et al. (1988), providing the individual with a high-p request creates a momentum of compliance that carries over through the low-p request (Mace et al., 1988). In theory, if a child's behavior is reinforced after a correct attempt of the initial high-p skill or sequence, the momentum from that reinforcement would carry over into the next low-p task that they are being asked to complete (Davis et al., 1992). For example, the practitioner could first ask the individual to complete one to three activities that have been completed with ease in the past (e.g., "give me a high-five," "bring me your shoes," "put on your shoes"). Something more difficult for the individual would then follow these requests, such as a task that has shown to be harder for them to complete in the past (e.g., "tie your shoes"). Since the individual was able to

complete the high-p task successfully and efficiently, the lower-p task would theoretically be easier to achieve because they had already accomplished the previous trials.

The theory behind the effectiveness of high-p interventions comes from the concept of behavioral momentum. The term behavioral momentum is a metaphor used to describe the relationship between a behavior and the rate of given reinforcement. According to Belfiore et al. (2002), "The application of the behavioral momentum model suggests that requests that have a high probability of compliance can be used to increase responding within the response class to such a level whereby compliance to low-probability requests is increased. The compliance and subsequent reinforcement of the high-p requests increase the amount of reinforcement for that response class, resulting in higher levels of overall compliance" (Belfiore et al., 2002, p. 173). Davis et al. (1992) used the concept of behavioral momentum to analyze the relationship between high-p request sequences and correlating low-p request response rate. The study's participants involved two young boys, one of which had the diagnosis of Down syndrome. In the researcher's experiment, participants were asked to perform three high-p skills followed by one low-p skill. After each skill that the boys were asked to complete, verbal and gestural praise was provided. Additionally, multiple adults were trained to implement momentum sequences with each participant. Final results showed that for both children, the delivery of the three consecutive high-p requests instantly increased their overall response rate to the low-p task that followed. Once the intervention was discontinued, both participants maintained their improvements in responding to the same low-p tasks as found in the intervention. Researchers attribute the results of this study to a behavioral momentum package of increased requests and reinforcement; this resulted in generalized responding to low-p requests issued by various adults. According to the authors, "The theoretical framework from which this procedure was

derived posits that increasing both the response rate and the reinforcement rate of a behavior in a response class creates a momentum that propels responding within that class of behavior" (Davis et al., 1992, p. 913).

Generalization. Along with high-p tasks, the concept of generalization can act as an antecedent-based intervention to reduce noncompliance and increase positive behavior. Baer, Wolf, and Risley (1968), wrote a landmark journal article on the seven dimensions of behavior analysis. The dimension of generality is an essential component to ABA that allows a learner to learn and test across multiple settings, people, and stimuli (Persicke, 2014). Baer, Wolf and Risley (1968) stated that a behavioral change might be considered generalized if, "...it proves durable over time, if it appears in a wide variety of possible environments, or if it spreads to a wide variety of related behaviors" (Baer, et al., 1968, p. 96). Stokes and Baer (1977) expounded on this definition by outlining nine strategies to program for generalization: (a) train and hope, (b) sequential modification, (c) natural maintaining contingencies, (d) train sufficient exemplars, (e) train loosely, (f) indiscriminable contingencies, (g) program common stimuli, (h) mediate generalization, and (i) train to generalize (Stokes & Baer, 1977, p. 350).

The concept of natural maintaining contingencies involves, "training procedures that described a deliberate attempt to shift the maintaining environmental variables for responding to any stimuli in the natural environment" (Gianoumis & Sturmey, 2012, p. 621). This can involve changing the physical stimuli used in an intervention so that the participant can perform a particular behavior with any object. For example, when teaching a child to receptively identify letters a teacher may show him letters on flashcards. To use natural maintaining contingencies, the teacher may take the child around the school and ask the student to point to letters found on

signs in the hallways. The teacher could also ask a parent to practice pointing to letters in books in the home setting.

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APPENDIX B

Online Parent Survey

Down Syndrome Physical Activity Research Study

Thank you for your interest in participating in this BYU research study that will help benefit individuals with Down syndrome. In order for us to know if your child might be a good fit for the project, please answer the following questions:

* Required

1. **Email address** *

2. **Your name:** *

3. **Relation to child:** *

4. **Phone number:** *

5. **What city do you live in?** *

6. **What is your child's name?** *

7. **How old is your child?** *

8. **Does your child follow simple directions? (Ex: Make your bed. Wash your hands. Come sit down.)**
Mark only one oval.

	1	2	3	4	5	
Never	◯	◯	◯	◯	◯	Almost always

9. **What type of physical activity does your child enjoy?**
Check all that apply.

- [ ] I do not know of any physical activity that my child enjoys
- [ ] Dancing
- [ ] Jumping on the trampoline
- [ ] Swimming
- [ ] Running
- [ ] Walking
- [ ] Playing basketball
- [ ] Playing baseball
- [ ] Playing soccer
- [ ] Playing tennis
- [ ] Playing football
- [ ] Other: _____

10. **Have you ever seen your child participate in any of the following activities? (Check all that apply)**
Check all that apply.

- [ ] Run at least 50 feet.
- [ ] Gallop at least 25 feet
- [ ] Hop on one foot for at least 15 feet
- [ ] Hit a ball off of a batting tee with a baseball bat
- [ ] Dribble a basketball
- [ ] Catch a ball (any size)
- [ ] Kick a soccer ball
- [ ] Throw a ball overhand (any size)
- [ ] Throw a ball underhand (any size)

11. **Do you have a copy of your child's most recent school IEP and 3-year evaluation?** *
Mark only one oval.

- ◯ IEP
- ◯ 3-year evaluation
- ◯ Both
- ◯ None
- ◯ Not sure

12. **Would you be willing to have a BYU student come to your home twice a week for approximatley six weeks (one hour each visit) to work with your child?** *

_____

APPENDIX C

Consent Form

Parental Permission for a Minor

Introduction

My name is Blake Hansen. I am a professor from Brigham Young University. My student Kaylee Christensen and I are conducting a research study to determine if a behavioral strategy can increase participation in physical fitness activities for children with Down Syndrome. I am inviting you and your child to take part in the research because (he/she) has Down Syndrome. To participate, your child must be between the ages of 7 and 17, must have the receptive language skills to be able to follow simple one-step directions (for example, "stand up", "touch your nose", etc.). Children with health concerns that would prevent exercise are not invited to participate at this time.

Procedures

If you agree to let your child participate in this research study, the following will occur: a researcher (Kaylee Christensen) and research assistant will come to your house two times per week over the course of a maximum of 15 weeks. If you want us to come more frequently, we can come four times per week if you prefer, in which case we would complete the study in 8 weeks. After observing his or her current levels of compliance with physical activities we implement a program to increase compliance and physical activity. You will complete several questionnaires about your child. Once we have identified strategies that improve your child's compliance we can train you on how to use them, but we will not keep data on training we provide you. We would like you to be present during all sessions with your child. We will also request current school testing information including assessments (cognitive and adaptive), and for goals relating to compliance and physical fitness in his/her individualized education program (IEP). We will also ask you which services your child receives at school and outside of school that pertain to his/her disability.

If you would like copies of videos of the intervention you may request them. In addition, we will provide you with a report of your child's results at the end of the study.

Risks

The children may feel boredom or frustration that they are being asked to do physical activities. If children begin to engage in more serious behaviors during a session (namely tantrums that involve the child collapsing to the ground, yelling loudly for more than 1 minute, or crying for more than one minute without interruption; physical or verbal aggression, or self-injurious behaviors) sessions will be terminated. Children will be allowed to take a break on a preferred activity. You are invited to be present at all sessions to help calm your child in the event of serious behaviors.

There is a minor risk of loss of privacy until the study is complete and names and personal identifiable information is removed. To protect privacy, all data will be stored in a locked filing cabinet or a password protected computer

Confidentiality

Paper observation forms will be kept and coded into a spreadsheet. Consent forms, demographics, and interview forms will be kept. These files will be stored in a filing cabinet in the Blake Hansen's office (343 MCKB, Brigham Young University) under lock and key. Video recordings of participants during observations will be generated. Video recordings will be used to score your child's behavior during the sessions. We will ask you if we can show the videos at conferences or workshops. These videos will be stored on a password protected computer. Only approved research staff (researchers and assistants who are part of the project) will have access to data and videos. Paper and video data will be kept for five years following any publications that emerge from this project. We will use pseudonyms for you and your child on all publications. Data files will use a generic number to represent your name.

Benefits

There are no direct benefits as a result of participating in this study, but it is hoped that your child's compliance and physical activity will increase.

Compensation

There will be no compensation for participation in this project.

Questions about the Research

Please direct any further questions about the study to Blake Hansen at 801-422-4691 or blake_hansen@byu.edu.

Questions about your child's rights as a study participant or to submit comment or complaints about the study should be directed to the IRB Administrator, Brigham Young University, A-285 ASB, Provo, UT 84602. Call (801) 422-1461 or send emails to irb@byu.edu.

You have been given a copy of this consent form to keep.

Participation

Participation in this research study is voluntary. You are free to decline to have your child participate in this research study. You may withdraw your child's participation at any point without affecting you or your child's standing with BYU.

Child's Name: _____

Parent Name: _____ Signature: _____ Date: _____

Physical Activity Attestation

By signing below, I acknowledge that my child does not have a medical condition that prevents him/her from engaging in physical activity.

Your Name: _____ Signature: _____ Date: _____

APPENDIX D

Assent Form

Child Assent

What is this research about?

Our names are Blake Hansen and Kaylee Christensen. We want to tell you about a research study we are doing. A research study is a special way to find the answers to questions. We are trying to learn more about how we can teach kids to exercise. You are being asked to join the study because you are old enough to exercise and we like to teach kids like you.

If you decide you want to be in this study, this is what will happen.
You will exercise with us two days per week. Each time we come it will take 45 minutes. We will make a video of you. Your mom and/or dad will be there with us each week.

Can anything bad happen to me?

The exercise session may make you feel tired. You may not want to exercise some days.

Can anything good happen to me?

We don't know if being in this study will help you. But we hope to learn something that will help other people some day.

Do I have other choices?

You can choose not to be in this study.

Will anyone know I am in the study?

Only your mom and your dad will know you are in a study. When we are done with the study, we will write a report about what we learned. We won't use your name in the report.

What happens if I get hurt?

Your parents have been given information on what to do if you are injured during the study.

What if I do not want to do this?

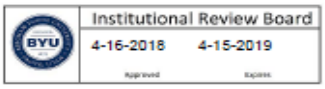
You don't have to be in this study. It's up to you. If you say yes now, but change your mind later, that's okay too. All you have to do is tell us.

Before you say yes to be in this study; be sure to ask Kaylee or Blake to tell you more about anything that you don't understand.

If you want to be in this study, please sign and print your name.

Name (Printed):_____ Signature_____ Date:_____

Ages 7-14



APPENDIX E

Data Collection Form

Antecedent-Based Intervention Data

Date:_____ Intervention phase:_____ Family member(s) present: _____
Practitioner:_____ Location:_____

	Trial Type	Specific Task	Complied within 10 seconds?	Completed Accurately?	Error Correction Notes
Block #1	High-P Task		Yes No	Yes No	
	Low-P Task	*Leap* _____	Yes No	Yes No	
	Low-P Task	*Slide* _____	Yes No	Yes No	
	Low-P Task	*Jump* _____	Yes No	Yes No	
Block #2	**Trial Type**	**Specific Task**	**Complied within 10 seconds?**	**Completed Accurately?**	
	High-P Task		Yes No	Yes No	
	Low-P Task	*Leap* _____	Yes No	Yes No	
	Low-P Task	*Slide* _____	Yes No	Yes No	
	Low-P Task	*Jump* _____	Yes No	Yes No	
Block #3	**Trial Type**	**Specific Task**	**Complied within 10 seconds?**	**Completed Accurately?**	
	High-P Task		Yes No	Yes No	
	Low-P Task	*Leap* _____	Yes No	Yes No	
	Low-P Task	*Slide* _____	Yes No	Yes No	
	Low-P Task	*Jump* _____	Yes No	Yes No	
Block #4	**Trial Type**	**Specific Task**	**Complied within 10 seconds?**	**Completed Accurately?**	
	High-P Task		Yes No	Yes No	
	Low-P Task	*Leap* _____	Yes No	Yes No	
	Low-P Task	*Slide* _____	Yes No	Yes No	
	Low-P Task	*Jump* _____	Yes No	Yes No	
Block #5	**Trial Type**	**Specific Task**	**Complied within 10 seconds?**	**Completed Accurately?**	
	High-P Task		Yes No	Yes No	
	Low-P Task	*Leap* _____	Yes No	Yes No	
	Low-P Task	*Slide* _____	Yes No	Yes No	
	Low-P Task	*Jump* _____	Yes No	Yes No	