GENERALIZATION OF PORTABLE ACTIVITY SCHEDULES TO THE INCLUSIVE SETTING FOR CHILDREN WITH AUTISM

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ABSTRACT

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This study evaluates portable activity schedules as a way to generalize independent play skills from locations in the instructional setting to locations within the community-based inclusive classroom for preschoolers with Autism Spectrum Disorders (ASD). Independent play skills and schedule-following behaviors on a portable activity schedule were taught to participants using back-step error correction. All three participants engaged in high rates of problem behavior (e.g., motor and vocal stereotypy, self-injurious behavior and physical non-compliance), but acquired the prerequisite skills to participate in the study. The results of the study indicate that portable activity schedules do not promote generalization to locations within the community-based inclusive classroom when taught in the instructional setting for the 2 of the 3 participants whom acquired independent play skills using a portable activity schedule.

Keywords: Autism, portable activity schedule, generalization, community-based inclusive classroom

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KEY TO SYMBOLS AND ABBREVIATIONS

®	Registered Trademark
ABA	Applied Behavior Analysis
ASD	Autism Spectrum Disorder

Introduction

Activity schedules are a type of visual support (e.g., a set of pictures or words) that cue an individual to engage in a specific sequence of activities (McClannahan & Krantz, 2010). When taught, activity schedules can be used to increase independent responding and on-task behaviors for individuals with Autism Spectrum Disorder (ASD) across a range of skills and behaviors (McClannahan & Krantz, 2010). Independent responding in the presence of an activity schedule allows individuals with ASD to engage in lengthy response chains without direct prompting or guidance from parents, teachers or additional support staff (McClannahan & Krantz, 2010). In addition, activity schedules have been labeled as an evidence-based practice for children with ASD to increase independent and on-task behaviors (Knight, Sartini, & Spriggs, 2015).

Generalization occurs when a learned behavior occurs in the presence of different stimuli, settings, and/or people without explicit teaching (Stokes & Baer, 1977, p. 350). One benefit of an activity schedule is that they can be used to aid in promoting generalization of skills with children with ASD. For example, Betz, Higbee, and Reagon (2008) taught six children with ASD to follow an activity schedule to improve on-task behavior during game-play. During generalization, un-taught games were introduced into the activity schedule, and participant responding generalized to those untaught games. In another example, Brodhead, Higbee, Pollard, Akers, and Gerencser (2014) taught six children with ASD to play hide-and-seek using an activity schedule. During a novel-location assessment, participants played hide-in-seek in places not explicitly taught during the intervention condition.

Additionally, Akers, Higbee, Pollard, Pellegrino, and Gerencser (2016) demonstrated activity schedule following can generalize to novel playground activities for three children with

ASD. The study taught the participants to engage with the playground activities, and during generalization, novel activities were introduced. In that study, all participants generalized their responding to novel playground activities. Finally, Bryan and Gast (2000) evaluated the effects of generalization to novel activities within a resource classroom during language arts centers (e.g., a writing, reading, listening and art center) for four elementary aged participants with ASD. The study measured the percentage of on-task behaviors during a one minute momentary time sampling for a 40-minute observation period. All four of the participants demonstrated generalization to novel activities within the resource classroom during generalization.

Activity schedules can be presented in many physical forms (e.g., a static book, written list, electronic or portable) to increase independent responding in individuals with ASD. Betz et al. (2008), Brodhead et al. (2014), Akers et. al (2016) and Bryan et. al (2000) used static activity schedules (i.e., a 3-ring binder with attached pictures of activities that remains in one location while it is being used) to promote generalization to novel activities and or locations. Due to previous studies' success of static activity schedules facilitating generalization without explicit teaching to novel locations within the same setting in which the activity schedule was taught, it would be beneficial for research to examine if portable activity schedules (i.e., an activity schedule attached to an individual) would facilitate generalization to locations in which schedule following was not explicitly taught.

The recent advent of a portable activity schedule raises at least a few potential implications for practice. Specifically, if an individual can learn to use an activity in one setting, one may ask if a portable activity schedule facilitates generalization of independent play skills with the same activity to another setting, due to its accessibility to the individual using it, because it is always on their person? In addition, a portable activity schedule may be less socially

stigmatizing in comparison to a static book activity schedule for individuals with ASD while in the general education classroom setting. The generalization of independent play skills from the instructional setting to the general education classroom setting would allow individuals with ASD to appropriately engage with materials and activities in multiple environments without explicit teaching. This could be done while the individual with ASD is wearing the activity schedule in comparison to traveling to and from a static book activity schedule. Such findings would allow instructors to teach schedule-following skills to individuals with ASD in a controlled environment, and due to the portability of an activity schedule, socially appropriate independent play skills may generalize to a new setting without the need of explicit instruction in that setting.

To date, there is no research examining the effects of a portable activity schedule in promoting generalization of skills to a new setting. In addition, there is no research evaluating the facilitation of generalization of independent play skills from a controlled, instructional setting to the general education classroom. Given the potential benefits of portable activity schedules promoting the generalization of independent and socially-appropriate play skills to a new setting; the purpose of this study is to evaluate the effects a portable activity schedule has on the facilitation of generalization to locations within an inclusive preschool setting. Results from this study will inform future research and practice within community-based interventions.

Method

Participants and Setting

Three children, Timothy (4 years old), Amanda (4 years old), and Lauren (3 years old), participated in this study. The three participants recruited for this study had a diagnosis of ASD, came from a low socioeconomic class and came from the same English-speaking household (they were siblings). The participants received 30 hours a week of ABA therapy from a community-based early intensive behavioral intervention center embedded in a public preschool. The participants had one to four hours of therapy in the general education classroom per week. Timothy and Amanda had previous experience with a static activity schedule. Lauren had no previous experience with any form of activity schedules.

Timothy engaged in motor stereotypy (i.e., repetitive motor movements), vocal stereotypy (i.e., repetitive speech) and physical aggression towards adults (i.e., biting and hitting). Timothy engaged in the above behaviors at high rates that interfered with skill acquisition, following functional routines and forming social relationships with peers. Amanda engaged in vocal stereotypy (i.e., repetitive speech) and physical non-compliance (i.e., resisting physical prompts and dropping to the floor). Amanda engaged in the above behaviors at high rates across multiple settings (e.g., therapy room, general education classroom and the playground) that interfered with her following functional routines, skill acquisition and forming social relationships with peers. Lauren engaged in high rates of self-injurious behavior (i.e., head banging), physical non-compliance (i.e., resisting physical prompts and dropping to the floor) and screaming/crying (e.g., vocalizations above normal conversation tone). Lauren engaged in the above behaviors at high rates that interfered with skill acquisition and following functional routines (i.e., using the bathroom).

All participants in the study possessed the prerequisite skills of independently engaging with the selected activities (i.e., completing a puzzle) and picture-to-object and picture-to-location matching for the study (described in more detail below).

Research sessions were conducted in the setting where participants receive individual ABA therapy and within the participant's general education classroom (i.e., the community-based setting). Within the instructional setting, the sessions were confined to specific areas (e.g. toy shelf, book shelf, carpet area and the group table). During this time, approximately seven therapists and seven students were in the instructional setting engaged in various instructional activities. In the general education classroom, the sessions were also confined to specific areas (e.g., pretend play area, book shelf, puzzle shelf and carpet area). In the general education classroom, 20 or more children and staff were present.

Materials

Sessions were video recorded by a research assistant using a GoPro Hero 3®. After each session, the videos were observed by the researcher and data were collected on a data sheet using a pen and paper. Portable activity schedules were constructed using a yellow piece of laminated construction paper and, Velcro®. The activity schedule also consisted of a laminated green square, and laminated picture icons of locations of the settings and activities. The activity schedule was constructed onto an 11 x 18 cm yellow sheet of construction paper that attached to the participants' pants with a retractable badge holder (see Figure 1). The activities chosen for the schedule were close-ended (i.e., had a discrete beginning and end), age-appropriate and were the same for all three participants. The activities included a shape sorter, puzzle, ring stacker, and peg board. Participants were able to independently and appropriately interact with each activity.

The sequence of the locations and activities on the activity schedule were determined using a random number sequence generator to ensure there was no researcher bias.

Measurement of Dependent Variable

The primary dependent variable in the session was the participants' engagement with the activity schedule using a per-opportunity measure (Cooper, Heron, & Heward, 2007). All of the sessions were video recorded by a second research assistant. After each session, the researcher scored the percentage of independent responses from the task analysis, described below. On the data sheet, an independent response was scored as a (+), and a prompted, no response, or incorrect response was marked as a (-) for each step on the task analysis. Specific operational definitions are described below.

The task analysis involved discrete behaviors requiring the participant to go to four different areas in the classroom and engage with four different activities. The first behavior on the task analysis required the participant to respond to the verbal instruction, "Go play!". This was scored as correct if the participant independently took one to three steps away from the entryway door. The following steps on the task analysis were repeated for four different locations and four different activities. The steps on the task analysis required the participant to: (1) grab the activity schedule, (2) move the green page marker to the Velcro® next to the designated sequence of events, (3) engage in an observation response (i.e., tap the picture icon or look at the picture icon for 1 to 3 s) of the location picture icon, (4) walk to the location designated on the picture icon, (5) engage in an observation response (i.e., tap the picture icon or look at the picture icon for 1 to 3 s) of the picture icon of the activity, (6) obtain the activity, (7) complete the activity. After the four sequences of activities were completed the participant was required to (8) move the green page marker to the final piece of Velcro®. If the participant

engaged in the all responses listed above within 6-s, the response was scored as correct. If the participant was prompted by the researcher due to him or her not engaging in a response or making an error, the response was scored as incorrect.

Interobserver agreement (IOA) was collected to evaluate the accuracy of data collection for at least 30% of sessions for each condition for all participants. An agreement was scored when both independent observers recorded the same response on the above-mentioned task analysis (e.g., an independent observer scored an independent response and the second independent observer scored an independent response). A disagreement was scored when both independent observers recorded different responses (e.g., an independent observer scored an independent response, but the second observer scored an incorrect response) on the above-mentioned task analysis. IOA was calculated by dividing the sum of agreements by the sum of disagreements and agreements and multiplying it by 100 to convert it to a percentage (Cooper et. al., 2007). IOA for Timothy was 98% (range, 95% to 100%). IOA for Amanda was 94% (range, 83% to 100%). IOA for Lauren was 100%.

A second independent observer coded procedural integrity for at least 30% of sessions for each condition for all participants. Procedural integrity was measured to ensure the accuracy of the researcher's implementation of the intervention (Cooper et al., 2007) of the activity schedule. A procedural integrity data sheet of all the necessary steps for each condition in this research study was created prior to the beginning of the study.

Procedural integrity measured specific components of each condition. In baseline and the generalization probes, the components measured were (a) the researcher started the participant by the instructional setting entry way door in baseline and by the general education classroom entry way door in the generalization probe; (b) the activity schedule was attached to the

participant's pants; (c) the researcher obtained participant's attending by receiving eye contact; (d) the researcher provided the verbal instruction, "Go play!" to the participant; (e) sessions lasted for a total of 3 minutes or until the participant completed all four activities on the schedule; (f) no verbal instructions or praise were provided to the participant after the initial verbal instruction; (g) if the participant walked to the correct location on the activity schedule, the activity present was the one denoted on the data sheet. In the teaching condition, the components analyzed were (a) the researcher started the participant in the instructional room entry way door; (b) the activity schedule was attached to the participant's pants; (c) the researcher obtained participant's attending by receiving eye contact; (d) the researcher provided the verbal instruction "Go play!" to the participant; (e) if the first teaching session, the researcher immediately provided a full physical prompt from behind the participant for the first 2 activities; (f) if the participant made an error, the researcher allowed the participant to complete the error and then immediately prompted the previous correct response and the correct response (i.e., the response the participant made an error on); (g) if the participant engaged in no response for 6-s the researcher provides a full physical prompt from behind the participant to engage in a correct response; (h) the researcher did not provide any verbal instructions or praise to the participant after the start of the initial instruction "Go play!"; (i) when the participant walked to the location on the schedule, the activity present was the one noted on the data sheet. The components analyzed for teaching with embedded reinforcement were the same as the teaching condition with the addition of whether or not the researcher provided an edible after every correct response. The components analyzed for the generalization condition were the same as the generalization probe components, noted above. The components analyzed for the generalization condition with embedded reinforcement were the same as the generalization probe components,

noted above, with the addition of whether or not the researcher provided an edible after every correct response.

A second independent observer collected procedural integrity data. Procedural integrity was calculated by dividing occurrences by the total number of occurrences and non-occurrences and multiplying it by 100. An occurrence was defined as the necessary step that was implemented correctly (e.g., accurately followed the procedures and task analysis of the experiment). A non-occurrence was defined if the necessary step was implemented incorrectly (e.g., a step from the task analysis was implemented incorrectly or was not implemented). Procedural integrity for Timothy was 97% (range, 88% to 100%). Procedural integrity for Amanda was 99% (range, 86% to 100%). Procedural integrity for Lauren was 100%.

Experimental Design

A non-concurrent multiple baseline across participants was used. A non-concurrent multiple baseline across participants involves implementing the intervention across three points of time with three participants in order to control for threats to history and to show an intervention effect (Cooper, et al., 2007).

Procedure

Preteaching. Before implementing the study, each participant was taught to independently engage in each component of an activity schedule. Picture-location correspondence was taught to ensure participants were able to move to the designated location within the instructional setting as denoted by the picture (e.g., the participant walks to the book shelf). The picture of the activity was presented to the participant while the researcher simultaneously said, “Go here!”. Physical prompts were provided from behind the participant and were systematically faded until 80% or better accuracy occurred across a five-trial block.

Each picture was considered mastered if the participant independently went to the corresponding location without physical prompts four out of five trials for 80% accuracy or better responding across three consecutive sessions. Picture-location correspondence was also taught in the general education classroom to Timothy and Amanda. This was identical to the picture-location correspondence within the instructional setting.

Picture-object correspondence was also taught in the instructional setting to ensure the participants were able to identify the activities (e.g., the shape sorter) as denoted by the picture. The picture of the activity was presented to the participant while the researcher simultaneously said, "Match!". The physical activities were arranged in an array of 4 in front of the participant on a table. Physical prompts were provided from behind the participant until 80% or better accuracy occurred across a five-trial block. Each picture was considered mastered if the participant correctly identified the physical object from the array as denoted on the picture.

Baseline. During baseline, the instruction "Go play!" was provided to the participant in the instructional setting entry way door. This instruction marked the start of the session. Research assistants did not provide any physical or vocal prompts to the participant. Reinforcement for independent responses was not provided to participants. If the participant engaged in problem behavior for 1 consecutive minute the session was terminated (see individual participant definitions of problem behavior above). Measurement was taken on the percentage of independent responding in the task analysis. Baseline sessions lasted for 3 minutes or until the participant was finished engaging with all four activities (whichever happened first). The purpose of the baseline condition was to measure the behavior prior to the implementation of the activity schedule and the back-step error correction (described below).

Generalization Probe. During the generalization probe, the instruction "Go play!" was provided to the participant in the general education classroom entry way door. This verbal instruction marked the start of the session. Researchers did not provide any physical or vocal prompts to the participant. Reinforcement for independent responses was not provided to participants. If the participant engaged in problem behavior for 1 consecutive minute the session was terminated (see individual participant definitions of problem behavior above). Measurement was taken on the percentage of independent responding in the task analysis. The generalization probe sessions lasted for 1 minute or until the participant was finished engaging with all four activities (whichever happened first). The activities used in this condition were identical to the ones used in baseline. The purpose of the generalization probe was to measure the behavior in the general education classroom prior to the implementation of the activity schedule and the back-step error correction (described below).

Teaching. This condition took place in the participant's instructional setting, and began with the instruction "Go play!". The activities used in this condition were identical to those in the previous two conditions. If the participant engaged in problem behavior for 1 consecutive minute the session was terminated (see individual participant definitions of problem behavior above). The purpose of the teaching condition was to implement the back-step error correction and provide physical prompts to teach participants to engage with the activity schedule to increase independent play skills in the participant's instructional setting. Measurement was taken on the percentage of independent responses (per the above task analysis).

Activity schedule following was taught using back-step error correction (see Brodhead, Courtney, & Thaxton, 2018). Specifically, the back-step error correction was implemented after the participant engaged in an incorrect response or did not engage in a behavior after 6-s had

elapsed from the previous behavior. If a participant engaged in an incorrect response, the researcher allowed the participant to complete the error and then provided a full physical prompt from behind the participant to prompt the participant to engage in the previous correct response and the response in which the participant got incorrect (e.g., if the participant walked to the incorrect location in the classroom the researcher waited for the participant to walk to the area and provided a physical prompt from behind to tap the location picture icon and physically prompted the participant to the correct area in the sequence).

In the first teaching session, the researcher used errorless teaching (i.e., physically prompted the participant) through the completion of the first 2 activities. The purpose of this was to provide prompts to the participants so they were taught how to appropriately engage with the portable activity schedule components. Upon being given the instruction, "Go play!" in the first teaching session, the participant was physically prompted to move the green square from the first Velcro® square to the first sequence of events (see Figure 1). The participant was then physically prompted to make an observing response by touching or looking at the picture icon of the location and was physically guided to the location. After going to the correct location, the participant was physically prompted to touch the picture icon of the activity (e.g., a puzzle). Then, the participant was physically prompted to locate and complete the activity (e.g., putting all the puzzle pieces in the puzzle). After the completion of the activity the participant was physically prompted to move the green square to the next row of activities. After the completion of the first 2 activities, the researcher implemented the back-step error correction for the remainder of the session, and for all subsequent sessions. In the following teaching sessions, the back-step error correction was implemented for all the activities if the participant engaged in an

incorrect response or did not engage in a response. This process was repeated for a total of four times, with four different locations and four different activities.

For each step of the task analysis, the participant had 6-s to complete each step. If a participant engaged in an incorrect response, the researcher implemented the back-step error correction (described above). For example, if the participant walked to the wrong location denoted on the activity schedule the researcher physically prompted the participant to engage in an attending response (e.g., tap the previous location picture icon) and physically prompted the participant to the correct location denoted on the schedule. No other prompts or assistance were provided from the researcher. Reinforcement for independent responses were not provided to the participant. Mastery criteria for the teaching condition was met when the participant scored 80% or higher on the task analysis for three consecutive sessions.

Teaching with embedded reinforcement (Amanda only). The purpose of this condition was to embed edible items contingent on independent responding to increase engagement with the activity schedules and increase independent play. This condition was identical to teaching, except edible items were delivered, upon correct independent responses, in order to increase participant responding. Prior to the start of the session, the researcher implemented a brief multiple stimulus without replacement preference assessment with five preferred edibles (Carr, Nicholson, & Higbee, 2000). The highest preferred edibles were used during the teaching session. If the participant engaged in an independent response before 6-s elapsed, the researcher provided a small portion of the highest preferred edible (e.g., if the participant completed an activity, she received a small piece of chocolate). The edible was provided from behind the participant and was delivered on a continuous schedule of reinforcement (i.e., every correct response) for every correct response completed in the activity schedule task analysis. During

back-step error correction, reinforcement was not provided to the participant. Sessions were terminated if the participant engaged in problem behavior for 1 minute (see individual participant definitions of problem behavior above). Mastery criteria for the teaching with embedded reinforcement condition was met when the participant scored 80% or higher on the task analysis for three consecutive sessions.

Generalization. The generalization condition was identical to the generalization probe and was implemented after the participant met mastery criteria in the previous teaching condition. The purpose of the generalization condition was to measure if the participant's independent play skills using an activity schedule were able to independently generalize to the inclusive setting (i.e., no teaching in the inclusive setting).

Generalization with embedded reinforcement (Amanda only). The generalization condition was identical to the generalization probe, except edible items were delivered on a continuous schedule of reinforcement upon correct independent responses. This condition was implemented after Amanda met mastery criteria in the teaching with embedded reinforcement condition. The purpose of the generalization condition was to measure if the participant's independent play skills using a portable activity schedule with embedded reinforcement were able to independently generalize to the inclusive setting (i.e., no teaching of independent play skills using the portable activity schedule in the inclusive setting).

Test probe (Amanda only). The test probe took place in the participant's instructional setting. The session started when the researcher delivered the verbal instruction "Go play!". No prompts or assistance from the researcher were provided. In addition, no reinforcement for independent responding was provided in the test probe. The sessions lasted for 3 minutes or until the participant finished engaging with the components of the activity schedule (whichever

happened first). Measurement was taken on the percentage of independent responding that occurred on the task analysis. The purpose of the test probe condition was to measure if the participant's independent responding while using the portable activity schedule remained at similar levels when reinforcement was removed while in the instructional setting. The test probe was implemented after the generalization with reinforcement condition.

Reinforcement probe (Amanda only). The teaching with reinforcement probe was identical to the teaching with reinforcement condition. This condition was implemented following the teaching without reinforcement probe. The purpose of this condition was to measure if the participant's independent responding while using the portable activity schedule remained at similar levels when reinforcement and the back-step error correction were delivered.

Results

Figure 2 depicts the percentage of independent responses from the task analysis for the three participants in the study. During baseline, Timothy did not engage in any independent responses. Similarly, during the generalization probe, Timothy did not engage in any independent responses. During the teaching sessions, independent responding increased from 17% to 83% over 11 sessions. In the generalization condition, independent responding increased from 0% to 10% over 4 sessions.

During baseline, Amanda did not engage in any independent responses over 5 sessions. Similarly, during the generalization probe, Amanda did not engage in any independent responses. During the teaching condition, independent responding increased from 17% to 40% over 3 sessions and then decreased from 40% to 33% in the following 3 sessions. During the teaching with embedded reinforcement condition, independent responding increased from 43% to 87% over 18 sessions. In the generalization condition, independent responding increased from 0% to 3% percent over 5 sessions. In the teaching probe, Amanda did not engage in any independent responses. In the reinforcement probe, Amanda engaged in 50% of independent responding.

During baseline, Lauren's independent responding increased from 0% to 7% over 8 sessions. During the generalization probe, Lauren did not engage in any independent responses. During the teaching condition, initially 4 consecutive sessions were terminated due to the participant meeting termination criteria for problem behavior. Lauren was removed from the study due to problem behavior.

Discussion

The current study demonstrated that the use of a portable activity schedule increased independent play skills within the instructional setting. Both Timothy and Amanda were taught to engage with the portable activity schedule in the instructional setting to increase independent play skills by engaging with different activities. However, Timothy and Amanda's independent play skills did not generalize to an environment outside of the instructional setting while using the portable activity schedule. Given the results of this study, portable activity schedules did not promote generalization to locations within the general education classroom.

A failure to generalize could be a result of differing environmental arrangements between the two settings. In the participants' instructional setting, there were seven other children with ASD and seven staff members. In comparison, in the general education classroom, there were 20 or more children and staff. Within the general education classroom, the participants' peers also initiated social interactions with the participants at higher rates than when in the instructional setting. Another possible reason for a failure to generalize due to the environmental arrangement could be due to the novelty of activities available outside of the activity schedule (e.g., participants were allowed free-access to an iPad) available in the general education classroom.

With Amanda, embedded reinforcement was necessary to increase her independent schedule following behaviors to compete with her high rates of vocal stereotypy. For this study, embedded reinforcement can be seen as a limitation. However, it provides practical implications and informs future research to evaluate delayed reinforcement (e.g., an edible serving as a reinforcer for schedule following behavior is provided after the completion of the whole task analysis) as a prerequisite skill for using portable activity schedules. In addition, future research could examine fading embedded reinforcement in a portable activity schedule from a continuous

schedule to an intermittent schedule (e.g., reinforcement is delivered to some, not all, behaviors that produce reinforcement).

Lauren's data highlight the need to evaluate additional prerequisite skills when using a portable activity schedule to teach independent play skills (McClannahan & Krantz, 2010). The participants recruited for this study all shared similar listed prerequisite skills reported in previous studies. For example, in Brodhead et. al (2014), participants had similar prerequisite skills as the participants recruited for the current study (i.e., picture-to-location and picture-to-object matching). In addition, the above pre-requisite skills were taught prior to the start of the study to further ensure the presence of these skills. However, when the portable activity schedule was attached to Lauren's pants in the teaching condition, she engaged in high rates of self-injurious behavior (e.g., head banging), screaming/crying and, physical non-compliance (e.g., falling to the floor and removing the schedule from her pants). Evaluating the prerequisite skills of participant's allowing a schedule attached to his or her body could be an avenue for future research. In addition, Lauren engaged in high rates of problem behavior during teaching prior to the verbal instruction of "Go play!" when relocating to the corner of the classroom where sessions were started. This could be because of Lauren's prior history during baseline with the starting point of the session and the verbal instruction "Go play!". Lauren was exposed to 8 sessions of baseline, in which she was allowed to engage with activities of her choice proceeding the verbal instruction "Go play!". During the teaching condition, she was required to engage with the activity schedule which required the researcher to provide physical prompts. Lauren engaged in problem behavior that met termination criteria immediately following a physical prompt from the researcher. It would be beneficial for future research to examine the prerequisite skills of

participants accepting physical prompts as a prerequisite skill for engaging with a portable activity schedule.

There are some limitations in the current study that are worth mentioning. First, in some cases, the portable activity schedule fell off the participant's pants (e.g., when the participant grabs the schedule and it comes off the participant's pants) or could be removed by the participant (such as during instances of problem behavior). Future research could examine additional modalities for a portable activity schedule and the prerequisite skills necessary for a participant to use a portable activity schedule.

As previously noted, another limitation of the current study is the embedded reinforcement provided on a continuous schedule of reinforcement for Amanda to engage in independent responding. Betz et al. (2008) demonstrated participants would independently engage in activities without programmed reinforcement (e.g., embedded reinforcement for independent behaviors through the task analysis) from the researcher. However, Amanda's results suggest embedded reinforcement was needed to teach independent play skills while in the instructional setting. Typically, activity schedules are implemented with the goal to increase independent responding for students without adult assistance (McClannahan & Krantz, 2010). The embedded reinforcement in Amanda's schedule requires the constant presence of the teacher (e.g., the teacher is within 2 m of the participant) to deliver reinforcement (i.e., the researcher is providing the edible reinforcement based on independent responding). An area for future research could examine systematic methods to fade out embedded reinforcement to a terminal reinforcer (reinforcement for completing the entire activity schedule) from an activity schedule while maintaining independent responding.

A third limitation of the study is the researcher did not evaluate the prerequisite skills requiring participants to wear a portable activity schedule and accepting physical prompts. Future research could systematically evaluate if participants are able to comply with physical prompts and wear a portable activity schedule as a way to increase independent play skills. Specifically, future research could systematically examine the prerequisite skills of participants accepting physical prompts from a therapist as a way to increase behavior and the prerequisite skills of participants tolerating additional materials attached to clothing.

The current study suggests portable activity schedules do not generalize independent play skills from the instructional setting to the general education setting. Two of the three participants increased their independent play skills within the instructional setting using the portable activity schedule but did not engage in similar levels of responding within the general education classroom setting. The third participant was discontinued from the study due to a lack of prerequisite skills of being able to successfully wear the portable activity schedule. The results indicate that further research is needed examining the prerequisite skills for wearing a portable activity schedule and the generalization of independent play skills using a portable activity schedule.

APPENDIX

Figure 1. Picture of portable activity schedule.

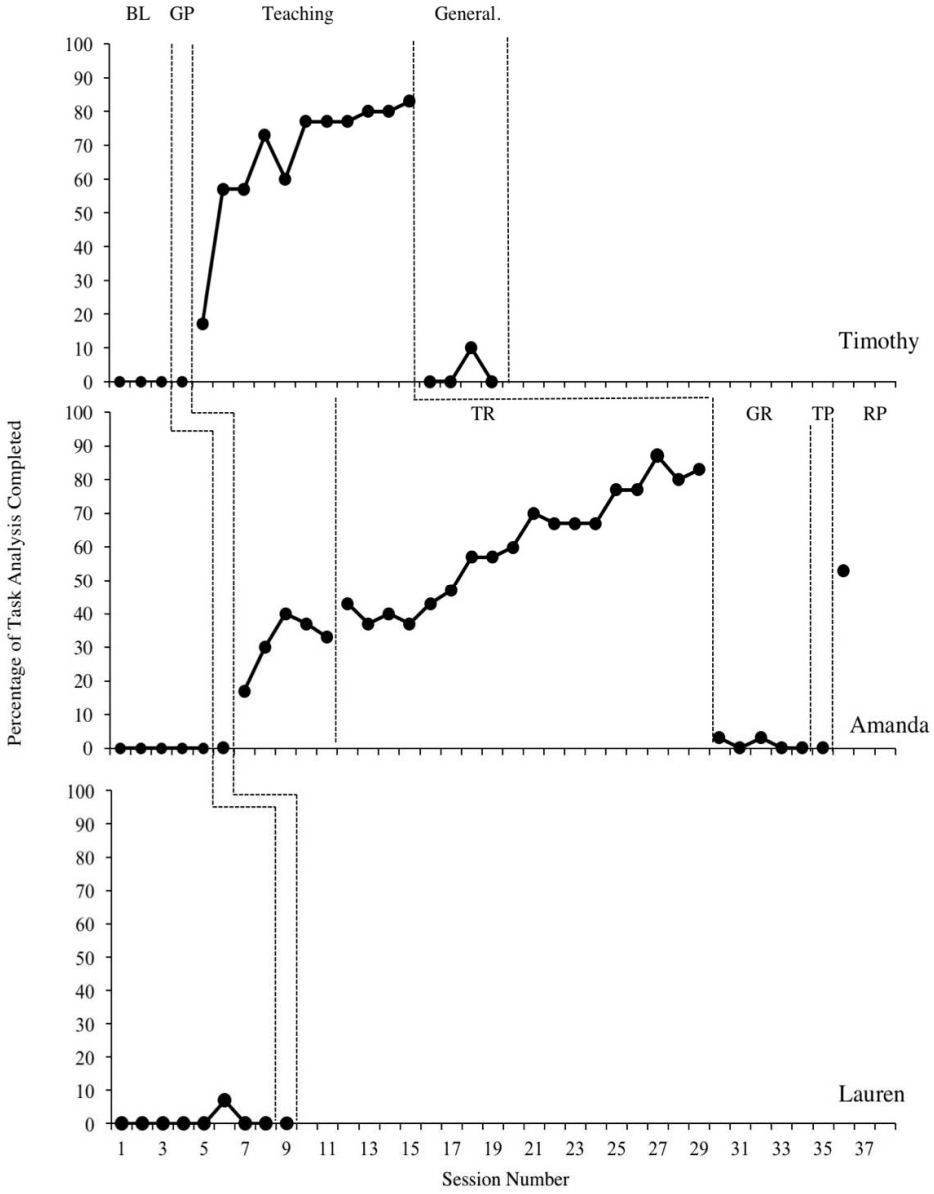

Figure 2. The percentage of independent play skills completed in the task analysis. BL=baseline, GP=generalization probe, Genaral.=generalization, TR=teaching with embedded reinforcement, GR=generalization with embedded reinforcement. TP=test probe. RP=reinforcement probe.

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