ASSESSING PREFERENCE FOR CHOICE-MAKING WITHIN ACTIVITY SCHEDULES AMONG CHILDREN WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

Activity schedules are commonly used in early intensive behavioral intervention to increase student independence in completing a sequence of activities. A study conducted by Deel et al. (2021) taught participants to assemble activity schedules where participants selected the order of activities (choice) and where the sequence of activities was already determined (no-choice). Deel et al. (2021) then evaluated preference for choice-making opportunities embedded in activity schedules. The purpose of the current study was to systematically replicate Deel et al. (2021) and evaluate participant preference for choice or no-choice activity schedules in concurrent operant assessments. All participants learned to assemble and independently complete choice and no-choice activity schedules. Results of the concurrent operant assessments were idiosyncratic across participants. Practical implications and methodological considerations for future research are discussed.

Keywords: activity schedules, choice, preference, early intervention

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INTRODUCTION

Activity schedules are visual supports that include sequences of pictures, scripts, and other stimuli to support independent and on-task behavior (Krantz & McClannahan, 2014). Across a variety of settings and contexts (e.g., school, community), activity schedules are an effective tool for supporting critical skills such as social interactions, appropriate play, daily living skills, vocational skills, academic skills, and transitions, and reducing reliance on adult prompting (Brodhead et al., 2019; Bryan & Gast, 2000; Carlile et al., 2013; Cihak, 2011; Kirkpatrick et al., 2023; Knight et al., 2015; Krantz & McClannahan, 2014; MacDuff et al., 1993; Morrison et al., 2002). Further, young children with autism spectrum disorder (ASD) in early intensive behavioral intervention (EIBI) or preschool settings can be taught to follow activity schedules to increase appropriate engagement with leisure items or activities (e.g., Akers et al., 2016; Brodhead et al., 2018) and social interactions with peers (e.g., Akers et al., 2018; Betz et al., 2008; Morrison et al., 2002; Osos et al., 2021). This is important as engaging in restricted and/or repetitive behaviors during unstructured leisure time interferes with opportunities to engage in appropriate play and social interactions with peers (Armendariz & Hahs, 2019).

Activity schedules also provide a context to teach and embed choice-making opportunities within the context of EIBI treatment (Deel et al., 2021; Krantz & McClannahan, 2014; Morrison et al., 2002; Tincani et al., 2024; White et al., 2023). Choice-making increases student independence and autonomy, and may even function as a reinforcer (Tincani et al., 2024). However, choice-making is itself a discriminated operant that is learned. Choice-making consists of a conditional discrimination and a selection or topography-based response. Further, a student's behavior must be under the control of the outcome it produces (contingency; see Tincani et al.,

2024, for more information). Therefore, activity schedules may be a beneficial and accessible context to teach and provide opportunities for students with ASD to make choices, along with improving social interactions, play skills, time on task, and overall independence.

A recent study conducted by Deel et al. (2021) taught choice-making within the context of photographic activity schedules to children with ASD. Participants learned to complete activity schedules including sequences of four leisure activities; some of the sequences were created by the practitioner whereby the participant did not have a choice in creating the sequence, and some of the sequences required participants to choose the sequence of their activities by selecting from an array of pictures representing the activities (leisure items), putting the activity selection in the schedule, and selecting from the remaining activities until a sequence of four activities was placed in the schedule. Each participant learned to complete the photographic activity schedule both when the teacher selected the sequence of those activities and when the learner selected the sequence of activities. Concurrent operant assessments were conducted to assess whether participants preferred choice or no-choice activity schedules. Preferences were idiosyncratic across participants and supported the value of incorporating a child's preferences into treatment decisions regarding activity schedules.

Deel et al. (2021) stated they did not continue to record percentage of correct responding in the choice assessments because the objective was to measure and assess participant preference. Therefore, the extent to which participants accurately completed the schedules they choose to engage with is unclear. The current study extended Deel et al. (2021) by measuring percentage of correct responding as participants completed the choice and no-choice activity schedules in concurrent operant assessments.

The purpose of the current study was to replicate and extend the study conducted by Deel et al. (2021) in assessing preference for choice or no-choice activity sequences in the context of a photographic activity schedule in young children with ASD. After teaching participants to follow the two types of activity schedules, we conducted concurrent operant assessments to evaluate whether participants demonstrated preference for choice activity schedules, no-choice activity schedules, or control activity schedules. We continued to measure percentage of correct responding while participants completed their selected schedules to assess whether participants' preferences aligned with performance of independent schedule completion. We asked the following research questions:

1. What are the effects of choice activity sequences versus no-choice activity sequences on completion of a photographic activity schedule?
2. Will participants demonstrate preference for choice or no-choice activity schedules, or demonstrate no preference, when given the choice in completing a photographic activity schedule?
3. Will participants continue to complete photographic activity schedules independently and correctly when given the choice to engage in a selected activity schedule (e.g., choice or no-choice)?

METHOD

Participants

Three children with a medical diagnosis of ASD participated in the study. All children received applied behavior analytic services at a community-based EIBI program (see Plavnick et al., 2020, for a description). All participants had assessments conducted in the EIBI program using the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008). Scores from their most recent assessments are included. Sammy was a 4-year-old female with a score of 134.5 points (out of a possible 170.0 points) on her most recent VB-MAPP conducted in October 2024. Jordan was a 5-year-old male and scored 163.5 points in a VB-MAPP conducted in December 2024. Grant was a 4-year-old male with a score of 127.5 points on his most recent VB-MAPP conducted in October 2024. All participants' daily programming included activity schedules to support their treatment goals.

Prior to the beginning of the study, potential participants were assessed for picture-to-item correspondence and independent leisure item completion skills. Picture-to-item correspondence was assessed by showing a picture of each leisure item and observing whether the participant obtained the correct item from an array of three. Independent leisure item completion was assessed by instructing participants to engage with each item and observing whether participants independently completed each item.

Participant assent was obtained and assessed in an ongoing manner throughout the study. Researchers consulted with each participant's supervising Board Certified Behavior Analyst ® and behavioral technicians to identify behaviors for each participant that might indicate dissent (e.g., crying, flopping). Sessions would be terminated upon a participant's engagement in

behavioral indicators of dissent; however, no sessions were terminated due to behavioral indicators of dissent during the study.

Setting

Sessions were conducted at a table with a chair in an EIBI classroom where roughly eight children between the ages of two and five years were receiving individual direct instruction with behavioral technicians at any given time. Sessions were conducted in the afternoons after participants' lunch breaks and during the initial portion of their afternoon treatment. Sessions were conducted each school day, with the exceptions of absences due to illness, participants sleeping during afternoon treatment sessions, scheduled clinic breaks (e.g., holiday break, spring break), and unscheduled clinic closures due to inclement weather.

Materials

Three types of activity schedules were used in this study: a *choice* activity schedule, a *no-choice* activity schedule, and a *control* activity schedule. Three-ring binders were used to construct each activity schedule, and different colors were used for each binder to facilitate participant discrimination between conditions (see Appendix). The choice activity schedule had green paper inserts on the front of the binder and on each page within the binder. The no-choice activity schedule had yellow paper inserts on the front of the binder and on each page within the binder. The control activity schedule had a white paper insert on the front of the binder and white or neutral pages within the binder. The choice and no-choice activity schedules each contained four pages with a small Velcro dot in the center to attach pictures of the leisure items. The control activity schedule contained one to 16 pages with pictures of leisure items already attached on each page.

During all sessions, leisure items were placed on a countertop five feet in front of the table at which participants completed their schedules. Five leisure items (i.e., dinosaur egg puzzle, ocean puzzle, hedgehog peg board, shapesorter, ladybug pegs) were available in the choice and no-choice activity schedules. These leisure items were included in the study because they had a discrete beginning and end. Each leisure item was modified to consist of eight pieces to control for response effort across activities, and they were held constant across participants to ensure differences in responding were a result of the act of choice-making within a schedule. The control activity schedule consisted of one to 16 neutral leisure items with discrete beginnings and ends that were freely available in the clinic. All leisure items included in the study were of unknown relative preference to participants. Each leisure item had a picture that depicted it against a white background. Each picture was laminated and had a small Velcro dot attached to its opposite side. Datasheets, pens, a stopwatch, and a video camera were also present in sessions for data collection purposes.

Measurement

Dependent Variables

Two dependent variables were measured in this study. The first dependent variable was *percentage of correct responding*. A correct response was defined as a participant engaging in a specific step in the task analysis (see Tables 1, 2, and 3) within 5 seconds from the previous step without adult assistance (Deel et al., 2021). Percentage of correct responding was calculated by dividing the number of steps correct by the number of steps correct plus incorrect (total number of steps) and multiplying by 100 to yield a percentage (Ledford & Gast, 2018).

The second dependent variable was *number of selections* of each type of activity schedule during the concurrent operant assessments. Selection was defined as a participant touching or

pointing to a specific activity schedule within 5 s (i.e., choice, no-choice, and control) when instructed to, “Pick one.”

Interobserver Agreement and Procedural Fidelity

Each session was video recorded, and each video was later reviewed to obtain measures of interobserver agreement (IOA) and procedural fidelity. Point-by-point IOA was recorded for at least 30% of all sessions in all conditions by a second observer (Ledford & Gast, 2018). Interobserver agreement of the first dependent variable, percentage of correct responding during choice and no-choice activity schedules, was calculated by dividing the number of agreements by agreements plus disagreements and multiplying by 100 to yield a percentage (Ledford & Gast, 2018). Agreement was defined as both observers independently recording the same response on a step in a task analysis. Disagreement was defined as both observers independently recording different responses on the same step in a task analysis. Interobserver agreement of the second dependent variable, number of selections during the concurrent operant assessments, was also calculated by dividing the number of agreements by agreements plus disagreements and multiplying by 100 to yield a percentage (Ledford & Gast, 2018). Agreement was defined as both observers independently recording the same selection response. Disagreement was defined as both observers independently recording different selection responses.

Interobserver agreement in all participants’ baseline sessions was 100%. In Sammy’s teaching conditions, average IOA was 99% (range 97-100%). In Jordan’s teaching conditions, average IOA was 95% (range 90-100%), and in Grant’s teaching conditions, average IOA was 98% (range 95-100%). Interobserver agreement in concurrent operant assessments was 100% across all participants. Data collection is ongoing, and upon completion IOA data will be available here: https://osf.io/mehfn/?view_only=1b2958ece6ce4a5bb1b5d71ddbe547cd.

Procedural fidelity was recorded for at least 30% of all sessions for all conditions. A second observer scored whether the researcher implemented each session correctly according to a pre-developed implementation checklist for each condition (see Tables 4, 5, 6, and 7). A correct response was defined as the observer recording that the researcher engaged in the correct step of the checklist. An incorrect response was defined as the observer recording that the researcher engaged in a response that did not correspond to the appropriate step of the checklist. Procedural fidelity was calculated by dividing the number of correct steps by the number of correct steps plus incorrect steps and multiplying by 100 to yield a percentage (Ledford & Gast, 2018). Procedural fidelity in baseline sessions for Sammy and Jordan was 100%. In Grant's baseline sessions, average procedural fidelity was 90% (range 71-100%). Across all participants, procedural fidelity in teaching conditions was 100%. Procedural fidelity in concurrent operant assessments was an average of 96% (range 88-100%) for Sammy and 100% for Jordan. Data collection is ongoing, and upon completion procedural integrity data will be available here: https://osf.io/mehfn/?view_only=1b2958ece6ce4a5bb1b5d71ddbe547cd.

Procedures

A noncurrent multiple baseline design across participants with an embedded alternating treatments design was used to evaluate responding in baseline and teaching conditions (Ledford & Gast, 2018). A simultaneous treatments design was used in the concurrent operant assessments to assess preferences across choice, no-choice, and control activity schedules (Ledford & Gast, 2018).

Baseline

Each baseline session began with the vocal instruction to complete four leisure items without an activity schedule present (e.g., "Play with the shapesorter, ladybug, hedgehog, and

dinosaur puzzle") (Brodhead et al., 2018; Deel et al., 2021). The order of leisure items in each instruction was randomized using RANDOM.ORG (https://www.random.org/lists/) and no prompting or putative reinforcement were provided. Sessions were terminated if the participant did not engage with any of the leisure items within 30 s of the instruction (Deel et al., 2021). Sessions were also terminated if the participant did not complete the sequence within 10 minutes of the instruction, or the participant completed all available leisure items within 10 minutes of the instruction.

Teaching

In the teaching condition, participants were taught to complete activity schedules both when the sequence of leisure items was pre-determined (no-choice) and when participants were required to select the sequence (choice) of leisure items. After baseline, participants were first exposed to a choice activity schedule in order to yoke the order of leisure items in the first no-choice activity schedule to the order in the first choice activity schedule, as a way to isolate the features of choice-making within schedules (Deel et al., 2021). The remaining series of choice and no-choice activity schedules were randomized using a random list generator (https://www.random.org/lists/).

Backstep error correction was used to teach participants to follow both types of activity schedules (Frost & Bondy, 2002). If a participant engaged in an incorrect response, the researcher used physical guidance to prompt the participant to complete the last independent correct response and the next step (the original incorrect response). At that point, the participant was given the opportunity to continue the activity schedule independently. The procedures specific to the choice and no-choice conditions are described in more detail below.

Choice Condition. Prior to activity schedule completion, participants were required to select leisure items and the order in which they were to be included within the activity schedule. Specifically, participants were presented with a horizontal array of five pictures of the leisure items. Pictures were identical in size and spaced equidistant from each other, and the order of pictures in the array was randomized prior to each session using a random list generator (https://www.random.org/lists/). Similarly, the array of the physical leisure items placed on the countertop were randomized prior to each session using the same random list generator. Participants were instructed to "Pick one," from the array of pictures. If the participant did not make a selection within 5 s, the instruction was repeated. After making a selection, if the participant did not independently place the selected picture on the corresponding page in the activity schedule and turn the page, they were physically prompted to engage in these steps. The remaining four pictures were moved one position to the right, with the farthest picture to the right moving to the first place in the array on the leftmost side. The instruction "Pick one" was again presented. This process continued until four selections had been made and the choice activity schedule was fully assembled. Once the activity schedule was constructed, the instruction, "Do your schedule," was delivered and participants were then able to complete the activity schedule. Backstep error correction was provided if the participant did not engage in the initial response within 5 s of the instruction or if errors occurred throughout the schedule.

No-Choice Condition. The no-choice activity schedule was identical to that of the choice activity schedule, with the following modifications. First, the order of leisure items in this activity schedule was yoked to the sequence of leisure items in the participant's most recent choice activity schedule (Deel et al., 2021). For example, if in the first choice activity schedule a participant selected the following leisure items in order: ladybug, hedgehog, ocean puzzle, and

shapesorter, the following no-choice sequence was yoked to this sequence (i.e., ladybug, hedgehog, ocean puzzle, shapesorter). Participants were still required to assemble the schedules in this condition in an attempt to equate response effort across teaching conditions, again to isolate the effects of choice-making. But instead of the participant making selections, each picture of the corresponding leisure item was presented, and the participant was required to place it on the corresponding page of the activity schedule and turn the page. This process continued until all four leisure items were placed in the activity schedule. The instruction to begin the activity schedule and backstep error correction procedures were identical to the choice condition.

Concurrent Operant Assessment

Following completion of the teaching phase, participants were exposed to the concurrent operant assessments to evaluate preference for the choice or no-choice activity schedules. Concurrent operant assessments were conducted with three activity schedules including choice, no-choice, and control activity schedules.

Each session began with the presentation of the choice, no-choice, and control activity schedules placed equidistant from each other in a horizontal array on the table in front of the participant. The order of activity schedules presented in each array was randomized using a random list generator (https://www.random.org/lists/). The participant was instructed to "Pick one" and given 5 s to make a selection, after which the remaining schedules were removed from the table and participants were immediately exposed to the activity schedule corresponding to each selection.

Choice and no-choice activity schedules were identical to those described in the teaching condition. The control activity schedule consisted of one page with a picture of a neutral leisure item already placed on the page prior to each session (Deel et al., 2021). The neutral leisure item

remained the same in each session and was held constant across participants. If a participant selected the control activity schedule, the researcher delivered the instruction, "Do your schedule," and implemented the backstep error correction procedures identical to choice and no-choice activity schedules. Response effort across the activity schedules was not controlled for, as the choice and no-choice activity schedules consisted of four leisure items and the control activity schedule consisted of one leisure item.

Effort Modification. Upon analysis of Sammy's and Jordan's initial selections, the control activity schedule was manipulated to increase response effort relative to the choice and no-choice activity schedules. Those modifications are described in more detail below.

First Modification. In Sammy's sixth session, Jordan's fourth session, and Grant's fourth session, the control activity schedule increased from one leisure item to eight leisure items. These leisure items were held constant across sessions and participants. The control activity schedules remained at eight leisure items, until the second modification in Jordan's case.

Second Modification. Beginning in Jordan's eleventh session, the control activity schedule increased from eight leisure items to 16 leisure items. These leisure items were held constant across sessions.

Bias Modification. After we modified Jordan's control book to include 16 leisure items, we observed a pattern of potential selection bias, indicated by repeated selection of the middle item in the array. Beginning in his 16th session, Jordan was instructed to stand five feet from the table with the three activity schedules already arranged in a randomized, horizontal array. Jordan was then instructed to "Pick one," and approach the table to make a selection. After a selection was made, all procedures continued as previously described.

RESULTS

Sammy

Teaching. Sammy engaged in 0% correct responding in all three baseline sessions (see Figure 2). With the introduction of an activity schedule (choice condition), an immediate increase to 82% correct responding was observed. Across five choice activity schedules, Sammy engaged in a range of 82-100% correct responding. In Sammy's second teaching session and first exposure to the no-choice condition, she demonstrated 89% correct responding. Across five no-choice activity schedules, Sammy engaged in a range of 89-97% correct responding.

Concurrent Operant Assessments. Sammy selected the control activity schedule in the first five sessions (see Figure 3). In the sixth session, and first modification of the control activity schedule, Sammy selected the choice activity schedule. Sammy selected the control activity schedule in the seventh and eighth sessions, but her responding shifted again towards the choice activity schedule in the ninth and 10th sessions. In the remaining nine sessions, Sammy selected the no-choice activity schedule.

Sammy engaged in a range of 97-100% correct responding in completion of three choice activity schedules when selected, and a range of 89-100% in completion of nine no-choice activity schedules when selected (see Figure 2).

Jordan

Teaching. In Jordan's first baseline session, he demonstrated 50% correct responding (see Figure 2). He demonstrated 0% correct responding in the second session and again demonstrated 50% correct responding in the third session. Responding decreased as the fourth session he responded 0%, 25% in the fifth session, and finally 0% in the sixth and seventh sessions. Upon introduction of an activity schedule (choice condition), Jordan demonstrated an

increase to 84% correct responding. Across six choice activity schedules, Jordan demonstrated a range of 84-100% correct responding. In Jordan's second teaching session and first exposure to the no-choice condition, he demonstrated 82% correct responding. Across six no-choice activity schedules, Jordan engaged in a range of 82-97% correct responding.

Concurrent Operant Assessments. Jordan selected the control activity schedule in the first three sessions (see Figure 3). In the fourth session, and first modification of the control activity schedule, Jordan selected the choice activity schedule. Jordan selected the control activity schedule in the fifth session, the no-choice activity schedule in the sixth session, and the choice activity schedule in the seventh session. Jordan again selected the control activity schedule in the eighth, ninth, and 10th sessions. In the 11th session, and second modification to the control activity schedule, Jordan selected the choice activity schedule. Jordan selected the no-choice activity schedule in the 12th session, the control activity schedule in the 13th session, the choice activity schedule in the 14th session, and the no-choice activity schedule in the 15th session. In the four selections of the choice activity schedule, Jordan engaged in a range of 97-100% correct responding. In the three selections of the no-choice activity schedule, Jordan engaged in a range of 97-100% correct responding.

In sessions 11 through 15, Jordan selected the activity schedule positioned in the middle of the array. Therefore, the bias modification was introduced in Jordan's 16th session. From a distance of five feet from the table, Jordan approached and selected the control activity schedule in the 16th and 17th sessions. Jordan selected the choice activity schedule in the 18th session, the no-choice activity schedule in the 19th session, and the choice activity schedule in the 20th and 21st sessions. Jordan selected the no-choice activity schedule in the 22nd session, and the choice activity schedule in the 23rd session. In the choice activity schedules selected in sessions 18, 20,

21, and 23, Jordan engaged in 97-100% correct responding (see Figure 2). In the no-choice activity schedules selected in sessions 19 and 22, Jordan engaged in 100% correct responding. Beginning in the 18th session, Jordan's responding returned to selections of the activity schedule positioned in the middle of the array. Data collection is ongoing, and upon completion data will be available here: https://osf.io/mehfn/?view_only=1b2958ece6ce4a5bb1b5d71ddbe547cd.

Grant

Teaching. Grant demonstrated 0% correct responding in the first baseline session (see Figure 2). In the second and third sessions, responding increased to 25% and 75%, and decreased again to 0% in the fourth session. Grant demonstrated a stable, low level of responding at 25% for the final five baseline sessions. Upon introduction of an activity schedule (choice condition), Grant's responding increased to 74%. Across six choice activity schedules, Grant engaged in a range of 74-100% correct responding. In Grant's second teaching session and first exposure to the no-choice condition, he demonstrated 79% correct responding. Across five no-choice activity schedules, Grant engaged in range of 79-97% correct responding.

Concurrent Operant Assessments. In the first three sessions, Grant selected the control activity schedule (see Figure 3). In the fourth session, and first session with the modification of the control activity schedule, Grant selected the control activity schedule. Grant selected the choice activity schedule in the fifth session, the control activity schedule in the sixth session, and the no-choice activity schedule in the seventh session. Grant selected the no-choice activity schedule in the eighth session, choice activity schedule in the ninth session, and no-choice activity schedule in the 10th session. In the two selections of the choice activity schedule, Grant engaged in 94-100% correct responding (see Figure 2). In the three selections of the no-choice activity schedule, Grant engaged in 89-100% correct responding. Data collection is ongoing, and

upon completion data will be available here:

https://osf.io/mehfn/?view_only=1b2958ece6ce4a5bb1b5d71ddbe547cd.

DISCUSSION

Teaching

One purpose of this study was to evaluate the effectiveness of teaching embedded choice-making opportunities within activity schedules. All three participants in the current study learned to assemble and complete activity schedules, both when given the opportunity to choose the sequence of leisure items within the schedule and when choice opportunities were not available. During baseline, participants did not engage with leisure items as instructed. During teaching, participants learned to assemble and follow the activity schedules to independently complete a sequence of four leisure items.

All three participants demonstrated high levels of correct responding across the teaching phase. These data contribute to the existing literature by demonstrating the effectiveness of activity schedules as visual supports, and error correction, to increase appropriate independent leisure skills in children with ASD within a classroom setting (Akers et al., 2018; Brodhead et al., 2018; Deel et al., 2021; Krantz & McClannahan, 2014). Additionally, this study further demonstrates the effectiveness of using activity schedules to increase choice-making opportunities for individuals with ASD (Deel et al., 2021; Watanabe & Sturmey, 2003). A benefit of incorporating choices in activity schedules for young children with ASD includes increasing opportunities to engage in the discriminated operant of choice-making, which promotes independence and autonomy. Additionally, behavior analysts have an ethical responsibility to promote the self-determination of their clients (Behavior Analyst Certification Board, 2020), and choice opportunities can allow practitioners to implement activity schedules based on child preferences. For example, Sammy selected activity schedules in which she did not have to make choices in assembling the schedules (i.e., no-choice).

Concurrent Operant Assessments

Preference. A second purpose of the study was to evaluate preferences between choice, no-choice, and control activity schedules. In an attempt to replicate Deel et al. (2021) as closely as possible, our control activity schedule initially consisted of one leisure item. Before modifications were made, Sammy, Jordan, and Grant exclusively selected the control activity schedule in their first five, three, and three sessions, respectively. The first session was the participants' first exposure to the control activity schedule. Therefore, we hypothesize each participant selected the control activity schedule because of its novelty compared to the choice and no-choice activity schedules. We hypothesize participants continued to select the control activity schedule after the first session because once selected and completed, participant responding was under the control activity schedule with lower response effort compared to the choice and no-choice activity schedules. That is, a control activity schedule that was completed with less response effort in less time was more likely to be selected than choice and no-choice activity schedules. For example, the first modification to increase response effort of the control activity schedule in comparison to the choice and no-choice activity schedules effectively shifted Sammy's selection responses. In Jordan's case, after completing his first selected control activity schedule with one leisure item, he was observed saying, "That's it?" Similarly, in the first and second sessions, Grant was observed saying, "This is so easy," after completing the control activity schedule. Conversely, when Grant selected the control activity schedule after its first modification to increase response effort, he was observed saying, "There's so many here," as he completed the schedule.

When response effort of the control activity schedule was initially increased beyond the putative response effort of the choice and no-choice schedules, Sammy's selections shifted away

from the control activity schedule. Though Jordan similarly shifted responding, he again allocated his selections to the control activity schedule, even with increased response effort. For Jordan, it is possible the additional response effort of schedule assembly in both choice and no-choice activity schedules could have influenced responding towards the control activity schedule. Additionally, it is possible Jordan's continued selections of the control activity schedule after response effort was increased were under the stimulus control of the initial control activity schedule containing one leisure item. That is, responding may not have been under the control of relevant features of the control activity schedules as modifications were made.

Finally, when response effort of the control activity schedule was further increased to 16 leisure items, Jordan's selections varied across control, choice, and no-choice activity schedules. Upon this second modification to response effort (sessions 11 through 15), Jordan demonstrated a selection bias towards the activity schedule positioned in the middle of the array. However, Jordan did not demonstrate a selection bias in the initial 10 sessions. We hypothesize when response effort of the control activity schedule consisted of one or eight leisure items, Jordan's pattern of responding indicated preference for the control activity schedule regardless of the choice or no-choice activity schedules also available. However, when response effort increased to 16 leisure items, Jordan's responding did not reflect a clear preference, as demonstrated by the position bias. Therefore, we instructed Jordan to approach the stimuli from a distance of five feet. This modification shifted Jordan's responding away from the activity schedule positioned in the middle of the array for two sessions. However, Jordan again selected schedules positioned in the middle of the array for the following sessions. It is possible responding was not under the control of relevant features of the activity schedules. It is also possible that responding did not indicate a clear preference because the stimuli included were not relevant to the individual.

Sammy's pattern of selections indicated a relative preference for no-choice activity schedules, as she allocated responding consistently to the no-choice activity schedules across nine sessions. Data collection with Jordan is ongoing, but currently his responding indicates a relative preference for control activity schedules. Between the choice and no-choice activity schedules, Jordan's allocated responses indicate a slight preference for choice-making opportunities within activity schedules.

The three participants in Deel et al. (2021) did not demonstrate a similar pattern of response allocation to the control activity schedules in the concurrent operant assessments as seen in the current study. The participants in the current study exclusively selected the control activity schedule before its modifications, and even after modifications increasing response effort had been made. Selections of the control activity schedules could be an artifact of the stimuli we selected to include in the activity schedules for our participants. It is difficult to identify similarities or differences between participants from the current study and Deel et al. (2021), as Deel et al. (2021) reported Development Quotients of each participant derived from administration of the Mullen Scales of Early Learning (Mullen, 1995), whereas the current study reported VB-MAPP scores. In the current study, we attempted to include leisure items that were similar in effort to replicate Deel et al. (2021) as closely as possible. However, the close-ended leisure items we included in the activity schedules were likely not as developmentally appropriate for our participants. Additionally, in Jordan's case, he selected the control activity schedules after the second modification (16 leisure items), which took more than 20 minutes to complete. It is possible selection of the control activity schedules functioned as negative reinforcement in the form of escape or avoidance of treatment engaged in more difficult skill acquisition.

Schedule Completion. Previous research evaluating preference for choice-making opportunities within activity schedules did not continue measurement of correct responding as participants completed their selected schedules (Deel et al., 2021). A third purpose of the current study was to evaluate accuracy of schedule completion during the concurrent operant assessments. Sammy, Jordan, and Grant maintained high levels of correct responding when engaging in choice and no-choice activity schedules during the concurrent operant assessments.

Continued measurement of schedule completion in the concurrent operant assessments demonstrated maintenance of both choice and no-choice activity schedule completion for all participants. That being said, we hypothesize Sammy demonstrated a slightly decreasing trend in responding in the final four sessions as she was observed to attend to stimuli in the environment such that it required implementation of the error correction procedure. These stimuli included other clients engaging in interfering behaviors such as screaming and property destruction, and other clients engaging in putatively reinforcing activities such as jumping on a trampoline nearby.

Limitations

Several limitations were identified, one being we did not identify mastery criteria for teaching sessions before conducting concurrent operant assessments. Rather, we assessed each individual participant's performance with the choice and no-choice activity schedules through ongoing visual analysis of data to guide our decisions in progressing to the concurrent operant assessments. Future researchers might consider identifying mastery criteria to aid in replications of experimental control across participants. Similarly, the current study did not define nor identify criteria for preference. We continued preference assessments with each participant until a stable pattern of selection was demonstrated, to observe changes in preference over time

(Auten et al., 2024; Deel et al., 2021). We recommend future researchers identify and set criteria to define a stable pattern of preference over time to promote consistency and replication across participants.

A potential limitation of this study was in the environmental arrangement of research sessions, which took place in a classroom where eight children with ASD between two and five years of age were receiving individual behavioral instruction. Though this setting more closely resembled typical learning environments (e.g., classroom), we recognize the environmental variables outside of our experimental control that may have influenced responding. This limitation was particularly present in Sammy's final sessions.

Another limitation was the physical characteristics of the control activity schedules as modifications were made to increase response effort. The type of pages within the control activity schedule altered the size of the binder relative to the choice and no-choice activity schedules. Additionally, the added leisure items were then also present on the countertop. For example, in the first session where the control activity schedule increased from one to eight leisure items, both Sammy and Jordan selected the choice activity schedule. These physical characteristics of the control activity modifications may have influenced responding, as both participants changed responding without actually contacting the increased response effort of the newly modified control activity schedule. We suggest future researchers present an array of colored picture cards depicting the choice (e.g., green), no-choice (e.g., yellow), and control (e.g., white) conditions in the concurrent operant assessments to increase the likelihood that responding is under control of relevant stimuli associated with each selection.

Finally, the varied response efforts of the control activity schedules in the concurrent operant assessments likely influenced participant responding. Future researchers, however, might

systematically investigate how response effort influences choice-making in the context of activity schedules. Additionally, specific procedural variations to implement in concurrent operant assessments when a participant demonstrates preference for the control condition are not clear across the literature (Auten et al., 2024). In the context of our study, we suggest future research conduct the control activity schedules identical to baseline sessions, with a vocal instruction to play with the neutral leisure activities, similar to Deel et al. (2021), and continue measurement of correct responding with the same task analysis used in baseline. This would provide an opportunity to measure and compare responding in the control condition to responding in baseline sessions. Also, it could potentially reduce the influence of response effort on selections as participants would be instructed to engage with four leisure items (the same number of leisure items in both the choice and no-choice activity schedules) without an activity schedule present.

The current study demonstrated the idiosyncratic and dynamic nature of preferences in the context of activity schedules with or without choice-making opportunities among young children with ASD. Several variables may influence preference for an intervention or procedure at any given time, but findings from this study further support the individualization of behavior analytic treatment regarding activity schedules.

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APPENDIX

Figure 1 Activity Schedule Binders

Choice Activity Schedule

No-Choice Activity Schedule

Control Activity Schedule

Table 1: Baseline Task Analysis

1.	Obtain activity #1
2.	Bring activity to table
3.	Complete activity
4.	Put activity away
5.	Obtain activity #2
6.	Bring activity to table
7.	Complete activity
8.	Put activity away
9.	Obtain activity #3
10.	Bring activity to table
11.	Complete activity
12.	Put activity away
13.	Obtain activity #4
14.	Bring activity to table
15.	Complete activity
16.	Put activity back on shelf

Table 2: Choice Condition Task Analysis

1.	Select a picture OR open book
2.	Open book OR select a picture
3.	Place picture in book
4.	Turn page OR select a picture
5.	Select a picture OR turn page
6.	Place picture in book
7.	Turn page OR select a picture
8.	Select a picture OR turn page
9.	Place picture in book
10.	Turn page OR select a picture
11.	Select a picture OR turn page
12.	Place picture in book
13.	Close book
14.	Obtain completed book
15.	Open book
16.	Touch or look at picture #1
17.	Obtain corresponding activity
18.	Bring activity to table
19.	Complete activity
20.	Put activity away
21.	Turn page
22.	Touch or look at picture #2
23.	Obtain corresponding activity
24.	Bring activity to table
25.	Complete activity
26.	Put activity away
27.	Turn page
28.	Touch or look at picture #3
29.	Obtain corresponding activity
30.	Bring activity to table
31.	Complete activity
32.	Put activity away
33.	Turn page
34.	Touch or look at picture #4
35.	Obtain corresponding activity
36.	Bring activity to table
37.	Complete activity
38.	Put activity away
39.	Close book

Table 3: No-Choice Condition Task Analysis

1.	Open book OR pick up picture #1
2.	Pick up picture #1 OR open book
3.	Place picture in book
4.	Pick up assigned picture #2 OR turn page
5.	Pick up assigned picture #2 OR turn page
6.	Place picture in book
7.	Pick up assigned picture #3 OR turn page
8.	Pick up assigned picture #3 OR turn page
9.	Place picture in book
10.	Pick up assigned picture #4 OR turn page
11.	Pick up assigned picture #4 OR turn page
12.	Place picture in book
13.	Close book
14.	Obtain completed book
15.	Open book
16.	Touch or look at picture #1
17.	Obtain corresponding activity
18.	Bring activity to table
19.	Complete activity
20.	Put activity away
21.	Turn page
22.	Touch or look at picture #2
23.	Obtain corresponding activity
24.	Bring activity to table
25.	Complete activity
26.	Put activity away
27.	Turn page
28.	Touch or look at picture #3
29.	Obtain corresponding activity
30.	Bring activity to table
31.	Complete activity
32.	Put activity away
33.	Turn page
34.	Touch or look at picture #4
35.	Obtain corresponding activity
36.	Bring activity to table
37.	Complete activity
38.	Put activity away
39.	Close book

Table 4: Baseline Procedural Fidelity

	Yes	No	N/A
Prior to Session			
1. Materials are accessible to researcher and/or participant			
During Session			
2. Researcher establishes attending from participant ("Get ready" or similar Sd)			
3. Instructs child to do four activities			
4. Terminates session after 30 seconds if participant does not respond			
5. Terminates session if participant does not complete the sequence within 10 minutes			
6. Terminates session if participant completes all available activities in under 10 minutes			
7. Does NOT prompt during sessions			
8. Does NOT provide reinforcement during sessions			

Table 5: Choice Condition Procedural Fidelity

	Yes	No	N/A
Prior to Session			
1. Materials are accessible to researcher and/or participant			
During Session			
2. Researcher establishes attending from participant ("Get ready" or similar Sd)			
3. Researcher presents correct number of pictures in the array to the participant (Starting with 5, then rearranges 4, then rearranges 3, etc.)			
4. Says "Pick one" to the participant			
5. Researcher repeats direction after 5 seconds if participant does not respond			
6. If no response after 15 sec, the researcher prompts participant's hand closer to array without prompting him/her to make a selection			
7. Researcher provides correct prompt level to assemble selected picture in first available page of activity schedule			
8. Researcher rearranges the remaining pictures of the array and presents correct number of pictures			
9. Researcher gives Sd: "Do your schedule" after schedule is assembled			
10. Researcher provides error correction if errors occur or if the participant does not engage in correct responding within 5 sec of the Sd			
11. Researcher provides neutral statement after completion of the schedule ("Thanks for doing that")			

Table 6: No-Choice Condition Procedural Fidelity

	Yes	No	N/A
Prior to Session			
1. Materials are accessible to researcher and/or participant			
During Session			
2. Researcher establishes attending from participant ("Get ready" or similar Sd)			
3. Researcher presents one picture at a time to participant			
4. Researcher provides correct prompt level to assemble picture in first available page of the activity schedule, second page, etc.			
5. Researcher presented pictures in correct order (order matches that of most recent choice session)			
6. Researcher gives Sd: "Do your schedule" after schedule is assembled			
7. Researcher provides error correction if errors occur or if the participant does not engage in correct responding within 5 sec of Sd			
8. Researcher provides neutral statement after schedule completion ("Thanks for doing that")			

Table 7: Concurrent Operant Assessment Procedural Fidelity

	Yes	No	N/A
Prior to Session			
1. Materials are accessible to researcher and/or participant			
During Session			
2. Researcher establishes attending ("Get ready" or similar Sd)			
3. Researcher presents all three activity schedules to participant (choice, no choice, and control books)			
4. Researcher says "Pick one"			
5. Researcher repeats "Pick one" if participant does not make a selection within 5 seconds			
6. Researcher prompts participant's hand closer to the array (without making a specific selection) after 15 seconds of no responding			
7. Researcher clears the table and presents appropriate materials according to participant's selection			
8. Researcher follows same procedure as in CHOICE condition if participant selected CHOICE book			
9. Researcher follows same procedure as in NO CHOICE condition if participant selected NO CHOICE book			
10. Researcher presents CONTROL book if participant selected CONTROL book			
11. Researcher gives Sd: "Do your schedule" after schedule is assembled (for CHOICE and NO CHOICE books) or assembled with one picture inside (CONTROL book)			
12. Researcher provides error correction if errors occur or if the participant does not engage in correct responding within 5 sec of Sd			
13. Researcher provides neutral statement after completion of CHOICE and NO CHOICE and CONTROL activity schedules ("Thanks for doing that")			

Figure 2

Graph of Correct Responding in Baseline, Teaching, and Concurrent Operant Assessments

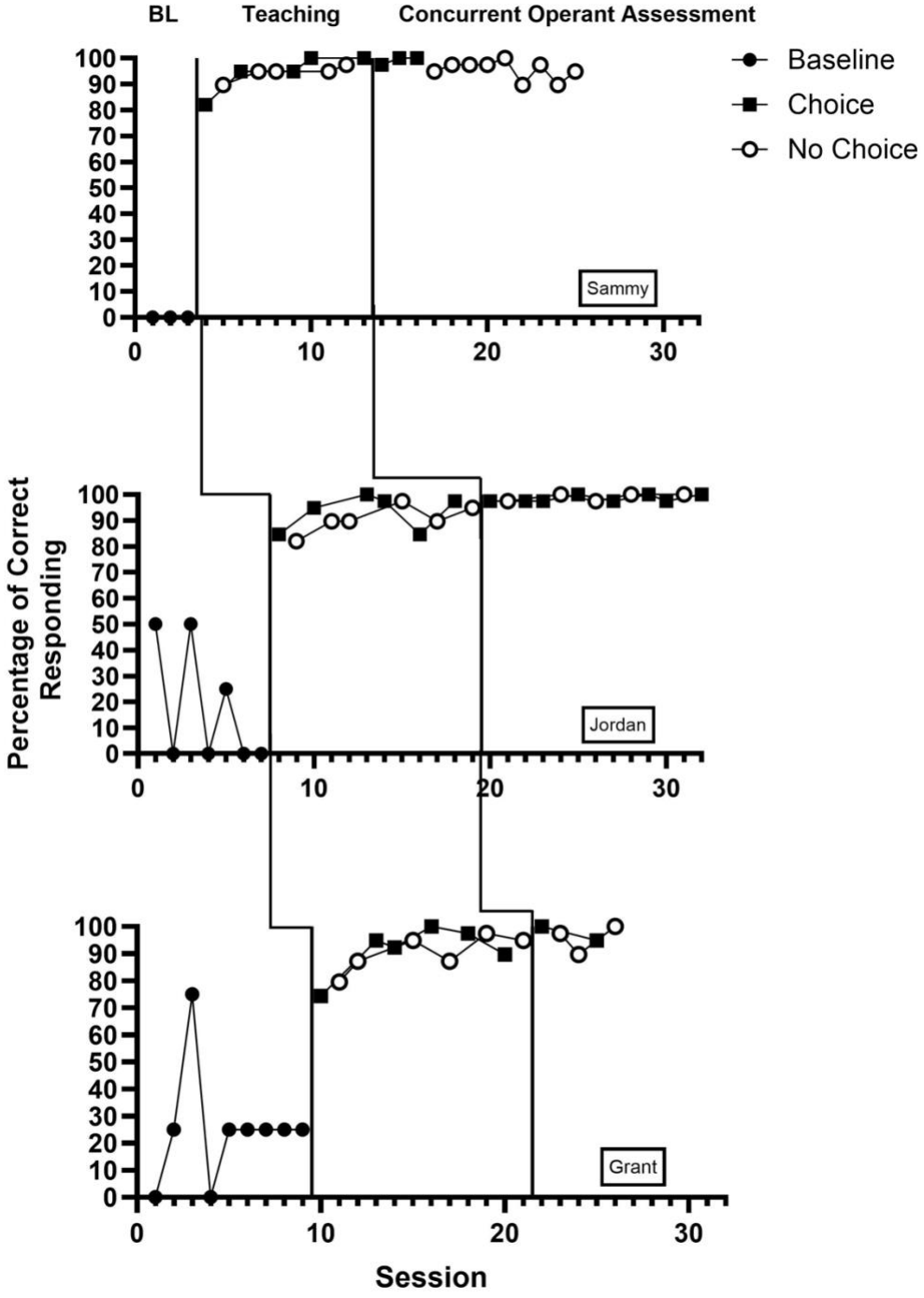

Figure 3

Display of Selection Distributions in Concurrent Operant Assessments