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Evaluating the effects of social interaction on the results of preference assessments for leisure items

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A variable that may influence the outcomes of stimulus preference assessments (SPAs) is whether social interaction is provided during the stimulus access period. In Experiment 1, we compared the outcomes of a Solitary paired stimulus preference assessment (PSPA) (toys only), Social PSPA (toys plus social interaction), and Combined PSPA (toys alone and toys plus social interaction) to determine whether the addition of social interaction influenced preference for toys in preschool children. In Experiment 2, we conducted a concurrent-operant reinforcer assessment to compare the reinforcing efficacy of stimuli with and without social interaction. Experiment 1 showed preference for toys was stable across assessments (Solitary and Social PSPAs) and most participants preferred toys plus social interaction when compared in a single assessment (Combined PSPA). Experiment 2 showed that results of the Combined PSPA in Experiment 1 predicted the outcome of most participants' reinforcer assessments.

Key words: paired-stimulus preference assessment, reinforcer assessment, social interaction, stimulus preference assessment

Systematic stimulus preference assessments (SPAs) have been used to identify preferred stimuli (e.g., edibles and toys) and activities that can be used as reinforcers in intervention programs for individuals with (Tullis et al., 2011) and without (Cote et al., 2007; Resetar & Noell, 2008) intellectual and developmental disabilities (IDD). Preferred stimuli are typically those an individual selects or interacts with most in an SPA, and it is hypothesized that the most preferred stimuli are likely to be the most potent reinforcers (e.g., Butler & Graff, 2021; Pace et al., 1985). Various SPAs have been used to identify preferred stimuli and activities (see Hagopian et al., 2004 and Saini et al., 2021 for a review of SPAs) and generally involve presenting one or more stimuli to an individual and measuring some response (e.g., selection response or interaction with stimuli).

Although previous research has suggested the utility of SPAs for identifying reinforcers, there are numerous variables that may influence the outcomes of SPAs. These variables include history effects, such as the time that elapses between assessments (Butler & Graff, 2021; Hanley et al., 2006; Zhou et al., 2001) and motivating operations, such as programmed periods of satiation and deprivation of particular stimuli (Gottschalk et al., 2000; McAdam et al., 2005; Vollmer & Iwata, 1991). Additionally, the arrangement or modality of the assessment may influence results. Verbal (therapist vocally asks the individual to select an item) or pictorial (therapist presents a picture of the stimuli instead of the actual stimuli; e.g., Heinicke et al., 2016) SPAs are alternatives to the typical

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SPA modality (i.e., physical stimuli presented to the individual). However, if an individual does not display certain discrimination or matching skills, these modalities may affect results of the SPA (e.g., Brodhead et al., 2016; Clevenger & Graff, 2005; Conyers et al., 2002). Further, various stimulus dimensions, such as the magnitude of the stimulus (e.g., number of edibles; Hoch et al., 2002; Moore et al., 2017; Trosclair-Lasserre et al., 2008) and duration of stimulus access (Clark et al., 2019; DeLeon et al., 1999; Hoffman et al., 2017; Jones et al., 2014; Steinhilber & Johnson, 2007) have been shown to influence results of preference assessments.

Studies have also shown that the type or quality of stimuli included in a SPA may influence the outcome (e.g., DeLeon et al., 1997; Sipila-Thomas et al., 2020). When different types or quality of stimuli are included in a single SPA, preference displacement may be observed in which the individual makes selections in one stimulus category disproportionately over the other (DeLeon et al., 1997). Preference displacement is often evaluated with SPAs including edible and leisure items (e.g., Andakyan et al. 2016; Bojak & Carr, 1999; Carter & Zonneveld, 2019; Clark et al., 2019; Conine & Vollmer, 2019; DeLeon et al., 1997; Fahmie et al., 2015; Ortega et al., 2012; Sipila-Thomas et al., 2020; Slanzi et al., 2019). That is, when highly preferred edible and leisure items are included in a single SPA, patterns of displacement by one stimulus category (e.g., edible items selected disproportionately over leisure items or vice versa) have been observed across populations including adults with IDD (Bojak & Carr, 1999), children with IDD (Fahmie et al., 2015), adults with dementia (Ortega et al., 2012), and typically developing children (Carter & Zonneveld, 2019).

Another variable that may influence the results of the SPA is whether social interaction (e.g., praise, conversation, physical attention; Vollmer & Hackenberg, 2001) is provided along with the delivery of the item or activity during the access period. A recent series of studies utilized a time allocation procedure to evaluate the function of social interaction for young children with autism spectrum disorder (ASD; Call et al., 2013; Morris & Vollmer, 2020b, 2021). All three studies measured the duration of time participants spent on either side of a room divided into two, with each side containing similar (or identical) leisure items. However, a therapist was on one side of the room and delivered social interaction on that side. Results of the assessment revealed whether social interaction was reinforcing, neutral, or aversive for a participant. Although these studies evaluated the function of social interaction, the methodology may also inform researchers of the influence of social interaction on participant preference for the leisure items included in the study (i.e., presence of the therapist on one side of the room may have influenced the participant's preference for the leisure items included in the assessment).

Goldberg et al. (2017) evaluated participants' preference for different leisure items when presented in solitary (i.e., participant interacted with the item alone) and social contexts (i.e., participant interacted with item with their mother) with children diagnosed with ASD and typically developing children of the same age. The experimenters evaluated whether there was a difference in the reinforcing value of social stimuli for children with ASD compared to their typically developing peers. Similar to Call et al. (2013) and Morris and Vollmer (2020b, 2021), the results revealed that participants with and without ASD worked harder for access to items and social stimuli as compared to the solitary items in a progressive ratio (PR) assessment, which reveals the influence social interaction may have on participant preference for the leisure items included.

Previous research on preference for different types of social interaction suggest social interaction is often preferred, and different types of social interaction may be more preferred than others (Harper et al., 2021; Kelly et al., 2014; Morris & Vollmer, 2019; Piazza et al., 1999; Stephenson & Hanley, 2010). Further, the evaluations of preference and reinforcing efficacy of social interactions suggest leisure items paired with social interaction may be more or less reinforcing for different individuals (Call et al., 2013; Morris & Vollmer, 2020a, 2020b, 2021). Thus, it is possible that the presence or absence of social interaction may influence the outcome of SPAs, which may in turn influence the efficacy of particular stimuli as reinforcers in subsequent teaching or intervention programs. However, the presence or absence of social interaction in a SPA is underreported in the literature. That is, it is unclear from the procedure sections of previous studies whether social interaction is provided during SPA access periods. For example, in a recent issue of the *Journal of Applied Behavior Analysis* (Summer 2021, Volume 54, Issue 3), seven articles noted the use of a tangible SPA; none noted whether social interaction was provided with the tangible item during the assessment.

It is possible that experimenters and clinicians do not systematically program for the presence or absence of social interaction during SPAs. Thus, when and how social interaction is delivered across trials and assessments may influence the outcome of SPAs. For example, some stimuli may be presented with social interaction and others may be presented without social interaction. Thus, it is possible the outcome of a SPA may result in the items that are presented with social interaction being more preferred or less preferred than those without social interaction. Further, the provision of social interaction with the presentation of all stimuli could influence the outcome, given the addition of social interaction may increase or decrease preference for certain stimuli. For example, some items or activities (e.g., board games) may be more preferred when social interaction is provided and other items or activities (e.g., reading a book) may be more preferred when social interaction is not provided.

Given the importance of social interaction as a variable in SPAs, the purpose of the current study was to evaluate the influence of social interaction on participant preference for common leisure items (Experiment 1) and to evaluate the relative reinforcing efficacy of preferred leisure activities with social interaction, preferred leisure activities without social interaction, or social interaction alone (Experiment 2) with a large number of typically developing preschool children. A secondary purpose of Experiment 2 was to evaluate if the addition of social interaction in an initial preference assessment (Experiment 1) predicted or corresponded with differences in a reinforcer assessment.

Experiment 1 Method: Solitary, Social, and Combined SPAs

Participants, Setting, and Materials

Thirty-three typically developing children (21 males and 12 females) between 2.5 to 6 years old who attended a university-based preschool program participated. Participants were children who were reported by classroom supervisors to engage in social interaction at least periodically with peers and teachers. That is, children who were reported to be unusually shy or tended to play alone the majority of the time in the classroom were not included in this study. Additionally, participants were children who were reported to remain seated for approximately 30 min without engaging in problem behavior that might interfere with completing the assessment. All SPAs were conducted using a paired stimulus preference assessment (PSPA; Fisher et al., 1992) format and were conducted at a table or on the floor in session rooms that were adjacent to the preschool classrooms and

contained a table, two chairs, and materials used during the study.

All PSPAs included five different toys that were available during free play periods in the classroom. These toys included a remote-control car, flipover car, Glodoodle©, Magnetix©, and pirate playset. During the Combined PSPA, duplicates of each toy were included such that the solitary stimulus (toy alone) and the social stimulus (toy plus social interaction) could be presented within the assessment. In addition, during some assessments (i.e., Social PSPA and Combined PSPA), pictures of the experimenter (5 cm x 8 cm) were used to denote to the participant that social interaction would be provided with access to a particular toy.

Response Measurement, Data Analysis, and Interobserver Agreement

Trained observers recorded data using paper and pencil data collection. For all PSPAs (i.e., Solitary PSPA, Social PSPA, and Combined PSPA), the dependent variable was stimulus selection, defined as the participant placing a hand on (or saying the name of) a presented stimulus within 5 s of its presentation in a trial. We determined selection percentages for each stimulus in a preference assessment by summing the number of times a stimulus was selected and dividing that sum by the number of times that stimulus was presented. We used these selection percentages to determine stimulus rankings, which ranged from "1" (highest selection percentage) to "5" (lowest selection percentage). If selection percentages were the same for two stimuli, we reviewed the raw data to determine which of the two stimuli was selected in the trial in which they were both presented. The stimulus selected was assigned the higher rank. If selection percentages were the same for more than two stimuli, a similar procedure was used by which we reviewed the raw data to determine which stimulus was selected most often, second most often, etc. across trials in which the stimuli were presented with each other. The stimulus selected most was assigned the highest rank, the stimulus selected second most was assigned the second highest rank, and so on. If the stimuli were each selected once when presented with each other, then they were assigned the same rank.

Data collectors also scored whether the experimenter delivered social interaction in each trial during preference assessments in which social interaction was programmed (i.e., Social PSPAs and Combined PSPAs). Social interaction was defined as exuberant interaction provided by the experimenter that included a pleasant facial expression, enthusiastic tone of voice, positive statements, and conversation about the child or the ongoing activity (e.g., statements about the toy or the participant interacting with the toy).

Procedural integrity was calculated for 33% of Social PSPAs and 33% of Combined PSPAs. Social interactions were scored as correct if the experimenters delivered a social interaction as defined above for approximately 30 s (25-35 s of delivery scored as correct). Procedural integrity was calculated by dividing the total number of correct social interaction deliveries by the total number of instances in which social interaction was programmed for delivery. Procedural integrity was 99% across the Social PSPAs (range, 90%-100%) and 97% across the Combined PSPAs (range, 76%-100%).

A second independent observer collected data on stimulus selections and social interaction delivery during approximately 67% of assessments across participants in the Social, Solitary, and Combined PSPAs. We calculated IOA for stimulus selection and social interaction by dividing the number of trials with agreement by the number of trials with agreement plus disagreement and multiplying by 100. Mean IOA for stimulus selection was 99% (range, 90%-100%) across participants.

Mean IOA for social interaction was 97.9% (range, 87%-100%) across participants.

Procedures

We conducted three separate, tangible PSPAs to determine stimulus rankings for common classroom toys when the items were provided alone (Solitary PSPA), paired with social interaction (Social PSPA), and delivered with and without social interaction (Combined PSPA). Although previous research suggests the applicability of vocal PSPAs for young typically developing children (e.g., Northup et al., 1995, 1996), we decided to use a more systematic method across all three assessments. Across each assessment, participants were able to either select or state which item they would like. The same experimenter conducted all PSPAs for a particular participant. All experimenters were known to the participants; however, some participants were more familiar with some experimenters (i.e., some experimenters were the participant's classroom supervisors and some experimenters were supervisors in adjacent classrooms) as a result of scheduling. In addition, the Solitary PSPA was always conducted prior to the Social PSPA to decrease the likelihood of a previous programmed history of social interaction paired with toys influencing the outcomes of the Solitary PSPA. The Combined PSPAs were conducted after both the Solitary and Social PSPAs were completed. Furthermore, only one PSPA was conducted per day, but no more than 7 days elapsed between the PSPAs to decrease the likelihood of changes in preference due to the period of time that elapsed between PSPAs.

Solitary PSPA

The Solitary PSPA was conducted to determine preference for five toys when social interaction was not provided during access periods. Prior to this assessment, the experimenter provided presession access to each of the toys by presenting each toy to the participant, vocally labeling the toy, and providing 30 s of access to the toy without social interaction. In each trial, the experimenter placed two toys equidistant and in front of the participant, vocally labeled each toy, and prompted the participant to, "Pick your favorite." Contingent upon toy selection, the experimenter provided 30 s of access to the selected toy. No social interaction was delivered during the access period; rather, the experimenter looked at the data sheet and set up materials for the next session. If the participants requested attention during the 30-s access period, the experimenter would briefly say, "I can't speak to you right now," or a similar statement. Following the access period, the experimenter removed the toy and presented the next two toys. If a participant did not select either toy within 5 s, the experimenter prompted the participant to interact with each toy for 5 s. After sampling each toy, the experimenter represented the toys. If the participant did not select either toy within 5 s, the experimenter removed both toys, scored "no choice" for that trial, and implemented the next trial. This process was repeated until each stimulus had been presented with every other stimulus once for a total of 10 trials.

Social PSPA

The Social PSPA was conducted to determine preference for the same five toys used in the Solitary PSPA when both the selected toy and continuous social interaction were provided during the access period. Presession access was similar to the Solitary PSPA; however, the experimenter told the participant that they would play with the participant with each toy while they pointed to a picture of themself. For example, the experimenter would say, "This is the Glodoodle© (pointing to the Glodoodle©) with me (while pointing to the picture of the experimenter)." In addition, during the 30 s of presession access to each toy, the experimenter provided continuous social interaction

(i.e., experimenter engaged in positive statements and conversations about the child or the ongoing activity [e.g., "Wow that is such a beautiful picture you drew on the Glodoodle©! What did you draw?"]). Trials were similar to those in the Solitary PSPA. However, in each trial, toys were presented along with a picture of the experimenter positioned next to the item to signal the availability of social interaction. Selection of a toy in each trial resulted in the experimenter delivering the selected toy plus social interaction for the 30-s access period. If a participant emitted a mand for a specific type of attention that was not currently provided, the experimenter would deliver the requested attention. If a participant requested that social interaction stop, the experimenter would end the trial. No participant requested an alternative type of attention or cessation of social interactions. The same procedures used in the Solitary PSPA were used if the participant did not make a choice in a particular trial. This process was repeated until each stimulus had been presented with every other stimulus once for a total of 10 trials.

Combined PSPA

The Combined PSPA was conducted to determine preference for toys paired with (i.e., social stimuli) and without social interaction (i.e., solitary stimuli) in the same PSPA. That is, the same five toys presented in the Solitary and Social PSPAs were used. However, the five toys were presented alone and a duplicate set of the toys were presented with social interaction (10 stimuli total). When social interaction was available for an item, a picture of the experimenter was included with the toy (same picture that was used in the Social PSPA) to signal to the participant that the experimenter would interact with them when this toy was selected. Presession access involved presentation of the solitary and social stimuli using the same procedures described in the Solitary PSPA and the Social PSPA. In each trial in the Combined PSPA, the experimenter vocally labeled the two stimuli that were presented. That is, if one or both of the stimuli was a solitary stimulus, the experimenter vocally labeled the toy as described in the Solitary PSPA. However, if one or both of the stimuli was a social stimulus, the experimenter presented the picture of the experimenter and the toy and vocally labeled that stimulus similar to the way it was described in the Social PSPA. Finally, based on which stimulus the participant selected, the 30-s access period was implemented as described in the Solitary PSPA and Social PSPA. The same procedures used in the Solitary PSPA were used if the participant did not make a choice in a particular trial. This process was repeated until each stimulus had been presented with every other stimulus once for a total of 45 trials.

Table 1

Summary of Comparison Between Solitary and Social PSPAs

	# of Selection	% of Selection
No change in item rank when social interaction was added	62	37.58%
Item moved down one rank when social interaction was added	31	18.79%
Item moved up one rank when social interaction was added	25	15.15%
Item moved down two rank when social interaction was added	22	13.33%
Item moved up two rank when social interaction was added	8	4.85%
Item moved down three rank when social interaction was added	6	3.64%
Item moved up three rank when social interaction was added	8	4.85%
Item moved down four rank when social interaction was added	0	0%
Item moved up four rank when social interaction was added	3	1.82%

Results

Table 1 depicts a summary of comparisons between the Solitary and Social PSPAs across participants in Experiment 1. For this comparison, we determined how many total selections

moved up or down in rank when social interaction was delivered with the item. This indicated whether the participant's preference for a specific item shifted from the Solitary to Social PSPA. For example, for 62 total selections (37.6%), there was no change in participant preference for specific items when social interactions were added. That is, in 37.6% of cases, a specific item was ranked the same regardless of whether social interaction was provided. Conversely, in 62.4% of selections, the addition of social interaction influenced the preference rank for a specific item. For example, 18.8% of items dropped in rank by one when social interaction was added and 15.15% of items increased in rank by one when social interaction was added. The magnitude and direction of change (i.e., how much an item moved up or down in rank as a result of the addition of social interaction) is summarized in Table 1.

Table 2 depicts a summary of the magnitude and direction of change for participants' top-ranked stimuli across the Solitary and Social PSPAs. For this comparison, we determined how many toys were ranked first across all participants (21 items; four participants demonstrated a three-way-tie of their number one stimuli) and then calculated how many top-ranked items shifted based on the presence or absence of social interactions. In 63.64% of cases across participants, there was no shift in preference of the top-ranked stimulus across the Solitary and Social PSPAs. When social interaction was added, 15% of top-ranked items moved down by one, 7.55% of top-ranked items moved down by two, 7.55% of top-ranked items moved down by three, and no top-ranked items moved down by four. Conversely, top-ranked social stimuli moved down in rank by one in 13.2% of cases, moved down in rank by two in 5.7% of cases, moved down in rank by three in 5.7% of cases, and moved down in rank by four in 5.7% of cases when the item was presented without social interaction.

Table 2

Summary of Top-Ranked Items Across Solitary and Social PSPAs

Shift in Top Ranked Solitary Item when Social Interaction was Added	# of Selection	% of Selection
No shift in preference of top ranked item	21	63.64%
Shift down by one	8	15.09%
Shift down by two	3	7.55%
Shift down by three	3	7.55%
Shift down by four	0	0%
Shift in Top Ranked Social Item when Presented Alone	**# of Selection**	**% of Selection**
No shift in preference of top ranked item	21	63.64%
Shift down by one	7	13.21%
Shift down by two	3	5.66%
Shift down by three	3	5.66%
Shift down by four	3	5.66%

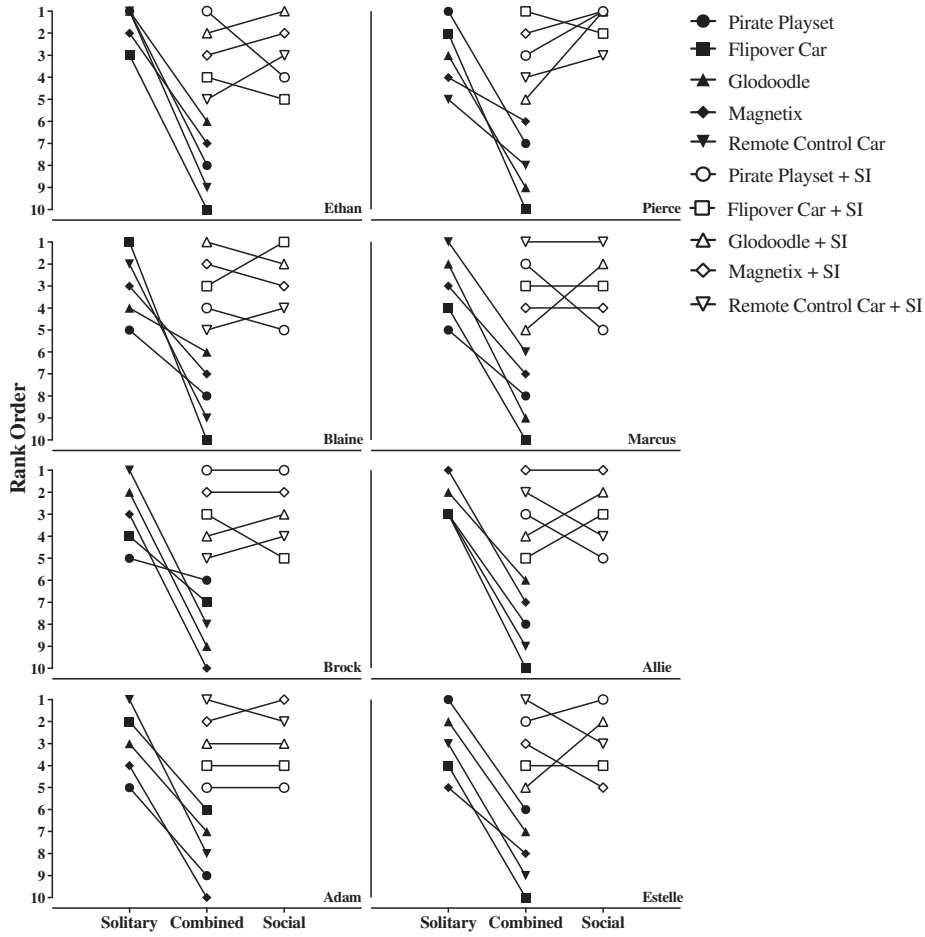
Note. Four participants demonstrated a three-way-tie of their number one stimuli (Candice [#1 social stimuli], Blake [#1 solitary stimuli], Ethan [#1 solitary stimuli], Peirce [#1 social stimuli]).

In further comparing results across the Solitary and Social PSPAs, 39.4% (13 of 33) of participants' top two toys were ranked the same across assessments (i.e., the same two toys were highest preferred with and without social interaction), 66.7% (20 of 33) of participants' top-ranked toy was the same across assessments (i.e., the same toy was highest preferred with and without social interaction), and 94% (31 of 33) of participants had at least one of the top two ranked toys the same across assessments.

Figures 1-4 depict the results of Experiment 1 for all assessments (i.e., Solitary, Social, and Combined PSPAs) for all participants. During the Combined PSPA, all participants' preference hierarchies contained a social stimulus in the top three stimuli, 82% (27 of 33) of participants had a social stimulus ranked as their number one stimulus, and 18% (6 of 33) of participants had a solitary stimulus ranked as their number one stimulus.

Figure 1

Experiment 1 Participants who Preferred Social Over Solitary Stimuli in the Combined PSPA

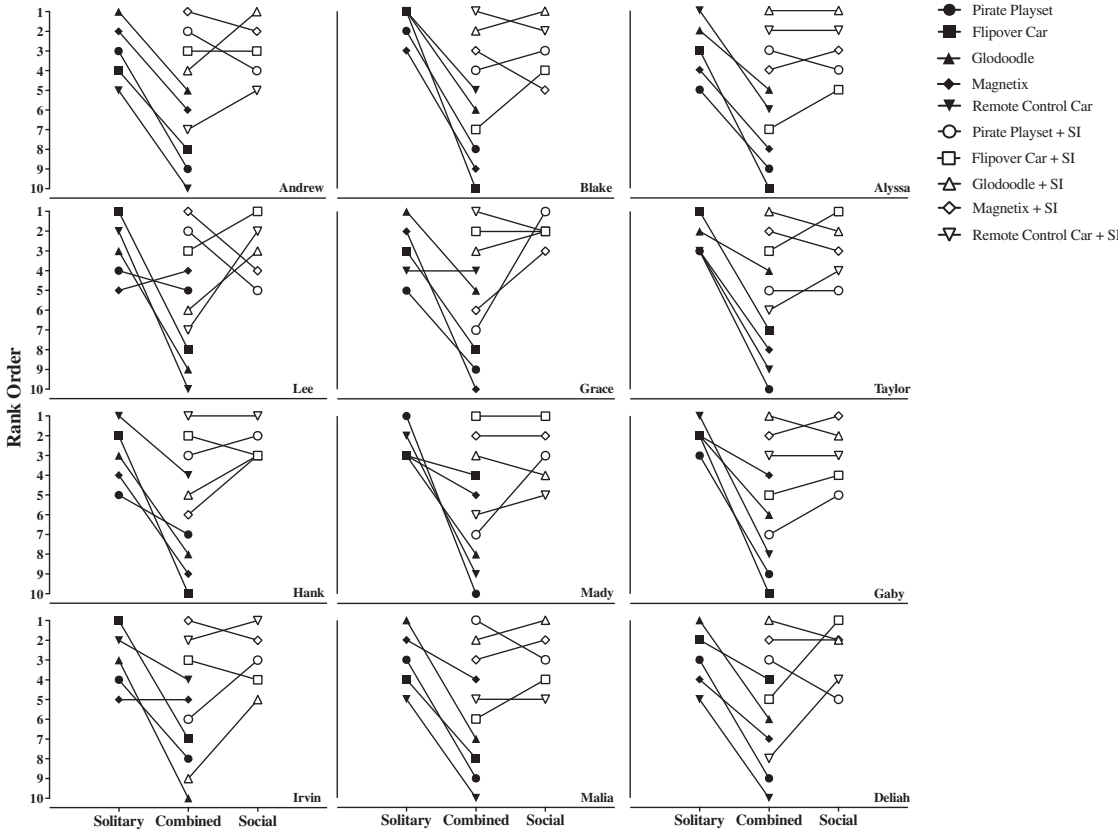


Note. Social interaction is denoted by SI.

Figure 1 depicts the results of the eight participants who preferred social (i.e., toy plus social interaction) over solitary stimuli in the Combined PSPA. That is, for eight participants (Ethan, Pierce, Blaine, Marcus, Brock, Allie, Adam, and Estelle), social stimuli were ranked as their top five items in the Combined PSPA. Figure 2 depicts the results of the 12 participants (Andrew, Blake, Alyssa, Lee, Grace, Taylor, Hank, Mady, Gaby, Irvin, Malia, and Deliah) for whom social stimuli were ranked as their top three or four in the Combined PSPA. Figure 3 depicts the results of the 13 participants who displayed mixed preference for social and solitary stimuli. That is, for the 13 remaining participants (McKenna, Candice, Jaci, Lucas, Callahan, Fitz, Avery, Jax, Jordan, Ivory, Reed, Nick, and Nora), either a social or solitary stimulus was ranked as highest or second highest preference. For seven of these participants (McKenna, Jaci, Candice, Lucas, Callahan, Fitz, and Avery), a social stimulus was ranked as highest preference (Callahan, Fitz, and Avery) or highest and second highest preference (McKenna, Candice, Jaci, and Lucas). For three of these participants (Callahan, Fitz, and Avery), a social stimulus was ranked as their

Figure 2

Experiment 1 Participants Who Preferred Most Social Stimuli over Solitary Stimuli in the Combined PSPA



Note. Social interaction is denoted by SI.

top preferred stimulus. For the remaining six participants (Jax, Jordan, Ivory, Reed, Nick, and Nora), a solitary stimulus was ranked as their top preferred (Jax, Jordan, Ivory, Reed), or their highest and second highest preference (Nick and Nora).

Figure 4 provides a summary of the participants' top five stimuli in the Combined PSPA. Eight participants' top five were social stimuli (i.e., their first, second, third, fourth, and fifth ranked stimuli were toys presented with social interactions). No participants' top five were solitary stimuli. Three participants' top four items were social stimuli (i.e., their first, second, third, and fourth ranked stimuli were toys presented with social interactions). No participants' top four were solitary stimuli. Nine participants' top three items were social stimuli (i.e., their first, second, and third ranked stimuli were toys presented with social interactions). No participants' top three were solitary stimuli. Four participants' top two were social stimuli (i.e., their first and second ranked items were toys presented with social interaction). Two participants' top two were solitary items (i.e., their top first and second ranked items were items presented alone). Three participants' top item was a social stimulus (i.e., their first ranked toy was a social stimulus). Four participants' top item was a solitary stimulus.

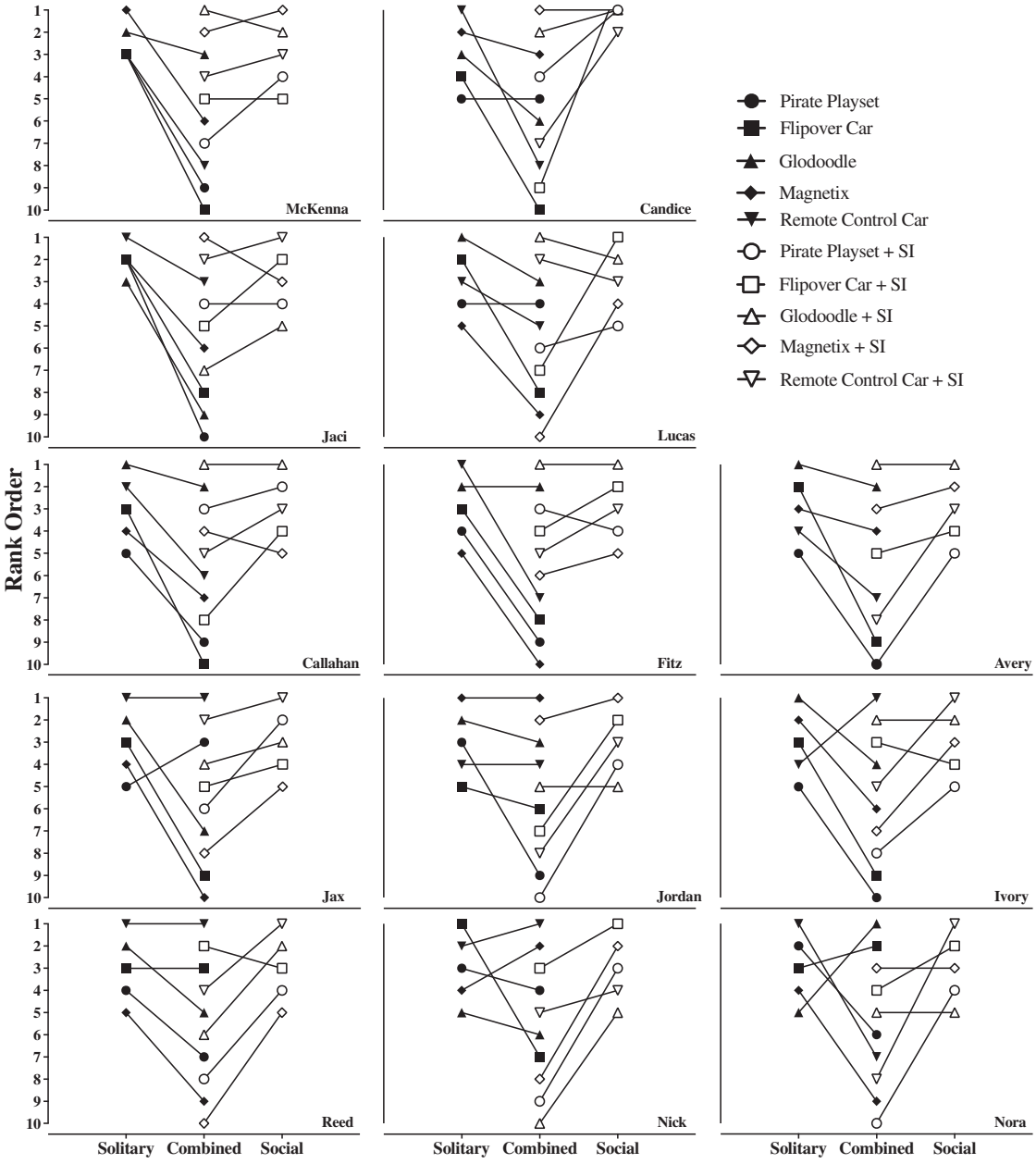
Experiment 2 Method: Reinforcer Assessment

Participants, Setting, and Materials

Twelve participants from Experiment 1 participated in Experiment 2. The purpose of Experiment 2 was to evaluate the extent to which the results of the Combined PSPA (i.e., how the addition of social interaction altered a participant's preference for a stimulus) predicted responding in a reinforcer evaluation.

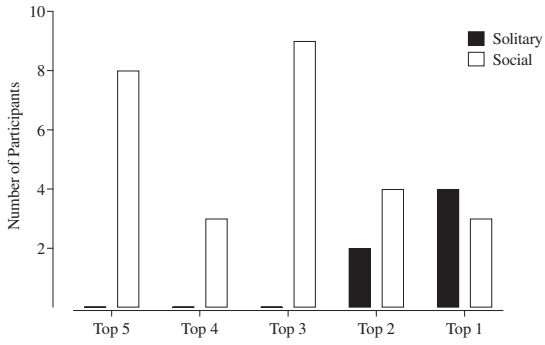
Figure 3

Experiment 1 Participants who Displayed Mixed Preference for Social and Solitary Stimuli in the Combined PSPA



Note. Social interaction is denoted by SI.

Figure 4
Summary of Participants' Top Five Stimuli in the Combined PSPA



Thus, items were selected for Experiment 2 based on participant selection in the Combined PSPA in Experiment 1. The items chosen to be used in the reinforcer evaluation were items that were ranked as the top one or two stimulus within a stimulus category in the Combined PSPA. That is, the item was ranked as 1 or 2 in the Combined PSPA (in either social or solitary) and also chosen first or second when presented in another modality (social or solitary) within the Combined PSPA. For example, for Allie, Candice, Hank, Gaby, Marcus, McKenna, Estelle, Deliah, and Blake, their top-ranked stimulus in the Combined PSPA was a toy plus social stimulus. That same toy alone was chosen first or second as a solitary stimulus in the Combined PSPA. For Jax and Jordan, the top-ranked stimulus in the Combined PSPA was a toy alone (solitary). That same toy plus social interaction was chosen first or second as a social stimulus in the Combined PSPA.

All sessions were conducted in the same session rooms as in Experiment 1, two to four times per day, 3 to 5 days per week. At least one hour elapsed between all sessions. Additionally, the same experimenter who conducted the PSPAs in Experiment 1 with a particular participant conducted sessions in Experiment 2. Task materials included a laminated board, on which there were six equal squares (6 cm by 6 cm) containing black and white pictures of animals (i.e., duck, cat, bird, dog, cow, and horse) and a pile of small, laminated squares (6 cm by 6 cm) with these same pictures. Participants matched the small pictures to the corresponding picture on the board. One alternative task was also available during sessions to act as a control. This task included a common classroom item that was not reported to be high-preferred for participants (e.g., crayons and paper, a book, or a puzzle). Finally, the same pictures of the experimenters used in Experiment 1 were used to denote that social interaction was available for responding during a particular task.

Response Measurement, Data Analysis, and Interobserver Agreement

Trained observers recorded data using iPod data collection devices. The dependent variable was the rate of correct picture matches, defined as the participant placing a matching stimulus (i.e., picture of animal) on the correct sample stimulus on the laminated board and removing their hand. Rate of responding was calculated for each session by dividing the frequency of correct matches by the session duration, minus reinforcer access time. That is, the duration of reinforcer access throughout the session was timed and removed from the total session time before the session rate was calculated.

Data collectors also scored the duration of stimulus access and social interaction. Stimulus access was scored for the duration of time from which the experimenter presented the toy to the participant (stimulus access ON) until the experimenter removed the toy (stimulus access OFF). Similarly, social interaction was scored for the duration of time from which the experimenter began interacting with the participant (social interaction ON) until the experimenter no longer provided interaction for 3 s (social interaction OFF). Social interaction was

defined in the same way as it was in Studies 1 and 2. Procedural integrity was calculated for 34% of sessions during the reinforcer assessment. A stimulus delivery was scored as correct if the experimenter delivered the correct stimulus within 3 s of the participant meeting criteria for access and delivered the stimulus for approximately 30 s (25-35 s of delivery scored as correct). Procedural integrity was 93% (range, 78%-100%) across the reinforcer assessment.

A second observer collected data on approximately 48% of sessions across participants. To determine IOA for picture matching, each 10-min session was partitioned into 10-s intervals, and we calculated IOA using the proportional agreement method. That is, the smaller number of responses in each interval was divided by the larger number of responses, averaged across intervals, divided by the total number of intervals, and multiplied by 100. To determine IOA for stimulus and social interaction delivery, each 10-min session was partitioned into 10-s intervals, and the partial-interval agreement method of IOA was calculated. That is, the number of intervals with agreements was divided by the total number of intervals and multiplied by 100. Mean IOA for correct responses was 98.2% (range, 79%-100%) across participants. Mean IOA for delivery of stimuli and social interaction was 98.9% (range, 90%-100%) across participants.

Procedure

All sessions were 10 min and were conducted using a concurrent-operants arrangement. Phases included baseline and a reinforcement phase. Prior to all sessions, the experimenter prompted the child to sit in the chair or on the floor facing the task materials, then provided presession exposure to each task, response requirement, and associated contingencies in place during each session (see below). The experimenter used three-step prompting, as necessary, to prompt the participant to engage in the required number of responses during presession exposure. Finally, the experimenter reminded the participants (a) of the consequences associated with each response option, (b) that they could switch tasks at any time, and (c) that the experimenter could not talk to them unless they selected the experimenter's picture.

As mentioned above, the task included matching different black and white animal cards to the corresponding black and white animal on the laminated matching board. This task was reported by classroom teachers to be mastered for all participants, and pre-experimental probes suggested all participants correctly engaged in the task. The response requirement to access 30 s of the programmed reinforcer for correct responding on a particular task was a fixed ratio (FR) 6 schedule of reinforcement (i.e., fill the laminated card associated with the stimulus) for 10 participants and an FR 1 schedule of reinforcement (i.e., one laminated picture is placed on laminated card associated with the stimulus) for two participants across all phases. For the two participants for whom a FR 1 schedule of reinforcement was used (i.e., McKenna and Jordan), results of pre-experimental probes of the matching task suggested an FR 6 schedule may have been too high a schedule requirement for these participants. Thus, the response requirement was lessened for these two participants. If during a session, the participant engaged in an incorrect response, the experimenter removed the incorrectly matched card to provide the opportunity for maximum correct responding on the laminated board. Additionally, once a laminated board was filled with all six correct responses the experimenter emptied the board to allow for additional correct responding.

Baseline

During baseline, only one set of task materials was presented to the participant. In

addition, an alternative activity was available (e.g., paper and crayons, books, or a puzzle). The experimenter provided no programmed consequences for either correct or incorrect responding. Further, the experimenter provided no programmed consequences if the participant engaged with the alternative task.

Reinforcement

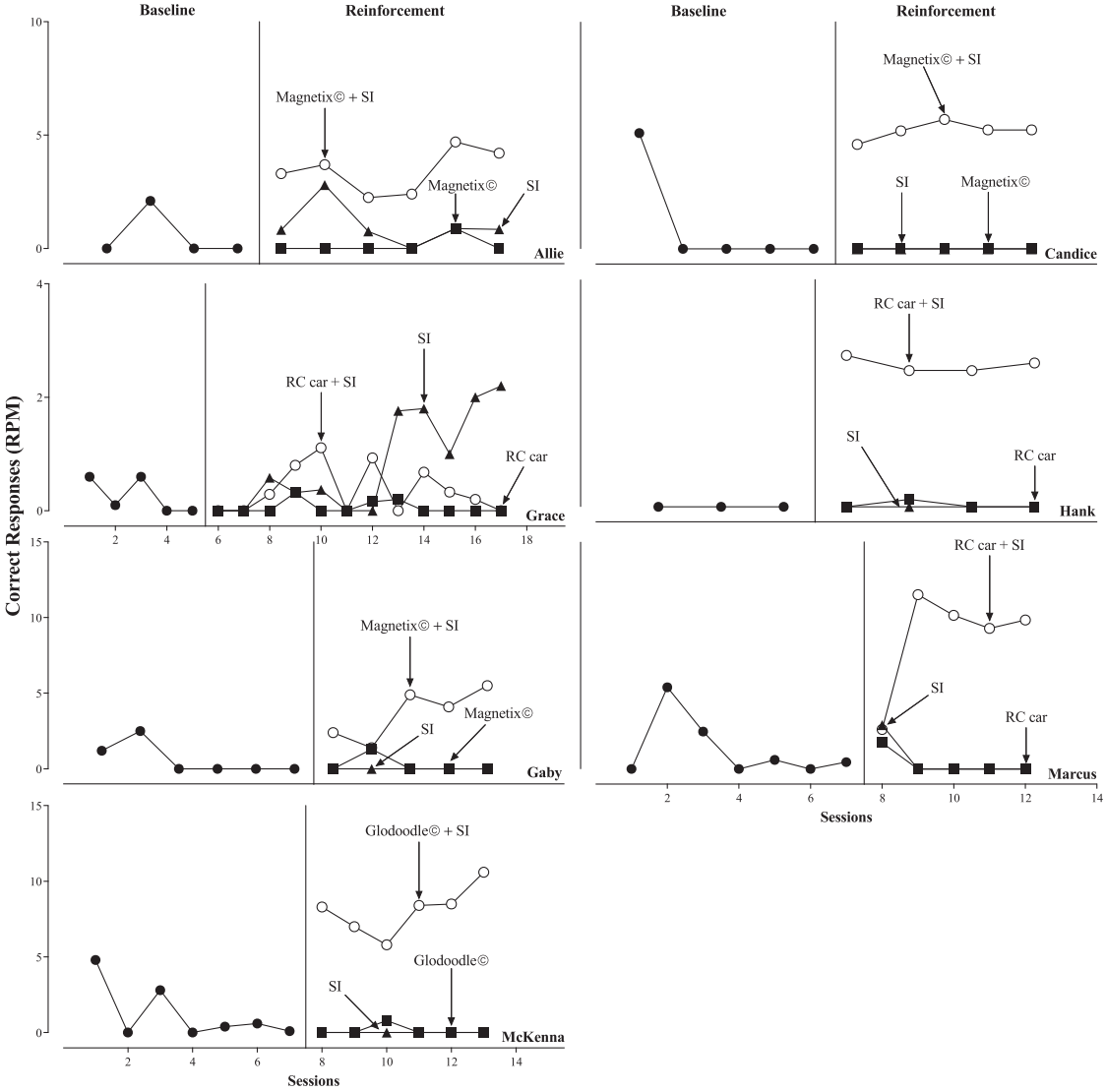
The purpose of the reinforcement phase was to compare response allocation across three concurrently available response options; each response option was associated with a solitary stimulus (toy alone), social stimulus (toy + social interaction), or social interaction alone. During these sessions, three sets of identical task materials and an alternative activity (i.e., paper and crayons, books, or a puzzle) were arranged in a quasirandom order and placed an equal distance apart in front of the participant. One set of task materials was associated with the delivery of the solitary stimulus. Thus, the toy was placed behind the task materials to denote the availability of that stimulus. Each time the participant met their programmed response requirement of correct responding (i.e., FR 1 or FR 6) on this particular task, the experimenter provided 30-s access to the toy. After 30 s elapsed, the experimenter removed the toy. A second set of task materials was associated with the delivery of the social stimulus (toy + social interaction). Thus, the toy and the picture of the experimenter were placed behind the task materials to denote the availability of the toy and social interaction. Each time the participant met the FR 1 or FR 6 requirement of correct responding on this task, the experimenter provided 30-s access to the toy plus social interaction (i.e., identical to the Social PSPA). After the 30 s elapsed, the experimenter removed the toy and social interaction. A third set of task materials was associated with the delivery of social interaction (SI) alone. Thus, only the picture of the experimenter was placed behind the task materials. Each time the participant met the FR 1 or FR 6 requirement on this task, the experimenter provided 30 s of social interaction only. That is, similar social interactions were delivered as in the Social PSPA in Experiment 1; however, interactions did not include talking about a toy (e.g., experimenter engaged in conversation about participants' preferred activities and topics). After the 30 s elapsed, the experimenter terminated social interaction. A social interaction alone stimulus was included in an attempt to determine whether responding occurred to access this consequence or if the combination of the toy plus social interaction was necessary. Participant mands for specific types of attention or for experimenter attention to cease did not occur.

Results

Figures 5-7 depict the results for all participants in Experiment 2. Figure 5 depicts results for the 7 of 12 participants whose Experiment 1 results corresponded with the results from Experiment 2. That is, for these seven participants (Allie, Candice, Grace, Hank, Gaby, Marcus, and McKenna), the most preferred item in the Combined PSPA (i.e., the social or solitary version of the item assessed) was the item for which the participant allocated the most responding in the reinforcer assessment (Experiment 2). For these seven participants, the social stimulus (toy + social interaction) was ranked higher in the preference assessment than the solitary stimulus (toy alone). These seven participants engaged in low levels of responding in baseline and increased levels of correct responding towards the task associated with the social stimulus, which corresponds with the results of Experiment 1. Grace allocated more responding to the task associated with the social stimulus (toy + social interaction) as compared to the solitary stimulus (toy alone); however, the difference was small and she allocated most of her responding to the task

Figure 5

Experiment 2 Participants whose Experiment 1 Results Matched Experiment 2 Results



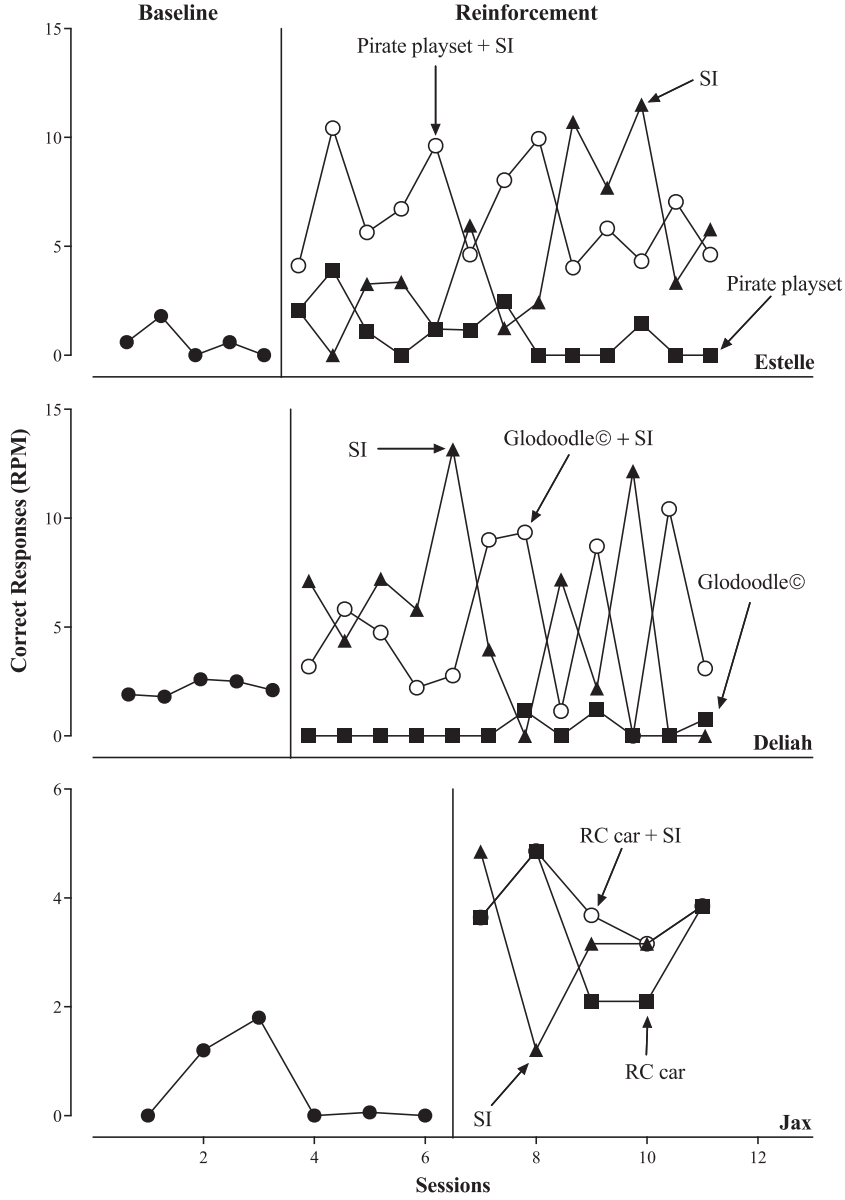
Note. Social interaction is denoted by SI.

associated with social interaction alone. For Grace, social interaction alone may have enhanced her preference for the social stimulus selected in Experiment 1.

Figure 6 depicts results for the 3 of 12 participants whose Experiment 1 results partially corresponded with the results from Experiment 2. In Experiment 1, Estelle and Deliah preferred the social stimulus (toy + social interaction). During their reinforcer assessment, both participants engaged in low levels of responding during baseline and allocated high and similar rates of correct responding to the social stimulus and social interaction only tasks as compared to both baseline levels and the solitary stimulus (toy alone) task. During Experiment 1, Jax preferred the solitary stimulus (toy alone). During the reinforcer assessment, Jax

Figure 6

Experiment 2 Participants whose Experiment 1 Results Partially Matched Experiment 2 Results

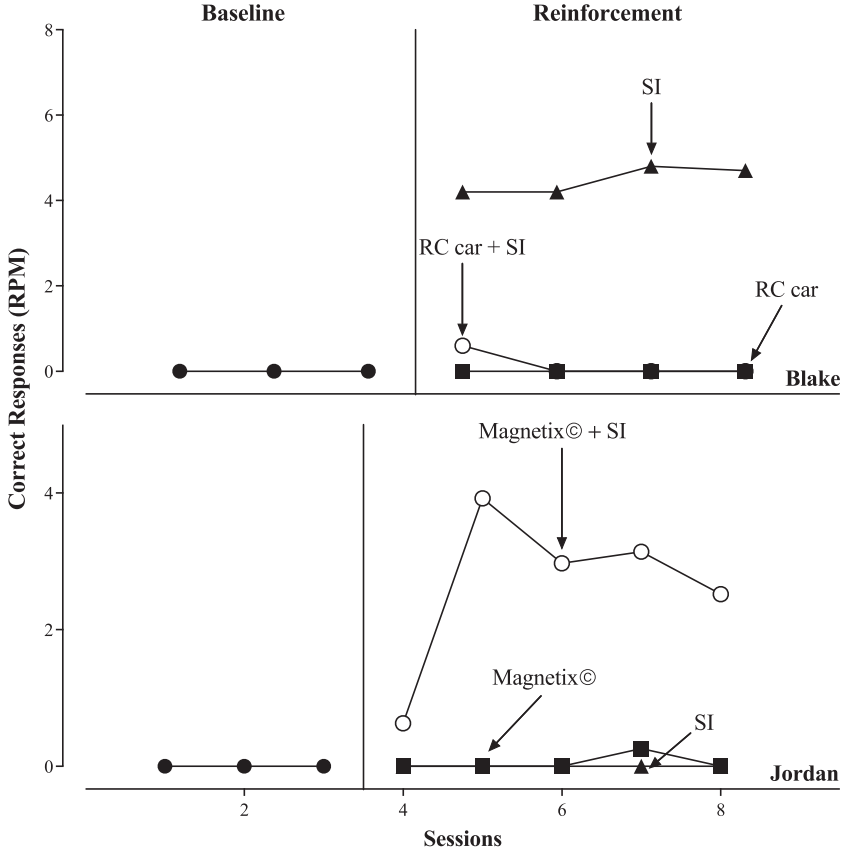


Note. Social interaction is denoted by SI.

allocated similarly high levels of responding across all tasks (i.e., solitary stimulus, social interaction alone, social stimulus).

Figure 7 depicts the results for the 2 of 12 participants whose Experiment 1 results did not correspond with the results from Experiment 2. Blake's most preferred stimulus was the social stimulus. However, during the reinforcer assessment, Blake allocated more responding to the task associated with social interaction alone as compared to baseline and the other two tasks (i.e., solitary and social

Figure 7
Experiment 2 Participants whose Experiment 1 Results Did Not Match Experiment 2 Results



Note. Social interaction is denoted by SI.

stimulus). Jordan's most preferred stimulus was the solitary stimulus; however, Jordan allocated more responding to the task associated with the social stimulus (toy + social interaction) as compared to baseline and the other two tasks (social interaction alone and solitary stimulus).

Overall, results from the Combined PSPA in Experiment 1 corresponded, at least partially, with the results of Experiment 2 for 83% (10 of 12) of participants, whereas for 16.7% (2 of 12) of participants, results from Experiment 1 did not correspond with Experiment 2.

General Discussion

Results of Experiment 1 demonstrated that most participants showed preference for stimuli paired with social interaction, when compared to stimuli presented alone in a single assessment. In fact, for all participants, a social stimulus was included in their top-three rank; for most participants (82%), a social stimulus was ranked number one. Further, results of the Combined PSPA revealed that for some participants (24%), all stimuli paired with social interaction were more preferred than the same stimuli presented without social interaction. No participant in the current evaluation had all solitary stimuli ranked above social stimuli in the Combined PSPA. In comparing results across the Solitary and Social PSPAs, results showed that most participants had the same toy ranked as their highest or second highest preferred item

across assessments. Thus, preferences for the highest preferred toys across assessments was relatively stable. Given that clinicians would presumably use the highest preferred stimuli from SPAs in intervention programs, results for these participants suggest that regardless of whether social interaction was provided with the toy in the assessment, the same items would be chosen for treatment.

In Experiment 2, we wanted to determine if similar allocation of responding for toys with and without social interaction would occur when the participant was required to engage in a pre-academic task. Furthermore, we included a social interaction-only stimulus option in an attempt to determine if it was the combination of the toy and social interaction that increased the value of the toy, or if it was simply social interaction. Overall, 10 of the 12 participants' Combined PSPA results matched or partially matched the results of the reinforcer assessment. For the remaining two participants, results of the Combined PSPAs did not correctly predict the outcome of the reinforcer assessment. Additionally, results of Experiment 2 demonstrated that 7 of the 12 participants allocated more correct responding toward the task associated with the social stimulus (toy + social interaction), 2 of 12 participants allocated more and similar levels of correct responding to the tasks associated with social interaction alone and the social stimulus (toy + social interaction), 2 of 12 participants allocated more correct responding to the task associated with social interaction only, and one participant allocated correct responding to all tasks (i.e., social interaction alone, solitary stimulus, and social stimulus). No participants allocated more responding to the solitary stimulus (i.e., toy without social interaction). These results suggest that regardless of the toy, the majority of participants allocated more responding to conditions that included social interaction (either alone or paired with toy).

Results of the current evaluation are consistent with previous research demonstrating that the inclusion of qualitatively different stimuli in a single assessment may influence the results of a SPA (e.g., DeLeon et al., 1997; Ortega et al., 2012; Sipila-Thomas et al., 2020). Most participants preferred stimuli paired with the delivery of social interaction over the same stimuli delivered without social interaction. Thus, solitary stimuli and social stimuli are qualitatively different and may result in different preferences. Therefore, when designing and conducting SPAs, clinicians should consider how stimuli might be delivered in their treatment or educational programs. For example, if stimuli will be delivered in a solitary manner (e.g., the therapist plans for the individual to engage with the item while they enter data), then they should be presented that way in the preference assessment. Furthermore, data from both studies suggest the delivery of social interaction with toys may enhance the toys' value. Thus, when attempting to determine stimuli that may have robust effects on treatment and educational programs for young children, practitioners and teachers should consider the delivery of social interaction with those stimuli.

Previous research has demonstrated that access to adult attention, particularly in the form of conversation, is preferred for many typically developing children (e.g., Harperet al., 2021). In the current evaluation, social interaction in the form of conversation about the toy was delivered simultaneously with the social stimuli, which may have added to the value of the toy and resulted in an increased preference for the social stimuli. Further, the addition of social interaction may have added a level of variation to the associated stimuli. That is, it is possible that the variability in conversation may have influenced participant preference for the item as variation in stimulus delivery has been shown to enhance preference (Egel et al., 1981; Keyl-Austin et al., 2012; Wine & Wilder, 2009).

Although variability in social interaction may have enhanced preference, the type and variability of social interaction was not controlled within or across participants and assessments. Experimenters were told to provide exuberant interaction; however, they were not provided scripts or instructions regarding the type and number of different social interactions to provide. Thus, the type and variability in social interaction may have influenced responding. For example, some experimenters might have had conversations in some sessions or with some participants that were more preferred than others, which may have influenced responding within and across participants. However, the results suggest that social interaction seemed to influence preference and response allocation even when it was not controlled within and across participants. Regardless, future research might involve evaluating the influence of various aspects of social interaction that result in social stimuli (toys plus social interaction) or social interaction alone being more preferred. Further, in the current evaluation, the social interaction provided was always delivered by an adult experimenter. It would be interesting to determine the extent to which the addition of social interaction by a peer would influence an individual's preference for a stimulus.

Another limitation of the current study is that the items used were not individualized. Items were standardized across participants, age-appropriate, and readily available in the participants' classrooms. Further, it was hypothesized that some of the chosen items may facilitate more social play and be enhanced by social interaction (e.g., the pirate playset), whereas others may facilitate more solitary play (e.g., Magnetix©). However, there were no consistent patterns of preference across items when presented alone or with social interactions. Not individualizing the items may have influenced the results as a participant may not have had high-preferred items in the array. Further, although there were no consistent patterns of responding observed to suggest certain items included in our evaluation facilitated more social or solitary play, it would be interesting to determine whether items that have historically been viewed as solitary stimuli (e.g., books or computer games) versus social stimuli (e.g., board games) would be more or less preferred when they are paired with various types of social interaction (e.g., Quilitch & Risley, 1973). Additionally, all stimuli included in the current evaluation were non-screen-based toys; thus, it is unknown what impact social interaction may have on an individual's preference for screen-based, or more high-tech items (e.g., video game, tablet, computer).

Another notable limitation in the current evaluation is that only children who were reported to engage in social interactions, at least periodically, with classroom supervisors and peers were included. That is, children who were reported to be shy or children for whom social interactions appeared to be less preferred were not included. It would be interesting to determine whether these children would show similar patterns of responding to those in the current study.

Another possible limitation is the degree to which the experimenters were familiar to participants. For some participants, experimenters were more familiar in that they were their classroom supervisors, whereas for other participants, the experimenters were less-familiar individuals (i.e., supervisors in other classrooms). However, no consistent difference in responding was observed based on familiarity. In addition, the degree to which social interaction from the experimenter or the type of social interaction that was manipulated in session was available throughout the day might have influenced the effects of social interaction on responding in the current study. Thus, the state of satiation or deprivation of experimenter attention was unknown across participants and sessions. Given responding is influenced by

relative states of satiation or deprivation (Vollmer & Iwata, 1991), future research might involve evaluating the degree to which access to social interaction by a particular individual or type of social interaction influences preference and reinforcer efficacy. Furthermore, all participants included were typically developing preschool-aged children; thus, the generality of these results across different populations is unknown. Given that previous research has suggested potential differences across populations in preference displacement of leisure and edible items (e.g., adults with dementia; Ortega et al., 2012; children with ASD; Sipila-Thomas et al., 2020), future research should evaluate patterns of responding when social interaction is and is not included with the delivery of stimuli across various populations.

The methodology used in Experiment 2 is another notable limitation. Although we evaluated the relative reinforcing efficacy of the same social and solitary stimuli using a concurrent-operants arrangement (Experiment 2), including social interaction alone, we were not able to determine the absolute reinforcing efficacy of these stimuli. If we had used a single-operant evaluation in which the reinforcing efficacy of each stimulus was evaluated alone, we would be better able to determine whether each of the stimuli included in the assessment functioned as reinforcers. Similarly, in the current evaluation, only high-preferred stimuli were included in the reinforcer evaluation; thus, it is unknown how participants would have responded if moderate- and low-preferred stimuli were evaluated.

Another limitation, and important avenue for future research, is the clinical relevance of the response included in the reinforcer evaluation. That is, the response used in the current evaluation was not a behavior of clinical significance (i.e., a known matching task) and it is important to understand the effects of including social interactions in SPAs and within the context of teaching or behavior reduction procedures.

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