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# Preference for and reinforcing efficacy of different types of attention in preschool children

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It is unknown whether and to what extent common types of attention delivered in early childhood environments are preferred by and function as reinforcers for young children. We assessed children's preference for commonly delivered types of attention across 31 preschool-aged participants (Experiment 1). Next, we conducted a reinforcer assessment (Experiment 2) and a progressive-ratio assessment (Experiment 3) to (a) validate the results of the preference assessment and (b) determine the relative reinforcing efficacy of each type of attention. Results of Experiment 1 showed that most participants preferred conversation or physical interaction. Results of Experiment 2 validated the results of Experiment 1 showing preferred types of attention were more likely to function as reinforcers. Finally, although some types of attention functioned as reinforcers, results of Experiment 3 indicated these reinforcers only maintained responding under relatively dense schedules of reinforcement. Clinical implications and directions for future research are discussed.

*Key words:* attention, preference, preschool children, progressive-ratio schedule, reinforcement

A common form of social positive reinforcement is the delivery of attention, which can include vocal-verbal interactions (e.g., praise and conversation), physical interactions (e.g., hugs and pats on the back), facial expressions (e.g., smiles and winks), or some combination of these stimuli. Previous research has shown the reinforcing effects of attention for increasing and maintaining a variety of appropriate behaviors (e.g., verbal behavior, social skills, academic performance, classroom behavior; Allen et al., 1964; Clausen et al., 2007; Hall et al., 1968; Horne & Lowe, 1996; Polick et al., 2012; Schutte & Hopkins, 1970;

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Weyman & Sy, 2018) in various populations and settings. Furthermore, various early childhood position papers and organizations suggest delivery of attention (i.e., praise, physical interaction, and conversation) for social–emotional development and teaching important skills (Cengher & Fienup, 2020; NAEYC, 2014; Serna et al., 2002). For instance, because attention is one of the most easily delivered and socially accepted forms of reinforcement (Brophy, 1981; Kazdin, 2013), most teachers and professionals working with children are trained to use their attention as a primary behavior-change strategy. Given the ubiquity of attention delivery in early childhood classrooms, it is important to understand children's preference for and the reinforcing efficacy of attention as a reinforcer within this setting.

Although numerous studies, review papers, and other resources suggest using attention to positively influence children's behavior, little is known about the conditions under which it functions as a reinforcer (Vollmer & Hackenberg, 2001). Several studies have shown that different types of attention (e.g., praise, physical interaction, conversation-style interaction; e.g., Kelly et al., 2014; Kodak et al., 2007; Roscoe et al., 2010) or the content of vocal-verbal attention (e.g., general or descriptive praise; e.g., Polick et al., 2012), when delivered in isolation or in combination, likely function as a reinforcer. Thus, it appears there is preliminary evidence that different types of attention may differentially influence levels of responding across participants.

In fact, recent research has demonstrated that types of attention are differentially preferred and function as reinforcers for children diagnosed with autism spectrum disorder (ASD; Clay et al., 2013; Clay et al., 2018; Hunnington & Higbee, 2018; Kelly et al., 2014; Lang et al., 2014; Morris & Vollmer, 2019; 2020a; 2020b; Nuernberger et al., 2012; Smaby et al., 2007; Weyman & Sy, 2018; Wolfe et al., 2018). For example, Kelly et al. (2014) investigated preference for and reinforcing efficacy of different types of attention for increasing appropriate behavior for five individuals. For each participant, seven different types of attention (e.g., singing, hugs, praise) were included in a preference assessment to identify the most and least preferred forms of attention for each participant. Next, in a single-stimulus reinforcer assessment, the most and least preferred forms of attention were delivered for prompted mands. Results showed the attention preference assessment was a valid procedure for identifying types of attention that would function as reinforcers. That is, all participants manded at higher rates for their most preferred type of attention. Interestingly, for some participants their least preferred form of attention also functioned as a reinforcer, suggesting these lower preferred forms of attention may also be effective at maintaining high rates of manding.

Additionally, Clay et al. (2018) investigated preference for and reinforcing efficacy across three classes of stimuli, which included physical attention (e.g., tickles, fist bump), vocal-verbal attention (e.g., talking about family, singing), and edibles (e.g., skittles, pretzels), for two children with ASD. Preference hierarchies were established in all three classes of stimuli and the top three from each stimulus class were included in a preference assessment across stimulus classes for each participant. Not surprisingly, the three edible items were most preferred across both participants; however, preference for the physical and vocal-verbal stimuli varied across participants. Despite varied preference for physical and vocal-verbal stimuli across participants, both participants responded at higher rates for the physical stimuli as compared to the vocal stimuli, suggesting that physical attention consequences were relatively more reinforcing than vocal-verbal consequences. Although this experiment compared classes of different types of attention, it did so with only two children diagnosed with ASD.

In a series of studies, Morris and Vollmer (2019, 2020a, 2020b) have shown the efficacy of the social interaction preference assessment (SIPA) for determining reinforcers for children diagnosed with ASD. The SIPA involves presenting multiple pictorial stimuli (i.e., different colored shapes to denote experimenter–participant interactions), restricting selected stimuli, and measuring selection as an indicator of preference for a particular interaction. The SIPA is similar to a multiple-stimulus without replacement preference assessment (DeLeon & Iwata, 1996) in that stimuli are simultaneously presented; however, it differs in that exposure trials are conducted before each session and sessions are conducted until a preestablished criterion is met for restricting stimuli. Results from Morris and Vollmer (2019) showed the SIPA identified differentially preferred and reinforcing types of social interaction for all five participants. Overall, results of the Morris and Vollmer studies have suggested the SIPA format is useful for identifying social reinforcers, producing stable and valid preference hierarchies, and demonstrating social interactions alone can function as effective reinforcers for increasing socially important skills in children with ASD. However, less is known about whether common types of attention are preferred and function as reinforcers with typically developing preschool-aged children.

In another recent experiment, Senn et al. (2020) evaluated the efficacy of praise as a reinforcer using known tasks (Experiment 1) and then compared the efficacy of descriptive versus general praise for acquiring unknown tacts (Experiment 2) for six children, three of whom were typically developing. Results of Experiment 1 indicated that praise only functioned as a reinforcer for two of the six participants (and none of the three typically developing children). Four of the participants from Experiment 1 participated in Experiment 2, two of which were typically developing. For participants who demonstrated a preference for praise in Experiment 1, a prompt-only condition was more or equally effective in teaching unknown tacts when compared to the prompt-plus-praise condition. For the two participants who demonstrated a preference for edibles over praise in Experiment 1 (i.e., both typically developing), the edibles condition resulted in quicker acquisition of unknown tacts as compared to the prompt or prompt-plus-praise condition in Experiment 2. Preference for general or descriptive praise was assessed following Experiment 2 and results varied across participants. That is, two participants preferred descriptive praise despite this consequence having minimal effects on acquisition, one participant (typically developing) preferred each type of praise equally, and the other participant (typically developing) preferred no therapist praise. These findings suggest that although praise can function as a reinforcer under some circumstances for some children, the type of attention must be carefully considered on an individual basis.

Most of the aforementioned studies demonstrated that different types of attention are differentially preferred and function as reinforcers for children diagnosed with ASD; however, less is known about whether common types of attention are preferred and function as reinforcers with typically developing preschool-aged children. Moreover, the degree to which attention would continue to function as a reinforcer when the response effort (e.g., homework completion) is increased has not been evaluated. Further, although physical interaction and conversation are common forms of attention delivered, they have not been included in previous evaluations with typically developing children; therefore, preference for and reinforcing effects of physical interaction and conversation are unknown with this population. Finally, although these assessments may be conceptualized as a form of reinforcer assessment that differ along a continuum of response effort and topography of target response required to access

the reinforcer, identifying and validating a simple assessment methodology for predicting the reinforcing efficacy of attention for an individual may be of great value if accurate results can be identified in a relatively brief manner.

The purpose of the current experiment was to replicate and extend previous research by determining preference for and reinforcing efficacy of three types of attention (i.e., praise, physical interaction, and conversation) with typically developing preschool-aged participants. We evaluated these three types of attention because they were (a) observed to be most commonly delivered by teachers in our preschool classrooms, (b) common types reported in the literature (e.g., McKerchar & Thompson, 2004), and (c) suggested to be used as best practice in early childhood environments by the NAEYC (2005; 2009) and in positive behavior support interventions (Stormont et al., 2005). First, we developed a preference assessment to determine the relative preference of these three types of attention for a large number of preschool-age participants (Experiment 1). Second, to validate the preference assessment in Experiment 1, we conducted a reinforcer assessment to determine the reinforcing efficacy of these types of attention (Experiment 2). Third, we conducted a progressive-ratio (PR) assessment to determine the relative reinforcing strength of the three types of attention (Experiment 3).

## Experiment 1 (Preference Assessment)

### Method

#### *Participants and Setting*

Thirty-one typically developing children (16 males and 15 females), ranging in age from 2 to 5 years, who attended our university-based preschool, participated in Experiment 1. Sessions were conducted in a room (approximately 3 m x 2.7 m), adjacent to the participants' classroom, that contained a table, chairs, and relevant session materials. Sessions were 2 min in duration and were conducted one to five times per day, 3 to 5 days per week.

#### *Materials*

During all attention preference assessment sessions, task materials included three different pictures (21.6 cm x 27.9 cm) of the experimenter and participant, each of which represented a different type of attention. Furthermore, for some participants, a blank and solid white card was included to serve as control. The picture depicting praise showed the experimenter talking to and making a thumbs-up to the participant. The picture depicting physical interaction showed the experimenter tickling, high-fiving, or hugging the participant. The picture depicting conversation showed the experimenter talking with the participant. We selected a picture of the experimenter and participant for each attention condition if it (a) accurately represented the type of attention for that condition (e.g., experimenter tickling participant to represent physical attention) and (b) was disparate enough from other pictures to increase likelihood of discrimination between attention conditions.

#### *Dependent Variable, Data Collection, and Interobserver Agreement*

Trained observers recorded participant and experimenter behavior using handheld iPod Touch® devices and a data collection app to collect data. Observers collected data on the frequency of picture touches toward each of the three pictures depicting the three different types of attention (i.e., praise, physical interaction, and conversation) and control card (if applicable), which we converted to a rate measure as our primary dependent variable. A picture or card touch was defined as the participant placing any part of their hand on one of the available stimuli. The duration of different types of attention was based on how they were typically delivered in the participant's classroom. To control for the varying durations of attention

delivery, we removed this time from the total session time prior to calculating the rate of picture or card touches. We decided to use this method for calculating response rates given that we did not observe participants engaging in the target response during attention delivery (although they could have) and because it allowed us to compare relative rates of responding across attention types.

During all sessions, observers collected data on the frequency and duration of experimenter delivery of attention. Observers collected duration data for each type of attention by scoring when a type of attention began and ended. The total duration of attention delivery was calculated by summing the period of time(s) in which a particular type of attention was delivered for a particular session. *Praise* was defined as a general positive statement delivered by the experimenter to the participant (e.g., "Awesome!" "Great job!" and "Very cool!"). *Physical interaction* was defined as tickles (i.e., physical touch by the experimenter to the participant on the stomach, underarms, or legs while making statements like "Tickles!" and "You're so ticklish!"), high-fives (i.e., physical touch by the experimenter to the participant by slapping hands together while making statements such as "High-five!"), or hugs (i.e., physical touch by the experimenter to the participant by reaching out and wrapping arms around participant while making statements such as "Oh, I love hugs."). *Conversation* was defined as the experimenter verbally interacting with the participant about either (a) activities that occurred in the classroom that day (e.g., "I saw that there are princess dresses out today. I really like the blue one; it's pretty!") or (b) known preferred topics as determined by casual observation of the participant in the classroom (e.g., "I think I will dress up as Darth Vader for our Halloween party. I really love Star Wars.").

A second observer independently collected data on participant and experimenter behavior for an average of 59% (range, 25% – 100%) of sessions across participants. To calculate interobserver agreement, observers' records were divided into 10-s intervals and compared on an interval-by-interval basis. Agreement was calculated by dividing the smaller number of responses by the larger number of responses recorded in each interval, summing these quotients, dividing this number by the total number of intervals, and converting this ratio to a percentage. For all participants, mean agreement was 96% (range, 60% – 100%). The lower ranges (i.e., below 80%) only occurred in one or a few sessions per participant and were due to the low number of instances of picture touches. That is, one observer scored one type of picture and the other scored another type of picture or no picture touch during that interval. Experimenters conducted additional training and reviewed operational definitions with all observers following sessions in which agreement was low.

### *Procedures*

We used a concurrent-operant arrangement (Fisher & Mazur, 1997) to determine the preferred type of attention for each participant. That is, the three different pictures of the experimenter and participant and the control card (for some participants) were placed in front of the participant, equidistant from each other. Each picture was associated with one of the three different types of attention (i.e., praise, physical interaction, and conversation) or no attention (control card). In addition, the pictures were placed in a different sequence across sessions in a quasirandom fashion. If a participant engaged in similar levels of responding across all attention types for several consecutive sessions, we introduced a blank control card to aid in discrimination across pictures and the corresponding contingency. Prior to the start of each session, the experimenter provided rules and presession prompts. First, they described the contingencies for selecting each picture (e.g., "If you select this one [pointing to the physical interaction picture], I

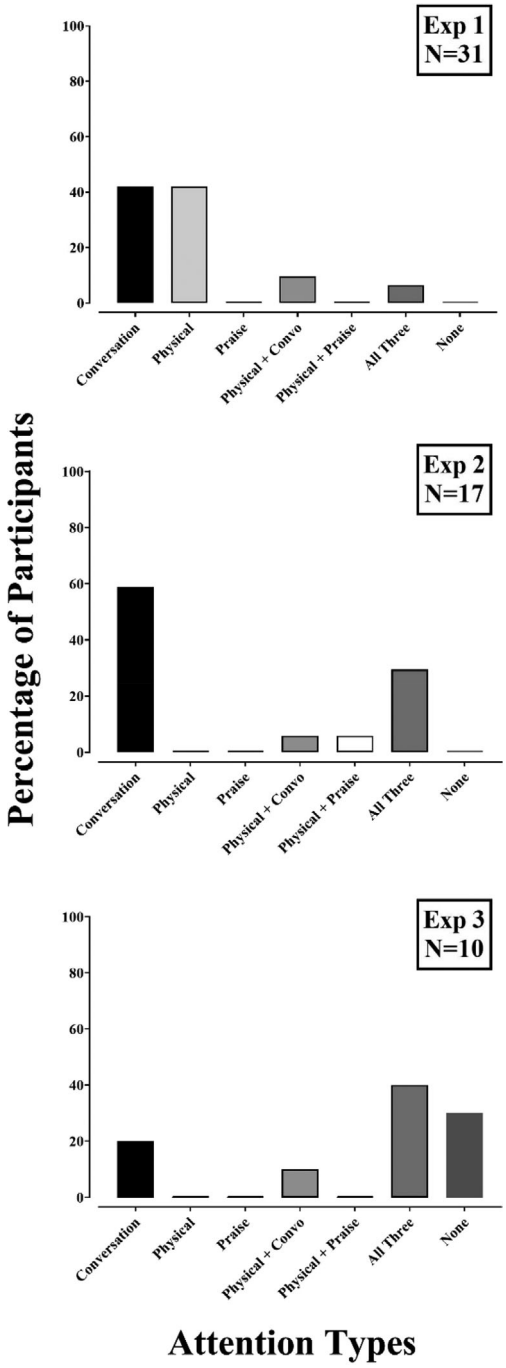
will tickle you."). If applicable, they also described the contingency associated with the white control card (i.e., "If you select this one [pointing to the control card], I won't do anything"). Second, the experimenter conducted two presession exposure trials in which the participant was prompted to touch each of the pictures (and control card, if applicable) and experience the corresponding contingency associated with each one. For example, they instructed the participant to touch the picture associated with praise, and immediately following the picture touch, the experimenter delivered a praise statement (e.g., "Woohoo!" or "You are amazing!"). Finally, they told each participant that they could touch any of the pictures as many times as they wanted.

The same experimenter conducted all sessions for a given participant. An experimenter was paired with a participant based on their prior history and familiarity with each other (i.e., they were a teacher in the participant's classroom or had frequent contact with the participant as a teacher in a nearby classroom). During each session, picture touches resulted in the experimenter delivering the selected type of attention for a brief period. Rather than equating each instance of attention delivery across the different types of attention (i.e., praise, physical interaction, and conversation), each type of attention was provided based on how it was typically delivered in the classroom. That is, 2 s of praise or physical interaction were delivered for touching those respective pictures, whereas 5 s of conversation was delivered for touching the conversation picture. We decided to do this because longer delivery times of praise and physical interaction may seem unnatural or might become aversive and shorter delivery times of conversation may not be sufficient for the participant to contact the reinforcing qualities of this attention type, which may influence their preference. Praise involved the delivery of various praise statements; however, we did not script these praise statements, nor did we control for the number of different praise statements that were delivered within or across sessions. Physical interaction involved either the delivery of tickles, high-fives, or hugs and included a vocal statement that we commonly observed to coincide with delivery of physical interaction in the classroom (e.g., "I'm going to get you!," "High-five up high!," and "I love when I get hugs from you!"). The three different types of physical interaction were delivered in a quasirandom fashion across picture touches for physical interaction. For example, if the participant selected the physical interaction picture on three separate occasions, the experimenter may have delivered tickles on the first selection, high-fives on the second selection, and hugs on the third selection. Conversation entailed a verbal interaction with the participant involving the discussion of a preferred topic or some activity in which the participant was observed to be engaged in the classroom earlier that day. Topics of conversation were typically based on the experimenter's familiarity with the participant's interest and could have been a continuation of a previous conversation topic. During all sessions, the experimenter attempted to control for the quality of attention by keeping their voice inflection and facial expressions the same across all deliveries of all types of attention.

## Results

Representative results of the attention preference assessment are shown in Figure 2, and overall results are found in the top panel of Figure 1. Additional individual participant data are found in subsequent figures for Experiments 2 or 3 or in the online Supporting Information. Overall, we observed four general outcomes across the 31 participants in Experiment 1. As represented by Ed's data in the first panel of Figure 2, 13 out of 31 participants responded at higher rates for conversation as compared to praise and physical interaction, suggesting

**Figure 1**
*Percentage of Participants for Whom Each Attention Type was Most Preferred (Experiment 1) and Reinforcing (Experiments 2 and 3)*




preference for conversation. As represented by Jules' data in the second panel of Figure 2, 13 of 31 participants responded at higher rates for physical interaction as compared to praise and conversation, suggesting preference for physical interaction. As represented by Ben's data in the third panel of Figure 2, 3 out of 31 participants responded at similar and higher levels for both conversation and physical interaction as compared to praise, suggesting preference for both conversation and physical interaction. As represented by Cody's data in the fourth panel of Figure 2, 2 out of 31 participants responded at similar and high rates for all three types of attention as compared to a control card, suggesting preference for all three types of attention.

As shown in the top panel of Figure 1, overall results suggest that different participants preferred (i.e., responded at higher levels for) different types of attention with the majority preferring conversation and physical interaction. In addition, the results indicate that praise was not preferred by most participants, and the only participants who preferred praise were also participants who preferred all types of attention. In other words, praise was not exclusively preferred by any participant in this experiment.

## Experiment 2 (Reinforcer Assessment)

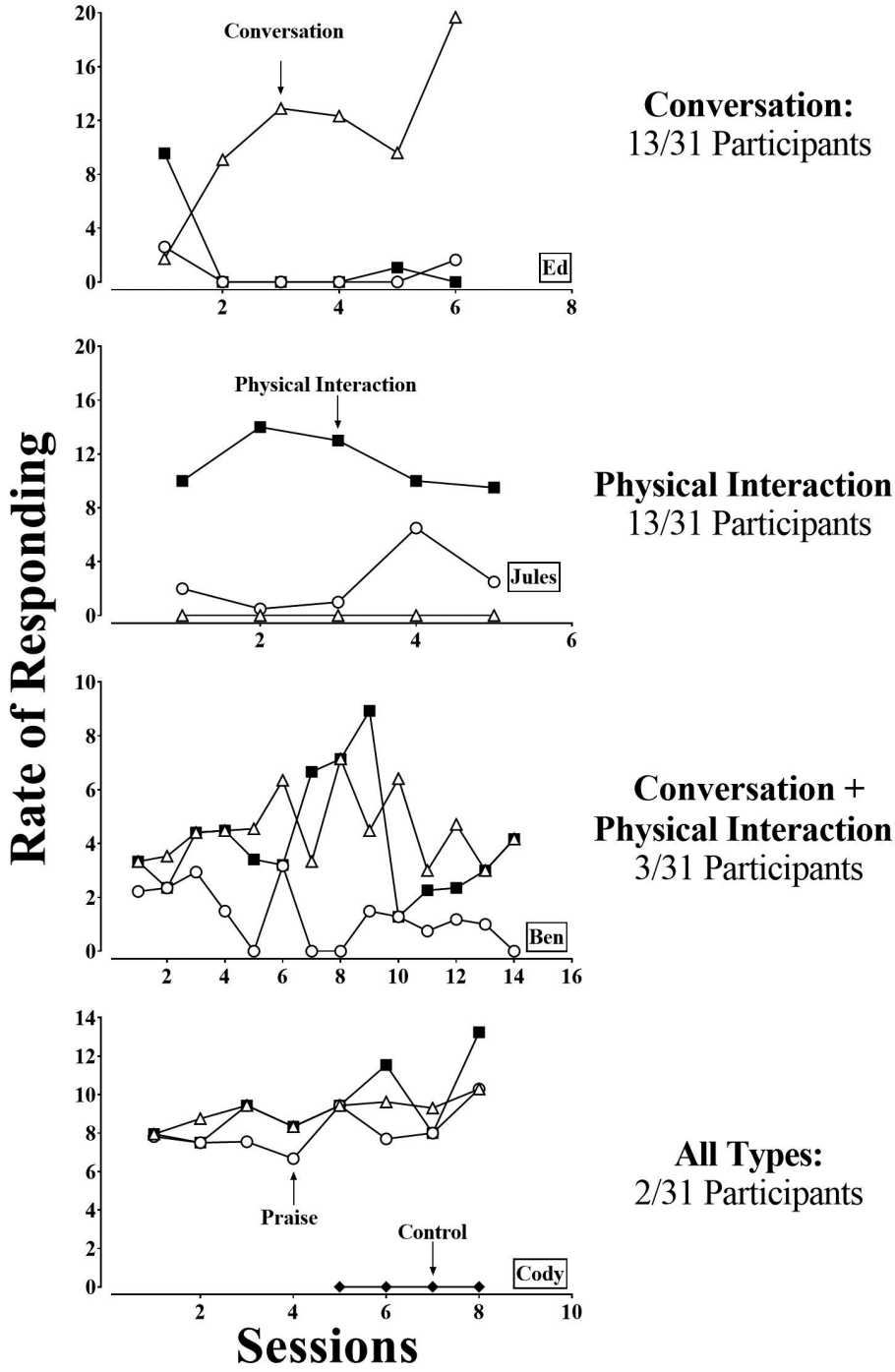
### Method

#### *Participants and Setting*

Seventeen typically developing children who participated in Experiment 1 who were still enrolled in the preschool and consistently assented to attending sessions also participated in Experiment 2. Prior to inclusion in the experiment, brief probes were conducted to determine whether the participant could correctly engage in the target task (letter-matching task). That is, the experimenter sat with the participant at the table and asked them to match alphabet letter cards to the corresponding letter on a matching board. If the participant could

**Figure 2**

*Representative Data for Four General Outcomes of Attention Preference Assessment and Number of Participants who Displayed Those Outcomes (Experiment 1)*



correctly match for the first five trials, they were included in Experiment 2. Sessions were conducted in the same session rooms as in Experiment 1 which contained a table, chairs, and relevant session materials.

### *Materials*

During all sessions, the target task materials and alternative task materials were present. The target task was a letter-matching task which included up to three poster boards each displaying the entire alphabet (each board measured 21.5 cm x 27.9 cm) and three accompanying sets of individual letter cards (each card measured 4.4 cm x 4 cm) each displaying a single letter. Specifically, each poster board depicted all 26 upper-case letters of the alphabet and each set of cards was made up of 26 individual cards, each depicting one lowercase letter of the alphabet. The alternative task included either crayons and paper, a book, or a puzzle. During attention sessions, one of the pictures depicting different types of attention (the same used in Experiment 1) was present to indicate the type of attention that would be available during that session.

### *Dependent Variable, Data Collection, and Interobserver Agreement*

Trained observers recorded participant and experimenter behavior using handheld iPod Touch® devices and a data collection app to collect data. The primary dependent variable was the frequency of correct, independent responses on the letter-matching task, which was converted to a rate measure. Correct, independent responses were defined as placing a card depicting a lowercase letter on top of the corresponding upper-case letter on the board. Observers also collected data on incorrect responses, which were defined as placing a card depicting a lowercase letter on top of the incorrect upper-case letter on the board. Finally, observers collected data on the frequency and duration of attention delivery by the experimenter (as described in Experiment 1). Similar to Experiment 1, we removed the duration of the delivery of each type of attention from the session time to control for the opportunity to respond across different attention sessions.

A second observer independently collected data on participant and experimenter behavior for 48% (range, 25% – 69%) of sessions for all participants throughout Experiment 2. The same methods described in Experiment 1 for calculating agreement were used. For all participants mean agreement was 96% (range, 70% – 100%).

### *Procedures*

During all sessions, the target task (i.e., letter-matching task) materials and alternative-task materials were placed in front of the participant. The alternative tasks were based on observation of common items available in the participants' classrooms and were included to decrease the likelihood that the participants would engage in the target task because "there was nothing else to do." Finally, a picture (the same used in Experiment 1) depicting the type of attention available during a particular session (i.e., praise, physical interaction, or conversation) was placed behind the task stimuli during sessions that involved the delivery of a particular type of attention.

Prior to the start of each session, the experimenter provided rules to the participant about the contingencies for the given session. In addition, the experimenter conducted two presession prompts in which they vocally prompted the participant to engage in the response (i.e., correctly match a letter) and delivered the contingencies associated with the session. Finally, for all sessions that involved the delivery of attention, that type of attention was delivered identically to how it was delivered in Experiment 1; however, it was delivered on a fixed-ratio (FR) 1 schedule of reinforcement for independent, correct responding on the target task. All sessions in Experiment 2 were

5 min, and we used a multielement or a reversal design to demonstrate experimental control.

**Baseline.** Baseline sessions were conducted as the control condition for some participants. Prior to the start of each baseline session, the experimenter told the participant, "You can match the letters or you can play with this (and pointed to the alternative task), but I can't talk to you while I am sitting here." During these sessions, the experimenter did not place any pictures behind the task stimuli and delivered no programmed consequences for engaging with either of the activities.

**Noncontingent Attention (All Types).** Noncontingent attention sessions were conducted as the control condition for participants who responded during baseline probes in which no consequences were delivered. Prior to the start of these sessions, the experimenter told the participant, "You can match the letters or you can play with this (and pointed to the alternative task), and I will talk to you; give you high-fives, hugs, and tickles; and say things like, 'you are doing great!' the entire time." During these sessions, the experimenter placed all three pictures, each depicting a different type of attention behind the task activities. In addition, the experimenter delivered all three types of attention in a quasirandom order continuously throughout the session.

**Praise.** Prior to the start of each praise session, the experimenter told the participant, "You can match the letters or you can play with this (and pointed to the alternative task); if you match the letters, I will say things like 'you are doing great!', 'awesome!', and 'you are terrific!'" During praise sessions, the experimenter placed the picture depicting the delivery of praise behind the task stimuli. Contingent upon each occurrence of an independent, correct matching response, the experimenter delivered a brief praise statement on an FR-1 schedule.

**Physical Interaction.** Prior to the start of each physical-interaction session, the experimenter told the participant, "You can match the letters or you can play with this (and pointed to the alternative task); if you match the letters, I will give you tickles, high-fives, or hugs." During physical-interaction sessions, the experimenter placed the picture depicting the delivery of physical interaction behind the task stimuli. Contingent upon each occurrence of an independent, correct matching response, the experimenter delivered physical interaction on an FR-1 schedule.

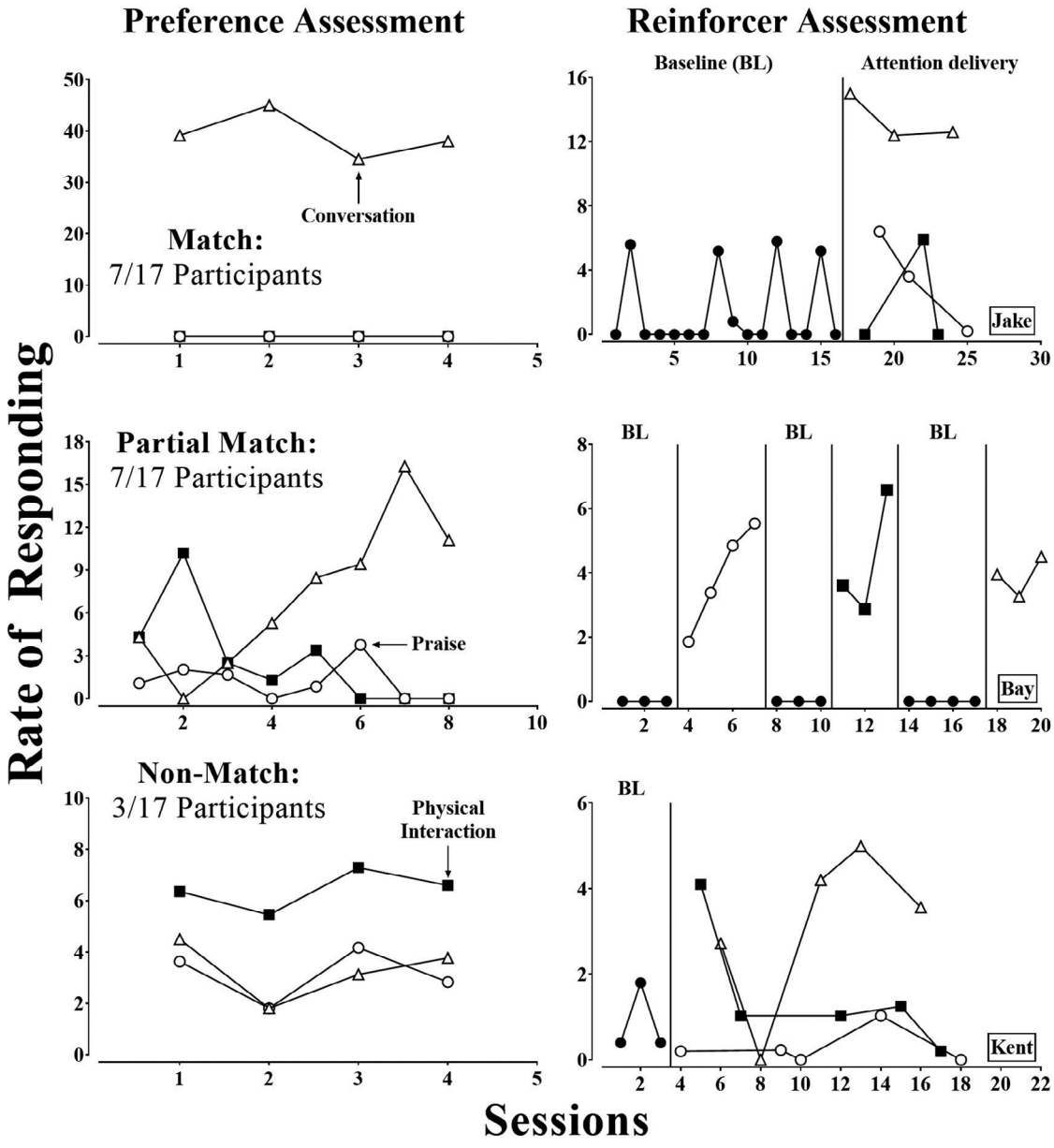
**Conversation.** Prior to the start of each conversation session, the experimenter told the participant, "You can match the letters, or you can play with this (and pointed to the alternative task); if you match the letters, I will talk to you." During conversation sessions, the experimenter placed the picture depicting the delivery of conversation behind the task stimuli. Contingent upon each occurrence of an independent, correct matching response, the experimenter delivered conversation on an FR-1 schedule.

## Results

As depicted in the middle panel of Figure 1, most participants responded at higher levels for conversation or all three types of attention in the reinforcer assessment in Experiment 2. Representative results of the comparison between the preference assessment and reinforcer assessment are depicted in Figure 3. Additional individual participant data are found in figures for Experiment 3 or in the online Supporting Information. Overall, for the 17 participants who completed both Experiment 1 and Experiment 2, we categorized the outcomes of the reinforcer assessment as either a match, partial match, or nonmatch with the preference assessment results. As represented by Jake's data in the top panel of Figure 3, 7 out of 17 participants showed a match between their preference assessment outcome (Experiment 1) and the reinforcer assessment outcome (Experiment 2). That

**Figure 3**

*Representative Data for General Outcomes of Attention Preference Assessment and Reinforcer Assessment and Number of Participants who Displayed These Outcomes (Experiment 2)*




is, they engaged in higher levels of letter matching in the reinforcer assessment for the type of attention that was most preferred in the preference assessment. Six of the seven matches were for conversation.

As represented by Bay's data in the middle panel of Figure 3, 7 out of 17 participants showed a partial match between the outcome of the preference assessment and reinforcer assessment. That is, their most preferred type(s)

of attention in the preference assessment resulted in high levels of letter matching in the reinforcer assessment; however, they either (a) also responded at high levels of letter matching for one or more other types of attention in the reinforcer assessment (as depicted in Bay's data; six out of seven participants) or (b) did not respond at high levels of letter matching for all types of attention shown to be preferred in the preference assessment (1 out of 7 participants).

As represented by Kent's data in the bottom panel of Figure 3, three out of 17 participants showed a nonmatch between the outcome of the preference assessment and reinforcer assessment. That is, the type of attention preferred in the preference assessment was not the type of attention that resulted in the highest level of letter matching in the reinforcer assessment. All participants who showed these outcomes preferred physical interaction in the preference assessment but engaged in higher levels of letter matching for conversation in the reinforcer assessment.

## Experiment 3 (Reinforcer Assessment [PR Schedule])

### Method

#### *Participants, Setting, and Materials*

Ten of the participants enrolled in Experiment 1 and Experiment 2 who were still enrolled in the preschool, consistently assented to attending sessions, and who showed at least one form of attention as a reinforcer in Experiment 2, also participated in Experiment 3. Sessions were conducted in the same rooms as Experiments 1 and 2. Sessions were conducted one to five times per day, 3 to 5 days per week. All task materials and alternative-task materials present during sessions were identical to those used in Experiment 2.

#### *Dependent Variable, Data Collection, and Interobserver Agreement*

Trained observers recorded participant and experimenter behavior using pencil and paper data collection methods in addition to handheld iPod Touch® devices and a data collection app to collect data. As in Experiment 2, the primary dependent variable was the frequency of correct, independent responses on the letter-matching task, which was converted to a rate measure. Data collectors scored correct responses, incorrect responses, and frequency and duration of experimenter attention delivery based on the definitions used in Experiment 2. As in Experiments 1 and 2, the duration of the delivery of each type of attention was removed from the session time to control for the opportunity to respond across sessions. Data collectors also scored the terminal PR schedule in each session as an additional dependent variable in Experiment 3. Experimenters determined the terminal schedule (i.e., break point) based on the last PR schedule successfully completed by the participant. Finally, data for PR sessions were analyzed to create work-function graphs showing the total number of responses across PR step sizes across all PR sessions (Roane et al., 2001).

A second observer independently collected data on participant and experimenter behavior for 39% (range, 12% – 61%) of sessions for all participants. The same methods described in Experiments 1 and 2 for calculating agreement were used. For all participants mean agreement was 98% (range, 77% – 100%).

#### *Procedures*

During all sessions, the tasks, materials, rules, and presession prompts were identical to the conditions described for Experiment 2. However, an additional rule was provided to the participant during presession prompts. That is, the experimenter also said, "Sometimes you will have to match more than one time." During all sessions in which we evaluated the effects of praise, physical interaction, and conversation on the letter-matching task, we increased the PR schedule by one following the completion of two response requirements at a

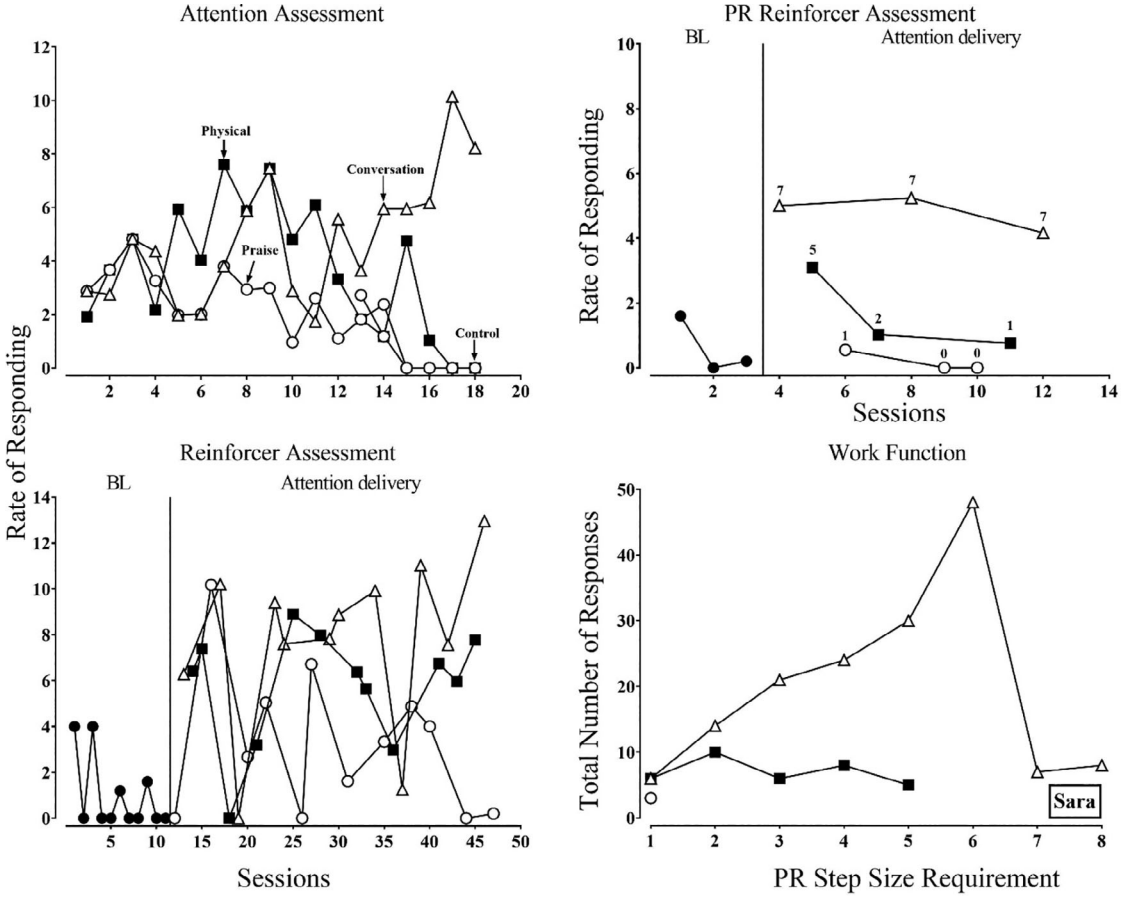
particular schedule (e.g., FR 1, FR 1, FR 2, FR 2, FR 3, FR 3, etc.; DeLeon et al., 1997; Roane et al., 2001) within session. Sessions ended after either 2 min elapsed without responding toward the target task or after 15 min elapsed, whichever came first. The break point was based on the last PR schedule successfully completed by the participant. The PR schedule reset to FR 1 at the start of each new session. The types of attention delivered were identical to those used in Experiments 1 and 2. We used a multielement design to demonstrate experimental control.

## Results

As shown in the bottom panel of Figure 1, most participants responded at higher levels with higher break points for all three types of attention; however, some participants displayed little (or a decreasing pattern of responding) for any type of attention. Representative results of the comparison between the preference assessment (Experiment 1; top left panel), reinforcer assessment (Experiment 2; bottom left panel), and PR reinforcer assessment (Experiment 3) depicted (a) as rate of correct letter matching per session with session break points (top right panel) and (b) as a work-function

**Figure 4**

*Representative Outcomes for Preference Assessment, Reinforcer Assessment, and PR Reinforcer Assessment (Match) (Experiment 3)*



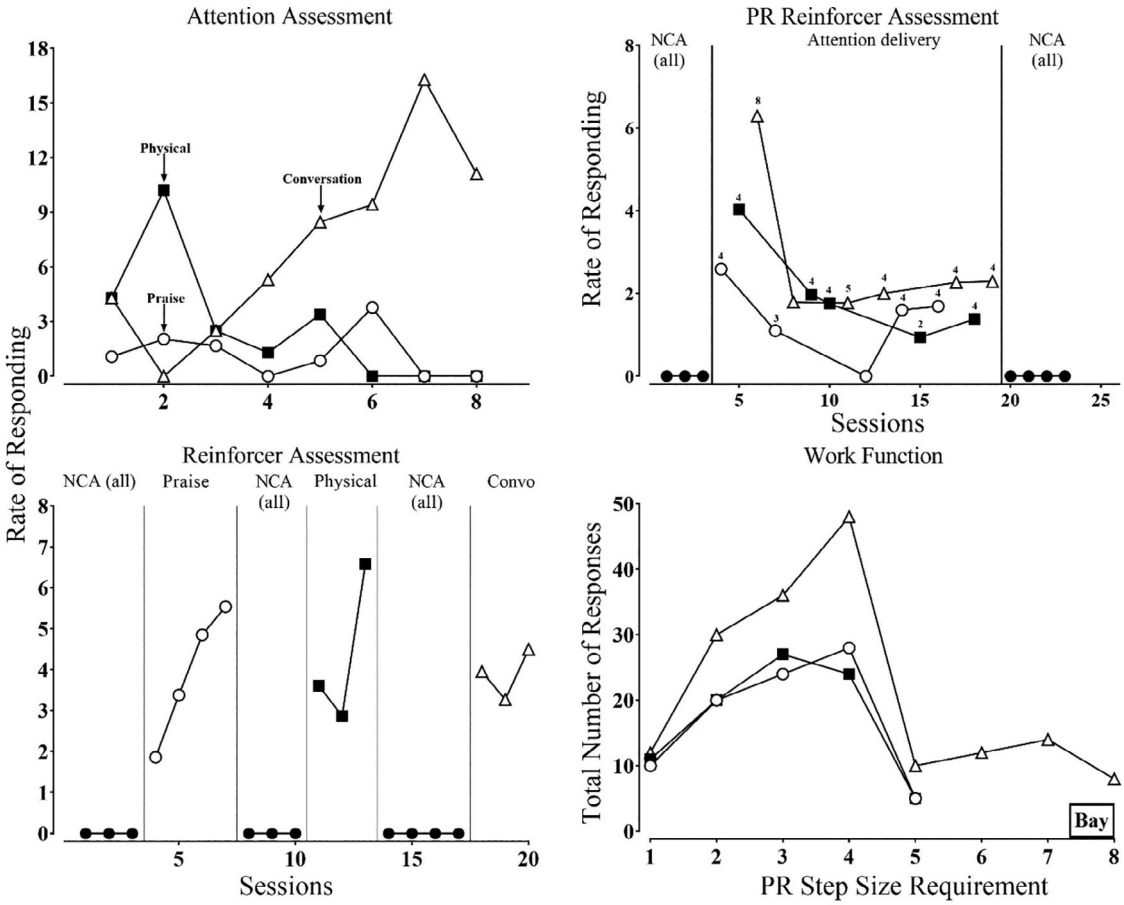

*Note*. BL denotes baseline phases. Numbers above data points indicate session break points.

showing total number of responses across the PR step size requirement across all sessions (bottom right panel) are shown in Figures 4–6. Additional individual participant data are found in the online Supporting Information. Overall, the outcomes of the PR reinforcer assessment are categorized as either a match, partial match, or nonmatch with the preference assessment and reinforcer assessment results for the 10 participants who completed all three studies.

As represented by Sara's data in Figure 4, three out of 10 participants showed a match between their preference assessment, reinforcer assessment, and PR reinforcer assessment. That is, they engaged in higher levels of responding and higher break points, as well as higher total number of responses across PR step sizes across sessions (work-function graphs) for types of attention that were found to be preferred in the preference assessment (Experiment 1) and most reinforcing in the reinforcer assessment (Experiment 2). For example, Sara engaged in higher levels of letter matching for her preferred type of attention (conversation; top, left panel)

**Figure 5**

*Representative Outcomes for Preference Assessment, Reinforcer Assessment, and PR Reinforcer Assessment (Partial Match) (Experiment 3)*



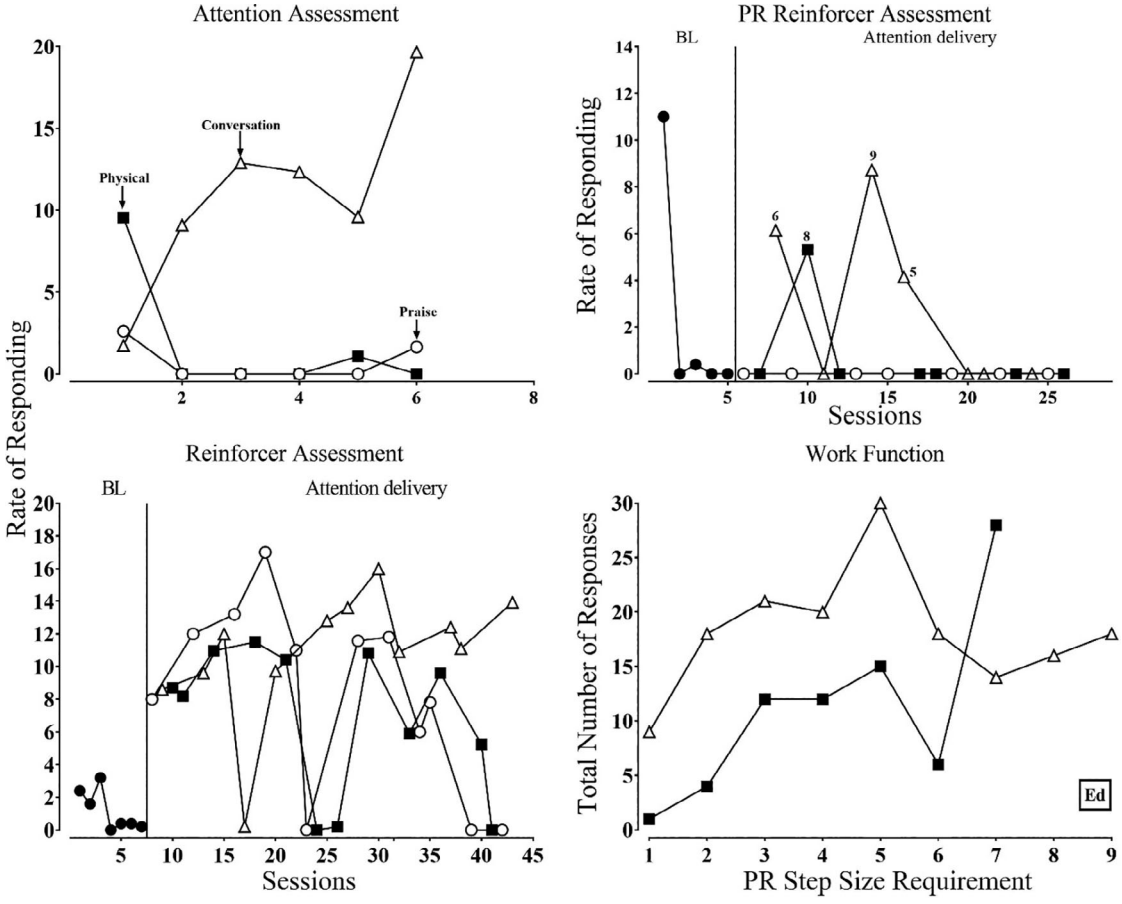

*Note*. BL denotes baseline phases. NCA denotes noncontingent attention phases. Numbers above data points indicate session break points.

during the reinforcer assessment (bottom, left panel) and the PR assessment (top, right panel). Furthermore, her work function graph for the PR assessment (bottom, right panel) shows she responded more at higher step sizes for conversation than other types of attention. Conversation was a match for two of the three participants who showed this outcome; all three types of attention was the match for the third participant. Therefore, for these participants, even when the response requirement was increased, the preferred types of attention functioned as a reinforcer.

As represented by Bay's data in Figure 5, four out of 10 participants showed a partial match between the assessments. That is, the results of their initial preference assessment (Experiment 1) indicated a preference for a single type of attention (i.e., either physical interaction or conversation); however, the subsequent reinforcer assessments indicated at least the same (if not one additional) type of attention also functioned as a reinforcer (Experiment 2). Furthermore, at least one of the types of attention demonstrated to function as a reinforcer during Experiment 2 also produced the highest levels of responding

**Figure 6**

*Representative Outcomes for Preference Assessment, Reinforcer Assessment, and PR Reinforcer Assessment (Non-Match) (Experiment 3)*




*Note*. BL denotes baseline phases. Numbers above data points indicate session break points.

and higher break points (Experiment 3), as well as higher total number of responses across PR step sizes (work-function graphs). For example, although Bay engaged in high levels of letter matching for conversation during the preference assessment (top, left panel), he engaged in high rates of letter matching across all types of attention during the reinforcer assessment (bottom, left panel) and high rates and similar breakpoints for all three types of attention during the PR assessment (top, right panel). Interestingly, the results of the work-function graph (bottom, right panel) suggest a slightly higher total number of responses across PR step sizes for conversation, suggesting that it might be a slightly more robust reinforcer (as originally predicted by the initial preference assessment in Experiment 1). For the four participants who showed this outcome, two showed preference in Experiment 1 for conversation (Bay and Bella) and two showed preference for physical interaction (Colton and Cynthia). During the reinforcer assessment (Experiment 2), all types of attention functioned as a reinforcer for two participants (Bay and Cynthia), physical attention and praise functioned as a reinforcer for one participant (Colton), and conversation functioned as a reinforcer for one participant (Bella). These results represented a partial match for three participants (Bay, Colton, and Cynthia) and a match for one participant (Bella). During the PR assessment (Experiment 3), all types of attention functioned as a reinforcer for three participants (Bay, Colton, and Bella), and physical attention and conversation functioned as a reinforcer for one participant (Cynthia). These results represented a partial match for all four participants. Results of work-function graphs suggest slightly higher total number of responses across PR step sizes for the type of attention identified as most preferred in Experiment 1 for two participants (i.e., conversation; Bay and Bella) and for the type of attention that functioned as a reinforcer in Experiment 2 and Experiment 3 for two participants (praise for Colton and conversation for Cynthia).

As represented by Ed's data in Figure 6, three out of 10 participants showed a nonmatch between the assessments. That is, the results of their initial preference assessment indicated a preference for either conversation or physical interaction (two participants) or all types of attention (one participant) and the subsequent reinforcer assessment confirmed this as either a match (Ed) or partial match (two other participants); however, results of the PR assessment (Experiment 3) indicated that no types of attention produced high or stable levels of responding, suggesting they did not function as reinforcers under conditions of increasing effort. For example, although Ed engaged in high levels of letter matching for conversation during the preference assessment (top, left panel) and reinforcer assessment (bottom, left panel), he displayed initially high levels of responding in a few conversation and physical interaction sessions during the PR assessment (top, right panel) that decreased to zero. Therefore, Ed's preference assessment results (i.e., preference for conversation) and reinforcer assessment outcomes (i.e., conversation functioned as a reinforcer) represent a nonmatch with the PR assessment results because no types of attention remained effective reinforcers under increased response requirements. Results of the work-function graph (bottom, right panel) show a slightly higher total number of responses across PR step sizes for conversation, suggesting it might be a slightly more robust reinforcer (as originally predicted by the initial preference assessment in Experiment 1 and reinforcer assessment in Experiment 2). Furthermore, results of the work-function graphs show slightly higher total number of responses across PR step sizes for the type of attention that functioned as a reinforcer in Experiment 2 for all three participants (conversation for two participants and physical attention for one participant), suggesting these attention types might function as a reinforcer under low-

to-moderate response requirements (as is the case with the task arranged for Experiment 2).

Overall, the results of Experiment 3 show conversation functioned as a reinforcer under increased schedule requirements for 7 out of 10 participants. Further, results of the work-function graphs (bottom, right panel) suggest conversation either always produced similarly high rates and break points or relatively higher rates and breakpoints when compared to other types of attention for nine of the 10 participants. In addition, other type(s) of preferred attention functioned as a reinforcer in the PR assessment for five out of 10 participants, demonstrating additional validation of the preference assessment. However, it is important to note that levels of responding and break points were relatively low during the PR assessment suggesting that as response requirements were increased, the reinforcing efficacy of attention (regardless of the type) decreased. In fact, break points never exceeded an FR-10 schedule.

## General Discussion

Outcomes of Experiment 1 showed most participants either displayed a preference for conversation (13 out of 31) or physical interaction (13 out of 31). Three out of 31 participants preferred conversation and physical interaction equally, and two out of 31 participants preferred all three types equally. Very few of participants (two out of 31) preferred praise, and these were only participants who preferred all three types of attention. These results suggest that two common types of attention that are delivered in early childhood environments (conversation and physical interaction) were preferred for most participants in Experiment 1. In addition, results suggest some types of attention are more preferred than others for particular participants. Finally, results suggest praise was not a highly preferred type of attention for most participants, which may be due to (a) the high level of praise (and other types of attention) delivered in the classrooms that the participants attended each day (i.e., satiation effects) and (b) the use of general praise rather than a potentially higher quality of praise (e.g., descriptive praise).

Outcomes of Experiment 2 indicated that for most participants (14 out of 17 participants) at least one type of attention that was preferred in the preference assessment also functioned as a reinforcer in the reinforcer assessment. For these 14 participants, the results of the two assessments were either an exact match (seven participants) or a partial match (seven participants). Of the participants showing an exact match, conversation was the type of attention for 6 of the 7 participants and all three types of attention resulted in high levels of responding across both assessments for the other participant. For the seven participants who demonstrated a partial match (e.g., physical interaction was the only preferred type of attention in the preference assessment but both physical interaction and conversation functioned as a reinforcer in the reinforcer assessment), specific outcomes were idiosyncratic. For the remaining 3 of 17 participants, their results were a nonmatch (e.g., physical interaction was the preferred type, but conversation was the type that functioned as a reinforcer).

Results of Experiment 2 indicated conversation functioned as a reinforcer for 16 out of 17 participants, suggesting conversation may be a powerful reinforcer for young children. Conversation may have been a more potent reinforcer as compared to physical interaction or praise because there was more variability in conversation as compared to praise and physical interaction. Although we controlled for the number of different types of physical interaction delivered and told experimenters to deliver varied praise statements and conversation statements within and across sessions, it is possible that this was done more for conversation in comparison to the other two types of attention. In fact, previous research has suggested that variation in stimulus delivery can influence the

potency of reinforcement (e.g., Egel et al., 1981; Keyl-Austin et al., 2012; Koehler et al., 2005; Wine & Wilder, 2009). In addition, it is possible the preference for the topics that were discussed (e.g., preferred items and activities) during conversation influenced the efficacy of conversation. Roscoe et al. (2010) showed that access to high preference conversation topics resulted in more responding than access to low preference conversation topics. Further, it is possible that conversation was a more potent reinforcer because it involved reciprocity (i.e., participants were involved in a conversational exchange with the experimenter). Given the potential impact of these variables, future research might parse out the relative influence of them on the efficacy of conversation as a reinforcer.

The comparison of results from Experiment 1 and Experiment 2 show that for 14 out of 17 participants, there was at least a partial match between the preference assessment and the reinforcer assessment. These data suggest the preference assessment was a valid method for determining type(s) of attention that would function as reinforcers (at least under an FR-1 schedule requirement). Furthermore, for 13 out of these 14 participants, all types of attention that were considered preferred in the preference assessment functioned as a reinforcer in the reinforcer assessment. That is, for only one participant was there a false positive result of the preference assessment. Finally, for 6 out of 17 participants, praise functioned as a reinforcer; however, for four of these six participants, all types of attention functioned as a reinforcer. Similarly, 8 out of 17 participants' results showed that at least one type of attention that was not shown to be preferred in the preference assessment functioned as a reinforcer in the reinforcer assessment. It is possible that this difference in results across assessments is due to the different arrangements used. That is, during the preference assessment, a concurrent-operant arrangement was used in which relative response rates were determined when all three types of attention were concurrently available. However, during the reinforcer assessment, a single-operant arrangement was used in which absolute response rates are determined when only one type of attention is available per session. Thus, exclusive preference in our preference assessment may suggest other options are not potential reinforcers, when this may be an artifact of the concurrent-operant arrangement. Future research might involve comparing the two assessment procedures under similar arrangements. Alternatively, future research might involve using an arrangement similar to Morris and Vollmer (2019, 2020b) in which stimuli are systematically removed from the preference assessment such that a hierarchy of potential reinforcing stimuli may have been obtained, resulting in a better comparison across assessments (including the PR assessment).

Overall results of Experiment 3 showed that the same type(s) of attention indicated in the preference assessment functioned as a reinforcer in the reinforcer assessment and the reinforcer assessment (PR schedule) for 3 out of 10 participants. For these three participants, the type of attention was either conversation or physical interaction (two participants) or all types of attention (one participant). Next, at least one type of attention that was indicated in the preference assessment also functioned as a reinforcer in the reinforcer assessment and the reinforcer assessment (PR schedule) for 4 of the 10 participants. Finally, the type(s) of attention that were indicated in the preference assessment did not function as a reinforcer in the reinforcer assessment or the reinforcer assessment (PR schedule) for 3 out of 10 participants. In fact, for these three participants, responding decreased and maintained at low levels in the PR schedule evaluation.

Data for the 7 of 10 participants who showed at least a partial match between the reinforcer assessment (PR schedule) and the preference assessment, suggests additional

support for the validity of the preference assessment. In addition, preference assessment outcomes only showed false negative results from the four participants showing a partial match between the reinforcer assessment (PR schedule) and the preference assessment. That is, there were types of attention that functioned as reinforcers under the PR schedule that were not shown to be preferred in the preference assessment; however, there were no types of attention that were shown to be preferred in the preference assessment that were not shown to be reinforcers in the PR schedule assessment. Furthermore, for several participants whom we determined to show partial matches between the preference assessment and reinforcer assessment, low and sometimes decreasing levels of responding occurred in the PR schedule. Overall, these data suggest attention may not be a potent reinforcer, particularly if the schedule requirements are rapidly increased. However, it is possible that had we increased the schedule more slowly or used a PR schedule that was increased across sessions, we may have observed different results.

An interesting area for future research would be comparing the reinforcing strength of attention by measuring responding for access to attention on maintenance tasks versus acquisition tasks in preschool children. It is possible that certain types of attention may be more valuable when learning a new task as compared to engaging in a known task. In addition, researchers could assess the reinforcing value of other types of attention (e.g., smiles, back pats, singing, piggy-back rides) that were not included in the current Experiment. Furthermore, researchers could determine whether other variables such as increased duration of attention increases the reinforcing efficacy of common types of attention, particularly under increasing schedule requirements.

Finally, researchers could extend the current Experiment by evaluating the effects of naturally occurring attention deprivation and satiation periods that occur in the classroom and determine the effects of those periods on subsequent responding to access different types of attention during teaching and play situations. Previous research has shown that a period of deprivation from a reinforcer increases the likelihood of responding for that reinforcer, whereas a period of access to (satiation) a reinforcer decreases the likelihood of responding for that reinforcer (e.g., Gewirtz & Baer, 1958a, 1958b; Vollmer & Iwata, 1991). Thus, if these periods influence the reinforcing efficacy of particular types of attention, then teachers might program in deprivation periods of particular types of attention if they are going to subsequently use that type of attention to teach a new skill.

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## Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's website.