

Preference and Reinforcer Effects of Different Forms of Attention in Young Children

By

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## Abstract

Attention may function as a reinforcer for increasing appropriate behavior and inappropriate behavior; however, the conditions under which attention is most likely to function as a reinforcer are unclear. Previous research has suggested that various factors may influence the reinforcing efficacy of attention including magnitude (i.e., duration) of attention; immediacy of attention delivery; schedule of attention delivery; motivating operations; conditioning history; and type, content, and overall quality of attention. Various position papers and early childhood organizations (e.g., NAEYC, 2014; Serna, Lambros, Nielsen, & Forness, 2002) have suggested the use of various forms of attention in early childhood environments for the purpose of social-emotional development and teaching of young children. Common forms of attention that are suggested include praise, conversation, and physical attention (e.g., Kazdin, Silverman, & Sitter, 1975; Kelly et al., 2014; Roscoe, Kindle, & Pence, 2010; Smaby et al., 2007). Therefore, I developed an efficient assessment procedure to determine which, if any, of these types of attention were preferred by a large number of preschool-age children. Next, I conducted a reinforcer assessment under fixed-ratio (FR) 1 and progressive schedules to (a) validate the attention assessment and (b) determine whether these common types of attention function as reinforcers when used contingent on correct responding on a maintenance task. Overall, results showed that the majority of children preferred conversation or physical attention. In addition, in general, the results from our reinforcer assessments suggested that the forms of attention that were preferred in the assessment were more likely to function as reinforcers.

*Keywords:* attention, reinforcer efficacy, praise, physical attention, conversation, progressive-ratio schedule

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## Preference and Reinforcer Effects of Different Forms of Attention in Young Children

Social positive reinforcement involves the contingent delivery of a stimulus by another person that results in an increase in the probability of behavior (Lovaas et al., 1966; Miltenberger, 2001). A common form of social positive reinforcement is the delivery of attention that may be delivered in various forms. Attention may include vocal-verbal interactions (e.g., praise, conversations, reprimands), physical attention (e.g., hugs, pats on the back), and facial expressions (e.g., smiles, winks, frowns). Previous research has shown the reinforcing effects of attention for increasing desirable behavior (e.g., Gable & Shores, 1980; McLaughlin, 1982), as well as undesirable behavior (e.g., Lovaas & Simmons, 1969; Iwata, Pace, Dorsey, et al., 1994) in various populations across various contexts and settings. However, less is known about the conditions under which attention functions as a reinforcer (i.e., the variables that may influence the efficacy of attention as a reinforcer; Vollmer & Hackenberg, 2001). One variable that may influence the efficacy of attention as a reinforcer is the type of attention that is delivered (e.g., Kelly, Roscoe, Hanley, & Schlichenmeyer, 2014; Kodak, Northup, & Kelley, 2007). Therefore, the overall objective of this project was to develop and evaluate an efficient technology for determining the types of attention that are typically used in preschool classrooms (i.e., praise, physical attention, conversation) that would function as reinforcers.

Although there is some disagreement across disciplines and sub-disciplines, behavior analysts have proposed that much of our social behavior including various forms of attention are likely secondary or conditioned reinforcers (Bijou, 1995; Bijou & Baer, 1961; Lovaas et al., 1966; Skinner, 1953). Under this paradigm, attention is initially a neutral stimulus that acquires reinforcing efficacy due to it signaling the availability of an already established reinforcer (i.e.,



discriminative stimulus) or its repeated pairing with an already established reinforcer (i.e., conditioned reinforcer; Bijou, 1995). In addition, Bijou (1995) suggested that forms of attention can become generalized reinforcers such that they are effective when delivered by various individuals and under various establishing operations.

Regardless of the mechanism by which attention becomes a reinforcer, it is obviously part of human interactions. In fact, from birth, infants depend on others caring for them for survival. That is, an important role of the parent is to provide positive reinforcers and remove negative reinforcers (Bijou & Baer, 1965), and a major determinant in the development of social and intellectual behavior in young children involves parent responses to child behavior (Hart & Risley, 1995; Horowitz, 1963; Lovaas et al., 1966). For example, Hart and Risley (1995) conducted a study in which parent-child interactions were observed, and results showed that positive affirmations delivered by parents was correlated with acquisition of child verbal behavior. Specifically, these authors found that parents with a high socio-economic status (SES) delivered more high quality attention (i.e., more affirmation contingent on vocalizations and more variability in words and questions asked), which was associated with more vocabulary growth as compared to middle and low SES parents. In fact, the NAEYC's Early Childhood Program Standards and Accreditation Criteria a Guidance for Assessment outlines that teachers are to build positive relationships with children and are to foster children's emotional well-being by engaging in frequent social conversations, joint laughter, and affection (NAEYC, 2014).

### **Attention as Reinforcer for Appropriate Behavior**

The delivery of attention has been shown to increase and maintain the occurrence of various appropriate behaviors across populations and environments. That is, the delivery of attention has been used as a consequence for increasing and maintaining behaviors such as

vocalizations and verbal behavior (e.g., Horne & Lowe, 1996; Poulson, 1983; Rheingold, 1956; Skinner, 1957), academic performance (e.g., Gable & Shores, 1980; McLaughlin, 1982), appropriate classroom behavior (e.g., Schutte & Hopkins, 1970; Thomas et al, 1968), leisure and play skills and activities (e.g., Barton, 1981; DiCarlo & Reid, 2004; Duffy & Nietupski, 1985; Whitman et al, 1970), and social interaction skills (e.g., Allen, Hart, Buell, Harris & Wolf, 1964; Milby, 1970; Moroz & Jones, 2002; Strain & Timm, 1974). It is important to note, however, that few studies have isolated the influence of attention as a reinforcer for increasing and maintaining appropriate behavior. That is, most studies involve attention as part of a treatment package in conjunction with various interventions.

The research on the effects of attention for increasing appropriate behavior suggests several important things. First, most of this research was conducted over 30 years ago, and little research has been recently been conducted on the utility of attention for increasing appropriate behavior. Second, the majority of studies on attention for increasing appropriate behavior involve several topographies of attention (e.g., praise, conversation, and physical contact) or the delivery of attention as part of a treatment package. Therefore, it is difficult to determine the effects of single forms of attention and the efficacy of attention alone for behavior change. As suggested by Wacker, Wiggins, Fowler, and Berg (1988), this lack of knowledge is likely to interfere with the effectiveness with which one can use attention in acquisition and maintenance programs. Third, the small number of studies that involve determining the effects of attention alone raises questions regarding the utility of attention as a reinforcer for increasing and maintaining appropriate behavior.

There are several possible reasons why few studies have been conducted recently on the efficacy of attention and why few researchers have isolated the effects of attention for increasing

and maintaining appropriate behavior. First, attention alone may not be an effective reinforcer for the population of individuals for which behavioral research is mostly published (i.e., individuals diagnosed with intellectual and developmental disabilities [IDD]). Second, attention may be an important component of a treatment package but may not be a potent reinforcer in isolation. Third, it is possible that attention is already widely assumed to be a reinforcer, and therefore little research has been conducted to validate this assumption.

### **Attention as Reinforcer for Problem Behavior**

Most recent research on attention as a reinforcer is in the area of assessment and treatment of behavior disorders, particularly with individuals diagnosed with IDD. In several large-scale studies, indirect assessments (e.g., Maurice & Trudell, 1982) and descriptive assessments (e.g., Lerman & Iwata, 1993; McKerchar & Thompson, 2004; Thompson & Iwata, 2001) have suggested that attention is a common consequence following the occurrence of problem behavior. For example, McKercher and Thompson (2004) showed that attention was the most common consequence for problem behavior (i.e., self-injury, aggression, or disruption) displayed by 14 typically developing preschool-age children in their classroom. Furthermore, functional analysis research has suggested that a relatively high percentage of published functional analyses have shown some form of attention as the maintaining variable (Beavers, Iwata, & Lerman, 2013; Hanley, Iwata, & McCord, 2003; Kurtz et al., 2003). In fact, Kurtz et al. (2003) showed that self-injurious behavior (SIB) displayed by 30 young (younger than 5 years) children with and without IDD was maintained by social positive reinforcement in the form of attention, tangible, or both for 37.9% of the cases. Furthermore, all problem behavior displayed by 24 out of the 30 participants was found to be maintained by social positive reinforcement in 62.5% of the cases. Functional analysis methodology (Iwata et al., 1982/1994) has allowed

clinicians and researchers to determine effective interventions based on the function of problem behavior. Functional analysis methods involve the direct manipulation of antecedent and consequent events to determine the events that are likely to evoke and maintain problem behavior (see Hagopian, Dozier, Rooker, & Jones, 2013 and Hanley, Iwata, & McCord, 2003 for a detailed review of functional analysis methodology). A test condition is included in a functional analysis to determine whether deprivation from and delivery of attention results in high levels of problem behavior. Functional analysis research has shown that various problem behaviors may be maintained by contingent attention including self-injurious behavior (SIB; Lovaas & Simmons, 1969; Iwata et al., 1982/1994), aggression (Roscoe, Kindle, & Pence, 2010), and bizarre vocalizations (DeLeon et al., 2003; Wilder, Masuda, O'Conner, & Baham, 2001).

Functional analysis methodology has allowed clinicians and researchers to determine effective interventions based on the function of problem behavior. If functional analysis results suggest that problem behavior is maintained by social positive reinforcement in the form of attention, various interventions may be developed. These interventions include (a) eliminating access to attention (i.e., extinction; Iwata, Pace, Cowdery et al., 1994), (b) providing access to attention on a time-based schedule (i.e., noncontingent reinforcement; Carr et al., 2000; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993), (c) providing attention contingent upon an alternative behavior (differential reinforcement of alternative behavior [functional communication training]; Carr & Durand, 1985; Dixon, Benedict, & Larson, 2001; Durand & Carr, 1991; Grauvogel-MacAleese & Wallace, 2010; Leon, Hausman, & Kahng, 2010; Roscoe, Kindle, & Pence, 2010; Wilder, Masuda, O'Conner, & Baham, 2001; Worsdell, Iwata, Hanley, Thompson, & Kahng, 2000) or the absence of problem behavior (differential reinforcement of

other behavior; Vollmer & Iwata, 1992; Vollmer et al., 1993), or (d) implementing negative punishment procedures such as time-out (e.g., Durand & Carr, 1992; Mathews et al., 1987; Nordquist, 1971) and response cost (Kazdin, 1972; Pazulinec, Meyerrose, & Sajwaj, 1983; Rapport, Murphy, & Bailey, 1982) to decrease the occurrence of the problem behavior. See Hagopian et al. (2013) for a detailed review of function-based interventions for behavior disorders.

In summary, functional analyses have allowed us to determine categories of variables influencing the occurrence of problem behavior and have resulted in an increase in the efficacy of behavioral interventions. In addition, the advent of functional analyses to determine function-based interventions has resulted in a reduction in the use of intrusive punishment procedures for reducing problem behavior. Furthermore, recent research has suggested that functional analyses are useful in isolating the effects of specific aspects or parameters of attention (e.g., type, duration, and schedule of attention delivery) on the occurrence of problem behavior.

### **Factors That Influence the Reinforcing Efficacy of Attention**

Although numerous studies, review papers, and other resources suggest the utility of attention in the modification of human behavior, we know little about the conditions under which attention functions as a reinforcer. Therefore, researchers have recently begun to investigate some of the characteristics and factors that may influence the efficacy of attention as a reinforcer. It is important to note that most of this research has been conducted in the context of the assessment and treatment of problem behavior. Some of the factors studied include the (a) magnitude of attention (e.g., Piazza et al., 1996; Volkert, Lerman, & Vorndran, 2005), (b) immediacy of attention delivery (e.g., Bijou, 1995; Hanley, Iwata, & Thompson, 2001), (c) schedule of attention delivery (e.g., Gable & Shores, 1980), (d) motivating operations (e.g.,

Gewirtz & Baer, 1958a; Gewirtz & Baer, 1958b, Vollmer & Iwata, 1991), (e) conditioning history (Baer, 1962; Bijou & Baer, 1965; Jerome & Sturmey, 2008), and (f) type, content, or overall quality of attention (e.g., Duncan & Bruwelheide, 1985/1986; Fisher et al., 1996; Kazdin & Klock, 1973; O'Leary & O'Leary, 1977; Piazza et al., 1996; Richman & Hagopian, 1999).

### **Magnitude of Attention Delivery**

Magnitude (duration) may be an important factor that influences the efficacy of attention as a reinforcer (Fisher, Piazza, & Chiang 1996; Hoch, et al., 2002; Lerman, et al., 2002); however, few studies have evaluated this variable. Magnitude is likely to be an important variable given that certain types of attention may be more valuable if the duration is longer. However, it is also possible that longer durations of attention may result in a decrease in responding to access attention due to satiation effects. In studies conducted by Fisher, Piazza, and Chiang (1996) and Volkert, Lerman, and Vorndran (2005) on the effects of different reinforcer durations in the context of functional analyses, results of both studies suggested that longer durations of reinforcer access resulted in lower levels of problem behavior as compared to shorter durations of reinforcer access. Trosclair-Lasserre, Lerman, Call, Addison, and Kodak (2008) showed that preference for different magnitudes of reinforcers may predict the efficacy of these reinforcers and magnitude effects may be influenced by schedule requirements.

Data from these few studies suggest that the duration of attention may be an important variable that influences the efficacy of attention as a reinforcer. Furthermore, data from Fisher et al. (1996) and Volkert et al. (2005) suggest that longer durations of attention may be useful for the reduction of problem behavior (satiation), whereas shorter durations of attention may be more effective for increasing appropriate behavior (due to a continuation of the relevant

establishing operation for attention). However, additional research is needed on the influence of magnitude on the reinforcing efficacy of attention.

### **Immediacy of Attention Delivery**

Immediacy of attention delivery may be an important factor that influences the efficacy of attention as a reinforcer (Fisher, Thompson, Hagopian, Bowman, and Krug, 2000; Hagopian, Fisher, Sullivan, Acquistio, & LeBlanc, 1998; Hanley, Iwata, & Thompson, 2001; Millar & Watson, 1979; Ramey & Ourth, 1971; Stromer, McComas, & Rehfeldt, 2000). With increasing delays between behavior and delivery of attention, attention may lose its reinforcing value. For example, both Ramey and Ourth (1971) and Millar and Watson (1979) investigated the delay in caregiver attention following the occurrence of infant vocalizations. The experimenters' showed that infant rate of vocalizations occurred at the highest levels when attention was delivered immediately (0-s delay), whereas lower levels of vocalizations occurred under the 3-s, 6-s, or 10-s delays.

Although, a delay in delivery of attention may decrease its reinforcing value, it is important to determine procedures that allow for a delay to the delivery of attention. Procedures for doing this might include delay fading and various mediating variables such as rules or instructions, delivery of conditioned reinforcers, and the availability of intervening tasks. In general, research has suggested that delay fading (i.e., gradually increasing the period of time between a response and the delivery of attention) alone has not been very effective (e.g., Hagopian et al., 1998; Hanley et al., 2001) for maintaining behavior under delayed reinforcement. However, some studies (e.g., Fisher, Thompson, Hagopian, Bowman, and Krug, 2001) have shown that providing an activity during the delay in conjunction with delay fading may allow for fading to a larger delay. Furthermore, studies using other reinforcers (e.g., tangible

items) have suggested that the use of signals (Vollmer, Borrero, Lalli, & Daniel, 1999) and providing access to tasks or activities (e.g., Dixon & Cummings, 2001; Newquist et al., 2012) during the delay have been shown to be effective for maintaining responding during delays. Additional research evaluating the procedures that are most effective for increasing delays to the delivery of attention for the occurrence of appropriate behavior are needed.

### **Schedule of Attention Delivery**

Behavior analytic research has shown that the schedule of reinforcer delivery may influence behavior, and research has shown that responding may maintain under both dense and lean schedules of reinforcement. However, few studies have evaluated the influence of schedule of reinforcement on the efficacy of attention as a reinforcer for appropriate behavior. One exception to this is a study by Gable and Shores (1980) that showed that the rate of correct oral reading was higher under intermittent variable-ratio schedules of praise as compared to continuous praise schedules. In addition, several studies (Beardsley & McDowell, 1992; Borrero & Vollmer, 2002; Borrero et al., 2007; Carr & McDowell, 1980; Dishion, Spracklen, Andrews, & Patterson, 1996; Conger & Killeen, 1974; Martens & Houk, 1989; McDowell, 1981) have analyzed the contingences between target behavior and attention delivery using the matching equation. The matching law states that an individual will allocate responding among concurrently available response alternatives in the same proportion that reinforcers are distributed among those alternatives (Herrnstein, 1961; 1970). Some of the studies have included behavior disorders as target behaviors, whereas others have included target behaviors such as conversation topics and attending. For example, Dishion et al. (1996) showed that the relative rate of talking about illegal activities by adolescent boys was associated with the relative rate of laughing by a listener. Similarly, both Conger and Killeen (1974) and Borrero et al.



(2007) showed that college students spent more time talking and attending to a confederate that provided statements of agreement on a denser variable-interval schedules than a confederate who provided statements on a leaner variable-interval schedule. Finally, Martens et al. (1990) found that student on-task behavior matched the amount of teacher attention when it was provided.

Other studies have shown that the schedule of reinforcement may affect the pattern of responding under later conditions of extinction or deprivation from attention. For example, Brackbill (1958) examined the effects of continuous reinforcement and an increasing intermittent reinforcement schedule on the rate of infant smiling behavior during a subsequent extinction period. Results showed that infants who were previously exposed to an intermittent schedule of attention, smiled at higher rates under extinction as compared to infants who were previously exposed to the continuous reinforcement schedule. These findings are consistent with previous research (e.g., Kazdin & Polster, 1973) suggesting that behavior is resistant to extinction when a response has been intermittently reinforced.

Given that higher levels of appropriate behavior may be maintained under intermittent reinforcement schedules and the fact that it is often difficult to deliver reinforcement on dense schedules in the everyday environment, it is important to determine ways in which the schedule of attention delivery can be thinned while maintaining the occurrence of appropriate behavior. Research on the treatment of problem behavior has evaluated various ways in which attention may be thinned while maintaining low levels of problem behavior and manageable levels of appropriate behavior. The procedures include systematically increasing the attention delivery under fixed-time or differential reinforcement of other behavior (DRO) schedules (e.g., Kahng et al., 2000; Vollmer et al., 1993) or using a multiple schedule to denote periods of reinforcement and extinction with respect to attention delivery in differential reinforcement of alternative

behavior (DRA) procedures (e.g., Hanley et al., 2001; Tiger & Hanley, 2004; Tiger, Hanley, and Heal, 2006). Few procedures have been conducted to determine the conditions under which continuous and intermittent attention delivery is necessary and sufficient for the acquisition and maintenance of appropriate behavior such as academic and social behavior.

### **Motivating Operations**

Several research studies have shown that the reinforcing efficacy of attention may be affected by motivating operations (i.e., a recent history of reinforcer availability). That is, exposure to or restriction from attention has been shown to affect subsequent responding in reinforcer assessments (e.g., Gewirtz & Baer, 1958a, 1958b; Vollmer & Iwata, 1991), tact training (Cengher, Jones, & Fienup, 2014), and functional analyses (e.g., Berg et al., 2000; McComas, Thompson, & Johnson, 2003; O'Reilly, 1999; Iwata, Duncan, Zarcone, Lerman, & Shore, 1994). Most of these studies on the effects of immediate histories of reinforcement have evaluated the effects of prior restricted access (no access) or continuous access to attention on subsequent responding for attention. Overall, these studies suggest that prior no access to attention results in an increase in subsequent responding for attention (deprivation) and prior continuous access to attention results in a decrease in subsequent responding for attention (satiation).

The implications of the influence of pre-session access to attention are that if attention is to be used as a reinforcer for increasing appropriate behavior, then it might be beneficial to provide a period of deprivation prior to teaching or training situations. For example, teachers may find it useful to program periods of individual work time or quiet reading time in which attention is not provided prior to teaching periods in which attention will be delivered for correct responding on acquisition tasks.

There are several other areas of future research on motivating operations and the efficacy of attention as a reinforcer. Future researchers might conduct a parametric evaluation to determine the influence of varying lengths of reinforcer access and no access on subsequent responding for attention as well as a determination of the effects of noncontingent delivery of attention (rather than continuous access to attention) on subsequent appropriate responding for attention or the efficacy of attention for subsequent teaching or training procedures. In addition, it might be interesting to determine whether satiation or deprivation from one form of attention (e.g., praise) influences the efficacy of other forms of attention (e.g., physical attention). Finally, it might be interesting to compare the effects of satiation and deprivation periods on responding for biological versus social reinforcers such as various forms of attention.

### **Conditioning History**

Another factor that may influence the efficacy of attention as a reinforcer is a particular individual's conditioning history (Baer & Goldfarb, 1962; Baron, 1966; Bijou & Baer, 1965; Piazza et al., 1999). In an early study by Bijou and Baer (1965), the authors suggested that the type of attention provided in an infant or child's environment may affect the degree to which that individual's behavior is later affected by certain forms of attention. Baer (1962) showed that when children were taught to bar-press to gain access to a puppet's attention, different rates of responding occurred across children. That is, most likely due to an individual child's history, children responded differently. Recent researchers have suggested that conditioning histories likely play an important role in the acquisition and maintenance of behavior disorders. For example, Piazza et al. (1999) suggested that certain forms of attention (e.g., verbal reprimands) may have a historical relation with problem behavior and other forms of attention (e.g., praise) may have a historical relation with appropriate behavior. These experimenters showed that

verbal reprimands functioned as reinforcers for appropriate behavior and problem behavior displayed by two individuals with developmental disabilities; however, praise did not function as a reinforcer for appropriate behavior when the delivery of verbal reprimands was also available. The authors proposed that these results might have been due to an individual's history of being provided verbal reprimands for problem behavior on a much denser schedule of reinforcement than praise contingent on appropriate behavior.

Another variable that may influence the efficacy of attention as a reinforcer is the individual who is delivering the attention, which is likely related to the individual's conditioning history. That is, certain individuals may signal the availability of attention or the availability of certain forms of attention. For example, problem behavior may be maintained by attention from peer attention but not adult attention or behavior may be maintained by attention from an individual's mother but not her father. In fact, numerous research studies have shown that peer attention may function as a reinforcer for problem behavior (e.g., Broussard & Northup, 1997; Ervin, DuPaul, Kern, & Friman, 1998; Jones, Drew, & Weber, 2000; Lewis & Sugai, 1996; Solomon & Wahler, 1973) and may be a more potent reinforcer than teacher attention (e.g., Broussard & Northup, 1995; Flood, Wilder, Flood, & Masuda, 2002; Northup et al., 1995). Problem behavior maintained by peer attention may present challenges with respect to treatment because it is more difficult to control the delivery of attention by peers. However, several studies have shown that peers can be taught to provide attention for appropriate behavior and ignore inappropriate behavior (e.g., Broussard & Northup, 1997; Grauvogel-MacAleese, & Wallace, 2010; Solomon & Wahler, 1973).

Another area of research that may suggest the importance of conditioning history and the person delivering attention is a study by Jerome and Sturmey (2008) in which they determined

preference for particular staff of individuals with IDD. For all three participants, access to attention from highly preferred staff (as determined by the preference assessment) resulted in a more responding than lower preferred staff, suggesting that attention from any individual may not function as a reinforcer. Future research is needed on the influence of conditioning history with respect to the reinforcing efficacy of attention in general as well as different types and components of attention. For example, researchers could program attention-based conditioning histories and subsequently determine the effects of that conditioning history on behavior to access particular types of attention. For example, one type or characteristic of attention could be conditioned as a reinforcer (e.g., paired with the delivery of already established reinforcers) and another type of attention not conditioned, then a test could be conducted to compare the efficacy of those types of attention for the acquisition and maintenance of responding for a particular individual.

### **Type, Content, and Overall Quality of Attention**

Most likely due to an individual's conditioning history, some forms of attention including the type of attention, content of vocal-verbal attention, and the "quality" of attention may be more effective as reinforcers than others. Given this, it is highly unlikely that all behavior for an individual occurs to access any type of attention (Brophy, 1981; Fisher et al., 1996). For example, a nod may function as a reinforcer for some behavior displayed by one individual, and only vocal-verbal attention that involves a certain quality may function as a reinforcer for another behavior displayed by another individual.

**Type of attention.** Most research on attention as a reinforcer has evaluated types of attention in combination (e.g., vocal-verbal attention, physical attention, and nonvocal attention [e.g., smiling and eye contact]). That is, the delivery of physical attention (e.g., hugs and high-

fives), vocal-verbal attention (e.g., instructions, praise, and conversation), and facial expressions (e.g., frowns, smiles, and winks) has all been shown to increase and maintain behavior in various combinations (e.g., Brackbill, 1958; Everett et al., 2005; Hart & Risley, 1995; Kazdin & Klock, 1973; Pfiffner, Rosen, & O'Leary, 1985; Rheingold et al., 1959). Among these studies, teachers' use of vocal-verbal attention and nonverbal attention (e.g., smiling, patting, holding, touching, moving toward the child, making eye contact) have been a major area of focus (e.g., Ackerman, 1972; Becker, Madsen, Arnold, & Thomas, 1967; Becker, Engelmann, & Thomas, 1971; Buckley & Walker, 1970; Buell, Stoddard, Harris, & Baer, 1968; Cooper, Thomson, & Baer, 1970; Diebert & Harmon, 1972; Everett, 2005; Hall, Lund, & Jackson, 1968; Madsen & Madsen, 1972; Mink, 1968; Skinner, 1968; Stephenson & Hanley, 2010). Results of these and other studies have most likely resulted in recommendations and standards set out by early childhood organizations regarding the use of attention (e.g., conversation, physical attention, and praise) for promoting social-emotional competencies and skills and other areas of development and learning (NAEYC, 2009a, 2014). However, little is known about the reinforcing efficacy of isolated types of attention, and the necessary components of attention delivery to affect behavior change (Kazdin & Klock, 1973).

Some researchers have studied the combined and separate effects of non-vocal attention (e.g., nodding, smiling, and types of physical contact) on behavior. For example, Kazdin and Klock (1973) showed that an increase in the delivery of non-vocal attention (i.e., smiling, patting, and touching) while holding vocal-verbal attention constant by a classroom teacher resulted in an increase in student attentive behavior for 11 out of 12 students diagnosed with IDD. Although it may be important to isolate the influence of particular types of non-vocal attention, few studies have determined which types of non-vocal attention may be most

influential, particularly when used in combination with vocal-verbal attention. An exception to this is the relatively large number of studies showing that various forms of physical attention (e.g., pats on the back and hand holding) used in isolation may function as a reinforcer. In fact, research has suggested that contingent physical attention may function as a reinforcer, and the combination of both physical and vocal-verbal attention may be a more powerful reinforcer than either type of attention alone (e.g., Clements & Tracy, 1977; Johnson & Frankel, 1978; Kazdin, Silverman, & Sitter, 1975; Wheldall, Bevan, & Shortall, 1986).

Johnson and Frankel (1978) initially conducted a reinforcer assessment to determine whether physical contact was a reinforcer for two boys with IDD. One participant displayed high levels of responding to access physical contact. Therefore, the experimenters implemented delivery of physical contact using a DRO schedule to decrease the occurrence of stereotypic behavior. Clements and Tracy (1977) compared the effects of physical attention only (i.e., tactile shoulder rubs), (b) physical attention and praise, and (c) praise only on on-task behavior of 10 boys in a special education classroom. Results showed that on-task behavior was higher when physical attention and a combination of physical attention and praise was delivered as compared to praise alone. However, the highest level of on-task behavior was observed when both physical attention and praise were delivered. In addition, Kazdin, Silverman, and Sitter (1975) provided contingent physical attention (i.e., pats) and found that providing contingent physical pats consistently altered the attentive behavior of target subjects but did not alter attentive behavior of adjacent peers. However, pats accompanied with vocal-verbal approval and a verbal prompt did increase attentive behavior of nonreinforced peers. Additionally, Smaby et al. (2007) conducted a free-operant preference assessment with three children diagnosed with autism spectrum disorder (ASD) to determine preferred forms of social interactions (i.e., tickles, head

rubs, and praise). For all three participants, physical forms of attention were preferred. Two participants responded at higher rates for head rubs and the other participant responded at the highest rate for tickles.

Very recently, several researchers (e.g., Kelly, Roscoe, Hanley, & Schlickemeyer, 2014; Neurnberger, Smith, Czapar, & Klatt, 2012) have investigated preference and reinforcing efficacy of different types of attention for individuals with ASD. For example, Kelly et al. (2014) investigated preference and reinforcer efficacy of different types of attention for increasing appropriate behavior for five individuals diagnosed with autism spectrum disorder. For each participant, seven different types of attention (e.g., singing, hugs, high-fives, head rubs, tickles, or praise) were included in a preference assessment to determine the types of attention that were the highest and lowest preferred. Next, in a single-stimulus reinforcer assessment, the highest and lowest preferred forms of attention were delivered for prompted mands. The results showed that the attention preference assessment was a valid procedure for determining types of attention that would function as reinforcers. That is, all participants manded at higher rates for their highest preferred type of attention. However, for some participants their lowest preferred form of attention was also effective at maintaining high rates of manding.

Researchers studying the influence of attention on behavior disorders have begun evaluating the effects of different types of attention on problem behavior. In fact, recent extensions of functional analysis methodology have suggested that distinctions can be made among types of attention that maintain problem behavior for a particular individual (e.g., Hagopian, LeBlanc, & Maglieri, 2000; Kodak et al., 2007; LeBlanc et al., 2001; Piazza et al., 1999; Roscoe, Kindle, & Pence, 2010). Several studies have shown that functional analysis



methodology is useful in determining the effects of specific types of attention on problem behavior and treatments based on those outcomes have been effective.

Several studies have shown that problem behavior is maintained by access to a particular type of physical attention (e.g., Britton, Carr, Kellum, Dozier, & Weil, 2000; LeBlanc et al., 2001; Richman & Hagopian, 1999; Vollmer, Iwata, Smith, & Rogers, 1992). For example, LeBlanc et al. (2001) assessed the effects of different forms of attention (physical versus verbal attention) on attention-maintained aggression displayed by an 11-year-old girl with profound mental retardation. In one treatment, noncontingent vocal-verbal attention (i.e., singing songs and animated conversation) was implemented; in the other treatment vocal-verbal attention plus physical attention (i.e., handholding, tickling, and hugs) was implemented. Results showed that problem behavior decreased under both attention conditions; however, lower rates of problem behavior occurred when verbal attention plus physical attention were delivered as compared to verbal attention alone.

In a recent study, Kodak, Northup, and Kelley (2007) evaluated the effects of different types of attention on the attention-maintained problem behavior of two children (one participant was diagnosed with attention deficit disorder and the other with PDD-NOS). Initial functional analysis results showed that problem behavior of the participants was maintained by attention. Next, an attention assessment was conducted to determine the influence of several common types of attention (i.e., reprimands, unrelated comments, tickles, eye contact, praise, and hands-down procedure) on levels of problem behavior. Results showed that one participant engaged in higher levels of problem behavior to access reprimands and tickles, whereas the other participant engaged in higher levels of problem behavior when reprimands and unrelated comments were

delivered. Thus, results demonstrate that different forms of attention differentially affected problem behavior for particular individuals.

**Content of vocal-verbal attention.** Another aspect of attention that has been investigated is the content of vocal-verbal attention (i.e., what is said), and differences in content may produce different responding. In fact, research on both the acquisition of appropriate behavior and the reduction of problem behavior has suggested that “what is said” may influence the efficacy of attention as a reinforcer.

It is often recommended that praise should be delivered in such a way that it involves specification of the behavior for which an individual is being praised (i.e., descriptive praise) as compared to general praise (i.e., statement of approval that does not specify the behavior being praised). In fact, the Council for Exceptional Children’s Division for Early Childhood (Sandall, Hemmeter, Smith, & McLean, 2005) and the National Association for the Education of Young Children (NAEYC, 2009a) suggest that teachers should, “Encourage and foster children’s learning and development [by] avoiding generic praise (‘Good job!’) and giving specific feedback (‘You got the same number when you counted the beans again!’)” (p. 19). In addition, early childhood educators have endorsed descriptive praise as an “important behavior support strategy and have indicated it is feasible to implement” (Stormont, Lewis, & Covington-Smith, 2005, p. 137).

Several studies have examined the effects of descriptive praise on appropriate behavior (Darch, Craig, & Gersten, 1985; Fullerton, Conroy, & Correa, 2009; Sutherland, Wehby, & Copeland, 2000). For example, Fullerton, Conroy, and Correa (2009) examined the effects of descriptive praise on activity engagement and compliance of classroom children. The authors showed that when teacher-delivered descriptive praise increased, the children engaged in a

higher percentage of compliance and engagement of classroom activities. Although this study demonstrates that descriptive praise was effective for increasing appropriate behavior, these data do not indicate whether descriptive praise is necessary (or the conditions under which it is necessary) for increasing behavior. Some studies have compared the effects of general praise and descriptive praise and found that descriptive praise was more effective for increasing appropriate behavior (Brophy, 1981; Chalk & Bizo, 2004; Haydon & Musti-Rao, 2011). In a recent study, Polick, Carr, and Hanney (2012) compared the effects of descriptive (e.g., “Great job saying, ‘blue’”) and general praise (e.g., “Great job!”) on the acquisition and maintenance of intraverbal responses in two children with ASD. Overall, results of this comparison showed that descriptive praise was slightly more effective; however, these effects decreased throughout the course of the study. Furthermore, education researchers have demonstrated that teacher-delivered descriptive praise increases appropriate behavior and decreases inappropriate behavior (Barton & Wolery, 2007; Hemmeter, Snyder, Kinder, & Artman, 2011; Stormont, 2002; Stormont, Smith, & Lewis, 2007; Sutherland, Wehby, & Copeland, 2000; Sutherland & Wehby, 2001). For example, Hemmeter et al. (2011) showed that teacher-delivered descriptive praise was effective at reducing problem behavior for two of four groups of preschool children. However, levels of child engagement were the same across baseline and intervention conditions.

Given that descriptive praise is suggested for increasing and maintaining behavior (most likely due to the additional instruction that is provided or the variation in remarks made), it is important to continue to conduct research to determine (a) whether behavior-specific remarks are necessary for praise to be an effective reinforcer and (b) the conditions under which descriptive praise may be necessary (e.g., for acquisition tasks or more complex tasks). For example, it is possible that when a task or skills is initially being acquired, descriptive praise is necessary to

tell the child what is correct or incorrect about their behavior such that children learn the skill quicker. However, it is possible that general praise may be more effective than or as effective as descriptive praise when an individual is engaging in a task that they have already acquired.

Several studies have shown that the content of vocal-verbal attention may influence the efficacy of attention for increasing and maintaining problem behavior (e.g., DeLeon, Arnold, Rodriguez-Catter, & Uy, 2003; Fisher et al., 1996; Hagopian, LeBlanc, & Maglieri, 2000; Roscoe, Kindle, & Pence, 2010). For example, Fisher et al. (1996) showed that reprimands were more reinforcing than praise or unrelated comments for problem behavior. This study was conducted to determine whether the content of attention delivered during a functional analysis (attention) condition would have a differential effect on the problem behavior displayed by a 4-year-old boy. Two attention conditions were compared to a play (control) condition using a multielement design. One attention condition involved therapist delivery of a reprimand related to the problem behavior (i.e., “Don’t hit me!” or “That hurts!”), and the other attention condition involved therapist delivery of a statement unrelated to the problem behavior (e.g., “It’s sunny today.”). The experimenters attempted to control for other characteristics of attention delivery such as facial expression and voice intonation. Results showed that problem behavior occurred at high levels in both attention conditions as compared to the play condition; however, much higher rates occurred during the reprimand condition as compared to the unrelated statements condition. These results suggest that reprimands were more potent reinforcers for problem behavior than statements unrelated to the problem behavior. It is possible that reprimands were more potent reinforcers because they were discriminative for the overall availability of attention. An interesting finding during treatment was that attention in the form of interactive play (i.e., a form different from the reprimand that was maintaining problem behavior) was effective in

reducing problem behavior. However, these effects may have been due to the addition of an extinction component for problem behavior (i.e., problem behavior no longer resulted in reprimands). It is possible that when problem behavior no longer produces reinforcement then other forms of attention may function as reinforcers.

In a recent study, Roscoe, Kindle, and Pence (2010) evaluated the effects of high- and low-preferred conversation topics on the occurrence of physical aggression displayed by a 13-year-old girl diagnosed with ASD. First, an initial functional analysis showed inconclusive results. Next, anecdotal information suggested that conversation (i.e., initiating social questions and statements) was a preferred form of attention. Therefore, the experimenters conducted a preference assessment to determine high-preference (HP) and low-preference (LP) conversational topics. The preference assessment involved the therapist presenting two pictures depicting different conversation topics. Contingent on selection, the therapist withdrew the pictures and initiated social questions and statements concerning the conversational topic selected. Next, the latency to aggression was compared under two different conditions in which the therapist either engaged in conversation about HP topics or LP topics contingent on problem behavior. Shorter latencies to aggression were found when problem behavior resulted in HP conversation topics as compared to LP conversation topics. Treatment involved functional communication training (FCT) in which the participant was taught to hand over a card to receive access to HP conversation and aggression was on extinction. This study extends previous research on traditional functional analyses by conducting a preference assessment with a novel form of attention (i.e., conversation) reported to maintain behavior. Additionally, conversation was demonstrated to be effective in assessing and treating problem behavior. The implications of these findings suggest that it might be necessary to determine specific types of attention that

function as reinforcers for problem behavior for particular individuals. Moreover, given that attention is commonly delivered to increase and maintain behavior, it would be beneficial for researchers and clinicians to determine efficient and effective preference assessment methodologies to determine specific forms of attention that may be more or less preferred for particular individuals.

**“Quality” of attention.** In addition to the type of attention and content of vocal-verbal attention, other qualities of attention may influence the efficacy of attention as a reinforcer. These other variables include voice intonation (Richman & Hagopian, 1999), warm and cold posturing (Gilboa & Greenbaum, 1978; Reese & Whitman, 1962), and various aspects of attention “qualities” (Gardner, Wacker, & Boelter, 2009). For example, Richman and Hagopian (1999) showed that voice intonation may influence the efficacy of attention as a reinforcer. In this study, the experimenters compared the effects of attention delivered during the attention condition of the function analysis on the occurrence of SIB and property destruction displayed by a 6-year-old boy. In one attention condition, a reprimand was delivered using “normal” voice intonation; in the other attention condition, reprimands were delivered using an “exaggerated” voice intonation in which the experimenters raised their voice and displayed physical signs of displeasure. Results of the functional analysis showed that higher levels of problem behavior occurred to access exaggerated attention.

In another study, Gardner, Wacker, and Boelter (2009) assessed conditions in which high-quality attention (HQA; i.e., frequent eye contact, physical contact, close proximity, orientation toward child, and enthusiastic praise) or low-quality attention condition (LQA; i.e., infrequent eye contact, no physical contact, distant physical proximity, orientated toward anything but the child, negative verbal statements, and a flat monotone voice) were delivered in

six different functional analysis conditions. That is, HQA was delivered in a demand, attention, and free play condition; and LQA was delivered in a demand, attention, and free play condition. For both participants, the highest levels of inappropriate behavior were found in the LQA demand condition. In addition, although behavior was maintained by access to escape, there were low levels of inappropriate behavior in the demand condition when it was accompanied with HQA. Furthermore, a concurrent-operants assessment was arranged in which HQA, LQA, and no attention were each combined with free play or demand conditions and pitted against each other to determine the percentage of time participants would allocate to each response option. Results showed that both participants allocated more responding to conditions in which high-quality attention was delivered regardless of whether it occurred in the play or demand context. These results demonstrate that quality of attention was the variable most likely to affect responding.

In a study by Gilboa and Greenbaum (1978), a large number of 3<sup>rd</sup> grade students ( $N = 120$ ) were included to determine levels of correct responding as a function of different qualities of attention. The different qualities of attention included “warm” nonvocal attention or “cold” nonvocal attention that were delivered noncontingently during the session along with the contingent delivery of a vocal-verbal statement (i.e., “correct” or “nice”) for correct responding. Aggregate data for all participants showed that higher levels of correct responding occurred when “warm” nonvocal attention was delivered than “cold” nonvocal attention. Although the nonvocal attention was delivered contingently, it is possible that the “warm” nonvocal attention provided throughout the session plus the contingent vocal attention was more reinforcing. In addition, it is possible that the warm nonvocal attention was discriminative for the delivery of praise for correct responding (due to a history of praise under “warm” nonvocal attention

conditions), whereas cold nonvocal attention was an S-delta for the delivery of praise. With respect to the education of young children, the NAEYC Early Childhood Program Standards suggest the importance of teacher-student relationships. Specifically, this position statement states that, “Warm, sensitive, and responsive interactions help children develop a secure, positive sense of self and encourage them to respect and cooperate with others.” (NAEYC, 2005, p. 1).

Overall, studies have suggested that quality of attention may be an important factor to consider when using attention to increase appropriate behavior. Furthermore, future researchers might consider determining the extent to which changing various aspects of the “quality” of attention might increase the effectiveness of particular type of attention or attention in general. For example, if a change in voice intonation, nonvocal behavior, or content of what is said increases the reinforcing efficacy of attention then manipulations can be made to typical types of attention (e.g., praise) such that those types of attention may become more potent reinforcers.

### **Summary**

Attention follows many of our behaviors throughout our day, and it is likely to influence our behavior in various ways. In fact, previous research has suggested that attention is a reinforcer for both appropriate behavior and problem behavior for various individuals across many environments. Recently, researchers have begun to determine the influence of various factors on the efficacy of attention as a reinforcer; however, the bulk of this research has been on the assessment and treatment of problem behavior. Therefore, additional research is needed on the influence of these various factors for increasing appropriate behavior. As discussed above, it is unlikely that all types of attention function as a reinforcer for all individuals. Therefore, arbitrarily selecting a type of attention may not be a sufficient method for identifying the most effective type (Fisher et al., 1996; Kelly et al., 2014; Piazza et al., 1999; Kodak et al., 2007).



Therefore, it may be important to determine a methodology (i.e., a technology) for predicting the effectiveness of a form or type of attention for increasing desirable behavior. Given the suggested use and common occurrence of teacher attention in early childhood environments (e.g., Hemmeter, Snyder, Kinder, & Artman, 2011; NAEYC, 2005; NAEYC, 2009b), I attempted to evaluate the efficacy of common forms of attention delivered to young children in a child development center. I chose to evaluate three forms of attention (i.e., praise, physical attention, and conversation) that (a) I observed to be delivered by teachers most in the classroom, (b) were reported in the literature, and (c) were suggested to be used as best practice in early childhood environments by the NAEYC (2005; 2009b) and positive behavior support interventions (Stormont et al, 2005). It is important to note that defining different forms of attention is very difficult because each form differs qualitatively and often includes various components. However, we defined the three forms of attention that we evaluated based on how they were defined in the literature and how they were observed to be delivered throughout the day in our classrooms (see method sections below).

The purposes of the current study were to replicate and extend the Nuernberger et al. (2012) and Kelley et al. (2014) study with young children as participants to (a) develop and evaluate the efficacy of a simple and efficient assessment technology for determining forms of attention that would function as reinforcers and (b) attempt to determine whether the common types of attention that are suggested and used in early childhood environments actually function as reinforcers. First, I developed an assessment technology to assess the relative preference of these three common forms of attention for a large number of young children in our early childhood classrooms (Study 1). Second, I conducted a reinforcer assessment to determine the reinforcing efficacy of the three common forms of attention and to attempt to validate the

attention assessment in Study 1 (Study 2). Third, I conducted a progressive ratio preference assessment to determine the reinforcing strength of the three forms of attention.

### **Study 1 (Attention Assessment) Method**

#### **Purpose**

The purpose of Study 1 was to develop a simple and efficient assessment technology to determine individual child preferences for three common forms of attention (praise, physical attention, conversation) for a large number of preschool-age children. As mentioned above, these three forms of attention are ones we observed occur regularly in our early childhood classrooms and have been recommended for use in early childhood environments based on previous research. The assessment methodology allowed me to determine the extent to which these common and readily used forms of attention are preferred within and across preschool-age children. Furthermore, the results of the assessment may be used to determine individual preferred forms of attention that may be used as reinforcers for teaching and intervention purposes.

#### **Participants and Setting**

Thirty-one typically developing children, ranging in age from 2 to 5 years, who attended the Edna A. Hill Child Development Center participated in Study 1. See Table 1 for detailed information on child ages and gender. Children were categorized as typically developing because they did not have a known diagnosis and had mastered age-appropriate skills across various domains (e.g., receptive and expressive language skills) according to the classroom curriculum assessment. For example, the participants displayed various receptive and expressive skills such as following either two- or three-step instructions (e.g., “Go to your cubby, and bring me your shoes”), labeling different common objects and items, matching-to-sample known

items, and initiating and appropriately manding for attention from others. Sessions were conducted in a session room (approximately 3 meters x 2.7 meters) that was adjacent to the classrooms in the child development center and were equipped with a table, chairs, and relevant session materials. Sessions were 2 min in length and conducted one to five times per day, 3 to 5 days per week.

### **Materials**

During all attention-assessment sessions, the same task materials were present. Task materials included three different pictures (21.6 cm x 27.9 cm) of the experimenter and participant, each of which represented a different form of attention. Furthermore, for some participants, a blank and solid white control card was included. The picture depicting praise shows the experimenter talking to and making a thumbs-up to the participant. The picture depicting physical attention shows the experimenter tickling, high-fiving, or hugging the participant. The picture depicting conversation shows the experimenter verbally interacting with the participant. See Appendix A for a depiction of the three different pictures used.

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

Trained observers recorded participant and experimenter behavior using handheld data-collection devices. The dependent variable was the frequency of picture touches to each of three pictures depicting the three different forms of attention (i.e., praise, physical attention, and conversation), which was converted to a rate measure. For some participants, we also included a blank control card and collected data on the frequency of picture touches to each of the four pictures (i.e., three attention pictures and one blank control card). A picture touch was defined as the participant placing any part of his or her hand on one of the available pictures. Because different forms of attention were delivered for somewhat different lengths of time (based on how

they were delivered in the participant's classroom), the duration of attention delivery during each session was timed and removed from the total session time before the session rate was calculated. For example, if the total duration of conversation delivered by the experimenter equaled 30 s for a session then that amount of time was subtracted from the total session time for calculating rate of responding for that particular session. I did this to attempt to equate the session time given that participants were not observed to engage in the target response when attention was being delivered (although it was possible that they could).

During all sessions, data were also collected on the frequency and duration of experimenter delivery of attention. Duration data for each type of attention were collected by pressing a button when a type of attention started and pressing another button when that type of attention stopped (as denoted by the experimenter stopping the type of attention and putting their head down). Duration was calculated by adding up the period of time in which a particular type of attention was delivered in 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 attention* 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 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 preferred topics of the participant as determined by casual observation of the

participant in the classroom. As mentioned, these three forms of attention were selected because they were observed to be delivered in our early childhood program, have been observed to occur in previous descriptive observations in early childhood environments (e.g., McKerchar & Thompson, 2004), and their delivery is recommended as best practice by national early childhood associations such as the NAEYC.

Interobserver agreement was assessed by having a second observer independently collect data on child and therapist behavior for an average of 59% (range: 25%-100%) of sessions across participants. Observers' records were divided into 10-s intervals and compared on an interval-by-interval basis. Interobserver 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 Ed, mean IOA was 96% (range: 86%-100%). For Jake, mean IOA was 98% (range: 89%-100%). For Bella, mean IOA was 95% (range: 73%-100%). For Arthur, mean IOA was 90% (range: 75%-100%). For Lilly, mean IOA was 100%. For Zora, mean IOA was 94% (range: 80%-100%). For Bay, mean IOA was 98% (range: 83%-100%). For Milo, mean IOA was 96% (range: 75%-100%). For Brandy, mean IOA was 97% (range: 83%-100%). For Carrie, mean IOA was 98% (range: 75%-100%). For Murray, mean IOA was 97% (range: 83%-100%). For Sara, mean IOA was 98% (range: 75%-100%). For Holly, mean IOA was 95% (range: 81%-100%). For Jules, mean IOA was 99% (range: 98%-100%). For Cain, mean IOA was 94% (range: 70%-100%). For Colton, mean IOA was 96% (range: 71%-100%). For Aaron, mean IOA was 98% (range: 83%-100%). For Sasha, mean IOA was 100%. For Cynthia, mean IOA was 95% (range: 81%-100%). For Kent, mean IOA was 96% (range: 88%-100%). For Luke, mean IOA was 88% (range: 70%-96%). For Janet, mean IOA was 99%

(range: 92%-100%). For Rory, mean IOA was 96% (range: 83%-100%). For Matilda, mean IOA was 94% (range: 60%-100%). For Cori, mean IOA was 95% (range: 73%-100%). For Brandon, mean IOA was 94% (range: 83%-100%). For Ben, mean IOA was 97% (range: 83%-100%). For Stella, mean IOA was 96% (range: 83%-100%). For Katrina, mean IOA was 97% (range: 67%-100%). For Gary, mean IOA was 98% (range: 73%-100%). For Cody, mean IOA was 95% (range: 79%-100%).

Although IOA means were high (right around or above 90%) for all participants, the lower range of IOA was relatively low for some participants (i.e., lower range was below 80%). These lower ranges only occurred in one or a few sessions per participant and were due to the low number of instances of picture touches in which one observer scored one type of picture and the other scored another type of picture or no picture touch during that interval. After all sessions in which IOA was low, experimenters conducted an additional training with all observers to ensure that they were scoring all responses based on the correct operational definitions.

## **Procedures**

A concurrent-operants arrangement (Catania, 2007; Fisher & Mazur, 1997) was used to determine the preferred form of attention for each participant. That is, the three different pictures of the experimenter and participant (as described above) and the control card (for some participants) were placed in front of the participant, equidistant from each other and the participant. Each picture was associated with one of the three different forms of attention (i.e., praise, physical attention, and conversation) or no attention (control card). In addition, the pictures were placed in a different sequence across sessions in a quasi-random fashion. That is, the pictures were not always placed in the same order but were quasi-randomly placed in a

different order from session to session. The blank control card was introduced for only those participants who showed indiscriminate responding across pictures. That is, the control card was introduced to ensure that the participant was not simply touching pictures randomly but was discriminating between the different pictures. See Appendix A for a model of the session materials and set-up.

Prior to the start of each session, rules and pre-session prompts were provided to increase the likelihood that the participants' were discriminating the contingencies associated with each of the pictures. First, the experimenter described the contingencies for selecting each picture (e.g., "If you select this one [pointing to the picture], I will tickle you."). If applicable, the experimenter 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"). Next, the experimenter conducted two pre-session prompts 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 picture (or card). For example, the experimenter told the participant to touch the picture associated with praise; once the participant touched the picture, the experimenter delivered a praise statement (e.g., "Woohoo!" or "You are amazing!"). Finally, the experimenter told the participants that they could touch any of the pictures as many times as they wanted and began the session.

Sessions were 2 min in length and were all conducted by the same experimenter with whom the participant was familiar (i.e., the experimenter was one of his or her teachers in the classroom or had frequent contact with the participant as a teacher in a nearby classroom in the Child Development Center). During each session, picture touches to a particular card resulted in the experimenter delivering that form of attention for a brief period of time. Rather than

equating the exact amount of time for which the different forms of attention (i.e., praise, physical attention, and conversation) were delivered, I delivered a particular form of attention based on how it was typically delivered in the classroom. I decided to do this because longer delivery times of praise and physical attention and shorter delivery times of conversation may have influenced their preference and may not have given us an idea of preference for the forms of attention as they were typically delivered in the classroom. Therefore, praise was delivered for 1-2 s contingent upon touching the picture card associated with praise; physical attention was delivered for 1-2 s contingent upon touching the card associated with physical attention; and conversation was delivered for approximately 5 s contingent upon touching the card associated with conversation. Praise involved the delivery of various praise statements; however, I did not script these praise statements, nor did I control for the number of different praise statements that were delivered within or across sessions. Physical attention involved either the delivery of tickles, high-fives, or hugs after a picture touch and included a vocal statement that I observed to coincide with delivery of physical attention in the classroom (e.g., “I’m going to get you!,” “High-five up high!,” and “I love when I get hugs from you!”). Although it may have been a potential confound in that both physical attention and vocal attention were provided for touching the physical-attention card, I decided to implement the physical attention in a way that was similar to that delivered in the classroom so that it was more naturalistic (Smaby, 2007). The three different forms of physical attention were delivered in a quasi-random fashion across picture touches for physical attention. For example, if the participant selected the physical attention picture, the experimenter may deliver tickles on the first selection, high-fives on the second selection, and hugs on the third selection. Conversation was a verbal interaction with the participant that involved a preferred topic or something the participant was involved in when he



or she was in the classroom earlier that day. 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 forms of attention.

### **Study 1 (Attention Assessment) Results**

Individual results of the attention assessment are shown in Figures 1-7. Figures 1-3 show results for the 13 participants who allocated more responding toward conversation as compared to praise and physical attention. Figures 1-2 show results for the 11 participants (Ed, Jake, Bella, Arthur, Lilly, Zora, Bay, Milo, Brandy, Carrie, and Murray) that displayed clear and almost immediately higher levels of responding for conversation as compared to praise and physical attention. Figure 3 shows results for the two participants (Sara and Holly) that displayed initially undifferentiated responding across all pictures. At this point, I introduced the control card to determine whether participants were discriminating between the cards that were in front of them or just randomly touching cards. Results for Sara (top panel of Figure 3) show that once the control card was implemented, she did not respond to the control card and her responding for the different attention pictures became differentiated. That is, she began to respond for conversation at much higher levels than the other two forms of attention. Results for Holly (bottom panel of Figure 3) show that when the control card was introduced, Holly did not respond to the control card; however, she continued to respond to all three attention pictures, with slightly higher and increasing levels for conversation across the assessment. However, overall, the means for conversation ( $M= 6.1$  RPM) and physical attention ( $M= 6.1$  RPM) were the same as compared to praise ( $M=3.1$  RPM).

Figures 4-6 show the results for the 13 participants that allocated more responding toward physical attention as compared to conversation and praise. Figure 4 shows results for the six

participants (Jules, Cain, Colton, Aaron, Sasha, and Cynthia) that displayed clear and almost immediately higher levels of responding for physical attention as compared to conversation and praise. Furthermore, these individuals responded at very low or zero levels for conversation and praise. Figure 5 (left column) shows results for the three participants (Kent, Luke, and Janet) that displayed consistently higher levels of responding for physical attention as compared to conversation and praise; however, they engaged in stable and moderate to low levels of responding for both conversation and praise. Figure 5 (right column) shows results for two participants (Rory and Matilda) that initially engaged in undifferentiated levels of responding across the different forms of attention; however, over time began engaging in much higher levels of responding for physical attention as compared to conversation and praise. To determine whether these participants were discriminating between the pictures or to possibly enhance discrimination across the pictures, I could have included the control card after seeing undifferentiated responding for five or six sessions. Figure 6 shows results for two participants (Cori and Brandon) that initially showed undifferentiated responding across the different forms of attention. Therefore, we included the control card as a response option. For both of these participants, upon including the control card, we began to see differentiated responding across the different forms of attention with eventually higher levels of responding for physical attention as compared to conversation or praise.

Figure 7 shows the results for the participants that preferred more than one form of attention. The left column of Figure 7 shows the results for the three participants (Ben, Stella, and Katrina) that preferred both conversation and physical attention. Although both Ben and Stella engaged in some responding for praise, they engaged in much higher and similar levels of responding for conversation across the assessment. In addition, the mean level of responding

was similar for conversation (M= 4.3 RPM) and physical attention (M= 3.5 RPM) for Ben. In addition, the mean level of responding was similar for conversation (M= 6.6 RPM) and physical attention (M= 5.9 RPM) for Stella. Katrina, on the other hand, initially displayed undifferentiated levels of responding across all three forms of attention. At this point, we introduced the control card to determine whether responding was due to discrimination difficulties and showed that she did not respond at high levels for the control card. Furthermore, the introduction of the control card was associated with a decrease in the level of responding for praise, whereas responding for conversation (M= 8.3 RPM) and physical attention (M= 7.1 RPM) remained relatively high and similar. The right column of Figure 7 shows the data for the two participants that preferred all forms of attention equally (Gary and Cody). When the experimenter introduced the control card after initial undifferentiated responding for these participants, responding occurred at zero or low levels for the control card suggesting that the participants were attending to the cards and were not just randomly touching cards in front of them. However, when the control card was introduced, both participants continued to respond at similar levels for all forms of attention.

As mentioned above, I introduced a blank control card for participants that were responding at similar levels across the different forms of attention to determine whether participants were responding similarly across the pictures because all forms of attention were preferred or because they were not attending to or discriminating between the different pictures. For participants for whom I included the control card, results showed that for all participants' very low levels of responding occurred toward the control card as compared to responding toward all or some of the forms of attention. These data suggest that the participants were discriminating between the different cards (at least the control card and the different picture

cards) and not just randomly touching the different cards in front of them. The control card was introduced for 7 of the 31 participants. Of these seven participants, introduction of the control card was associated with clear differentiated responding across the different picture cards for four participants (Sara, Brandon, Cori, and Katrina), whereas for one participant (Holly) the association is less clear. For two participants, introduction of the control card was not associated with differentiated responding (i.e., these participants continued to respond to access all forms of attention).

The overall results of the attention assessment are listed in Table 1 along with the name, age, and gender of the participants. Overall the gender of the participant was not associated with the preferred type of attention. That is, six males and seven females preferred conversation, seven males and six females preferred physical attention, one male and one female preferred both conversation and physical attention, and two males and one female preferred all three forms of attention relatively equally. Furthermore, our data do not suggest an association between age and the preferred type of attention. That is, of the two participants between 2 and 3 years of age, one preferred conversation and the other preferred physical attention; of the eight participants between 3 and 4 years of age, five preferred conversation, two preferred physical attention, and one preferred all three forms of attention relatively equally; and of the 20 participants older than 4 years of age, seven preferred conversation, nine preferred physical attention, two preferred both conversation and physical attention, and two preferred all three forms of attention relatively equally.

## **Study 2 (Reinforcer Assessment) Method**

### **Purpose**

The purpose of Study 2 was to determine whether the three different forms of attention (praise, physical attention, conversation) that are commonly delivered and suggested to be delivered in early childhood classrooms functioned as reinforcers. This allowed us to determine whether the different forms of attention could be used to increase and maintain behavior. Furthermore, it allowed us to determine the validity of our attention assessment in determining forms of attention that are likely to serve as reinforcers.

### **Participants and Setting**

Seventeen typically developing children that participated in Study 1 also participated in Study 2. Prior to inclusion in the study, the experimenter conducted a brief probe to determine whether the participant could correctly engage in the target task (alphabet-matching task). That is, the experimenter sat with the participant at the table and asked the participant to match alphabet cards to the corresponding letter on a matching board. If the participant was able to correctly match for the first five trials, they were included in Study 2. Sessions were conducted in the same session rooms as Study 1 and were equipped with a table, chairs, and relevant session materials. Sessions were 5 min in length and conducted one to five times per day, 3 to 5 days per week.

### **Materials**

During all sessions, the task materials and alternative task materials were present. The target task was an alphabet-matching task, and the materials included 2-3 sets of alphabet cards (each card measured 4.4 cm x 4 cm) and 2-3 sets of alphabet poster boards (each board measured 21.5 cm x 27.9 cm). In each set of alphabet cards there were 26 cards, and each card depicted one of the 26 lower-case letters of the alphabet. On each of the poster boards there were 26 upper-case letters of the alphabet. As mentioned above, this target task was shown to be a

maintenance task for all participants. An alternative task was also present on the table and included crayons and paper, a book, or a puzzle. During the attention sessions, one of the pictures depicting different forms of attention (the same used in Study 1) was present to indicate to the participant the form of attention that would be available during that session. See Appendix B for a depiction of stimuli used in these sessions.

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

Trained observers recorded participant and experimenter behavior using handheld data-collection devices. The dependent variable was the frequency of correct, independent responses on the alphabet-matching task, which was converted to a rate measure. Correct, independent responses were defined as placing a card depicting a lowercase letter (sample stimulus) on top of square on the board depicting the corresponding upper-case letter (comparison stimulus). Data were also collected on incorrect responses, which were defined as placing a card depicting a lowercase letter on top of a square on the board depicting the incorrect upper-case letter. However, incorrect responding rarely occurred. That is, the range of the mean rate of incorrect responding across participants was 0-.17 (see Table 2 for individual mean rates and ranges), which suggests that the participants were not missing out on the opportunity to access attention because of incorrect responding. Finally, data were collected on the frequency and duration of attention delivery by the experimenter (as defined in Study 1). Similar to Study 1, the duration of the delivery of each form of attention was removed from the session time to control for the opportunity to respond across different attention sessions.

Interobserver agreement was assessed by having a second observer independently collect data on child and therapist behavior for 48% (range, 25% - 69%) of sessions for all participants throughout the study. Observers' records were divided into 10-s intervals and compared on an

interval-by-interval basis. Interobserver 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 Jake, mean IOA was 87% (range: 86%-100%). For Arthur, mean IOA was 91% (range: 70%-100%). For Lilly, mean IOA was 99% (range: 87%-100%). For Bella, mean IOA was 96% (range: 89%-100%). For Sara, mean IOA was 96% (range: 85%-100%). For Ed, mean IOA was 96% (range: 82%-100%). For Gary, mean IOA was 97% (range: 92%-100%). For Cody, mean IOA was 97% (range: 87%-100%). For Matilda, mean IOA was 99% (range: 94%-100%). For Colton, mean IOA was 97% (range: 89%-100%). For Ben, mean IOA was 97% (range: 86%-100%). For Zora, mean IOA was 97% (range: 92%-100%). For Bay, mean IOA was 99% (range: 95%-100%). For Cynthia, mean IOA was 98% (range: 79%-100%). For Kent, mean IOA was 96% (range: 84%-100%). For Jules, mean IOA was 99% (range: 94%-100%). For Cain, mean IOA was 97% (range: 86%-100%).

## **Procedures**

Sessions in Study 2 were 5 min in length. During all sessions, the alphabet-matching task materials and alternative-task materials were placed in front of the participant. The experimenter sat next to the participant on the same side of the table such that delivery of attention could be easily heard and physical attention could be immediately delivered. The alternative tasks were selected based on observation of common items participants engaged with at moderate levels in the classroom. I included an alternative task in all sessions to decrease the likelihood that the participants would engage in the target task because “there was nothing else to do.” Finally, during sessions that involved the delivery of a particular form of attention, a picture (the same

ones used in Study 1) depicting the form of attention that was available during a particular session (i.e., praise, physical attention, or conversation) was placed above the task stimuli.

Prior to the start of each session, the experimenter provided rules to the participant regarding the contingencies that would be in place during that particular session (see detailed description below). In addition, the experimenter conducted two pre-session prompts in which the experimenter vocally prompted the participant to practice the response (i.e., correctly match a letter) and delivered the contingencies in place for that particular session. Finally, for all sessions that involved the delivery of attention, that form of attention was delivered identical to the way it was delivered in Study 1; however, it was delivered on a fixed-ratio 1 (FR 1) schedule of reinforcement for independent, correct responding on the alphabet-matching task.

***Baseline.*** Baseline sessions were conducted as the control condition for some participants. Prior to the start of each baseline session, the experimenter conducted two pre-session prompts and 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, no pictures depicting attention were present, and no programmed consequences were delivered.

***Noncontingent attention (all forms).*** Noncontingent attention sessions were conducted as the control condition for some participants that responded during baseline probes in which no consequences were delivered. Prior to these sessions, the experimenter conducted two pre-session prompts and 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 whole time.” During these sessions, all three pictures,



each depicting a different form of attention were present. In addition, the experimenter delivered all three forms of attention in a quasi-random order continuously throughout the session.

***Praise.*** Prior to the start of each praise session, the experimenter conducted two pre-session prompts and 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 picture depicting the delivery of praise was present. In addition, a brief praise statement was delivered (as in Study 1) contingent upon each occurrence of an independent, correct matching response.

***Physical attention.*** Prior to the start of each physical-attention session, the experimenter conducted two pre-session prompts and 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-attention sessions, the picture depicting the delivery of physical attention was present. In addition, physical attention was delivered (as in Study 1) contingent upon each occurrence of an independent, correct matching response.

***Conversation.*** Prior to the start of each conversation session, the experimenter conducted two pre-session prompts and 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 picture depicting the delivery of conversation was present. In addition, conversation was delivered (as in Study 1) contingent upon each occurrence of an independent, correct matching response.

## **Experimental Design**

A multielement or a reversal design was used for experimental control. When I used a reversal design for experimental control, the order of attention conditions depended on the

preference level of each form of attention from Study 1. After baseline, the least preferred form of attention (from the attention assessment in Study 1) was implemented first. Next, the second preferred form of attention was implemented. Finally, the most preferred form of attention was implemented. A noncontingent attention baseline was chosen as an alternative to the no programmed consequences baseline if the participant engaged in responding toward the task during the no programmed consequences baseline. The purpose of the noncontingent attention baseline was to determine whether the task was reinforcing in itself and to determine whether attention functioned as a reinforcer. That is, if during the noncontingent attention baseline, if the participant responded to the task it would suggest that the task was reinforcing in itself or that attention was not a reinforcer. Alternatively, if the participant did not respond to the task during the noncontingent attention baseline it would suggest that attention was a reinforcer, or at the very least, attention was more reinforcing than the task.

### **Study 2 (Reinforcer Assessment) Results**

Results of the reinforcer assessments are depicted in Figures 8-12. Figures 8 and 9 show the results for the seven participants that showed an identical match between their attention assessment and reinforcer assessment. Figure 8 shows the results for the four participants (Jake, Arthur, Lilly, and Bella) that showed much higher levels of responding for conversation as compared to praise and physical attention across both the attention assessment and reinforcer assessment. That is, during the reinforcer assessment, Jake and Arthur both showed low and sometimes decreasing levels of responding during baseline, praise, and physical attention conditions, whereas high and stable levels of responding occurred during the conversation condition. In addition, Lilly and Bella showed overall higher and sustained levels of responding during the conversation condition as compared to praise and physical attention; however, Lilly

initially responded at moderate and variable rates during the second praise condition, which decreased over time; and Bella responded at moderate to high rates during some of the praise and physical attention conditions. The left column of Figure 9 shows the results for two additional participants (Sara and Ed) who engaged in overall higher and more stable levels of responding for conversation as compared to praise and physical attention during both the attention and reinforcer assessment. However, their patterns of responding were somewhat different than those for the four participants depicted in Figure 8. During the reinforcer assessment, Sara engaged in low levels of responding in baseline; however, she engaged in high and variable levels of responding during praise and physical attention conditions. Responding eventually decreased in praise conditions and maintained at lower levels in the physical attention condition as compared to conversation. Interestingly, this pattern of responding was similar to those seen in Sara's attention assessment. In addition, Ed engaged in low levels of responding during baseline and high, stable levels of responding for conversation; however, similar to Sara, he engaged in relatively high and variable levels of responding during praise and physical attention conditions. Unlike Sara, this pattern of responding for praise and physical attention did not match the outcome of his attention assessment. That is, he responded almost exclusively for conversation in the attention assessment. The right column of Figure 9 shows the results for Gary who displayed low levels of responding in baseline and high and similar levels of responding across all forms of attention, which matched the outcome of his attention assessment. Overall, the data for these seven participants show a match between the preferred forms of attention in the attention assessment and the highest levels of responding in the reinforcer assessment. Therefore, the data for the reinforcer assessment for these participants was an identical match and validate the outcome of the attention assessment for these participants.

Figures 10 and 11 show the results for the seven participants that showed a partial match between the attention assessment and the reinforcer assessment. Cody (top, left column of Figure 10) engaged in low levels of responding in baseline and higher and more stable levels of responding during the conversation condition as compared to the praise and physical attention condition of the reinforcer assessment. However, Cody's attention assessment showed high and similar levels of responding for all forms of attention. Thus, Cody's assessments showed a partial match for conversation. Matilda (bottom, left column of Figure 10) engaged in low levels of responding during baseline and increasing levels of responding to access conversation and physical attention during the reinforcer assessment. Her attention assessment showed that she engaged in initially similar levels of responding for conversation and physical attention; however, after session 13, she began engaging in much higher levels of responding for physical attention suggesting higher preference for this form of attention. Thus, Matilda's assessments showed a partial match for physical attention. Colton (top, right column of Figure 10) engaged in low levels of responding during baseline, high levels of responding to access physical attention and praise, and lower levels to access conversation during the reinforcer assessment. However, his attention assessment data showed that physical attention was the most preferred form of attention. Thus, Colton's assessments showed a partial match for physical attention. Ben (bottom, right column in Figure 10) engaged in low levels of responding during baseline and increasing levels of responding to access all forms of attention during the reinforcer assessment. However, his attention assessment showed that he engaged in higher levels of responding for conversation and physical attention as compared to praise. Thus, Ben's assessments showed a partial match for both conversation and physical attention.

Zora (top panel of Figure 11) engaged in low levels of responding during baseline and relatively similar levels of responding across conversation (M= 5.5 RPM), physical attention (M= 4.1 RPM), and praise (M= 3.5 RPM) conditions. Although the means are somewhat different, the general pattern of responding suggests that no type of attention was more effective than the other. However, after the first several sessions of her attention assessment, she engaged in higher levels of responding for conversation. Thus, the outcomes of her assessments were a partial match for conversation. Bay (middle panel of Figure 11) engaged in low levels of responding during noncontingent attention conditions and high and similar levels of responding during praise (M= 3.9 RPM), physical attention (M= 4.3 RPM), and conversation (M= 3.9 RPM) conditions. However, during his attention assessment, he displayed higher levels of responding for conversation as compared to physical attention and praise. Thus, the outcomes of his assessments were a partial match for conversation. It is important to note that I did not attempt to replicate the effects of the different attention conditions in the reinforcer assessment for Bay. Therefore, it is unclear whether the effects would have been replicated or more closely matched the outcomes of the attention assessment. Cynthia (bottom panel of Figure 11) engaged in low levels of responding during baseline conditions and variable but relatively high levels of responding to access all three forms of attention in the reinforcer assessment. Her attention assessment showed much higher and more stable levels of responding to access physical attention. However, it is important to note that only three sessions were conducted in the attention assessment and the first several rounds of sessions of the reinforcer assessment showed higher levels of responding for physical attention as compared to the other forms of attention. Therefore, it is possible that had we conducted more than three sessions in the attention assessment we would have observed similar responding as that in the reinforcer assessment.

Regardless, of the data collected, the outcomes of the two assessments show a partial match for physical attention. Overall, results for the seven participants depicted in Figures 10 and 11 show a partial match between their attention assessment and their reinforcer assessment suggesting the validity of our attention assessment methodology.

Figure 12 shows the results for the three participants (Kent, Jules, and Cain) that showed no match between their preferred form of attention in the attention assessment and the form of attention that functioned as a reinforcer during the reinforcer assessment. For all three participants, low levels of responding occurred during baseline, whereas higher levels of responding occurred to access conversation as compared to the other forms of attention. These data suggest that conversation functioned as a reinforcer for these three participants. In addition, the attention-assessment results for all three of these participants showed that physical attention was the most preferred form of attention. Overall, three participants attention assessment results did not match their reinforcer assessment results, suggesting that our attention assessment methodology was not useful for predicting the form of attention that would function as a reinforcer.

Table 3 lists the results of the attention assessment and reinforcer assessment for each participant. The results show for 7 out of 17 participants, the outcomes of the assessments was an identical match. Interestingly, 6 of these 7 participants showed conversation to be most preferred and to result in the highest level of responding in the reinforcer assessment. The 7<sup>th</sup> participant showed all three forms of attention as preferred and as a reinforcer. In addition, 7 out of 17 participants showed a partial match between their attention assessment and reinforcer assessment. Therefore, 14 out of 17 participants showed at least a partial match between their attention assessment and their preference assessment suggesting the utility of our attention

assessment for predicting the reinforcing efficacy of the different forms of attention. Finally, 3 out of 17 participants did not show a match between their attention assessment and their reinforcer assessment. Interestingly, all three of these participants showed physical attention as more preferred in the attention assessment but conversation resulted in higher levels of responding during the reinforcer assessment.

### **Study 3 (Reinforcer Assessment [Progressive-Ratio Schedule]) Method**

#### **Purpose**

The purpose of Study 3 was to determine whether forms of attention that were preferred in the attention assessment and that functioned as reinforcers in the reinforcer assessment would also function as reinforcers when the schedule of reinforcement was quickly increased within session (progressive-ratio [PR] schedule). By conducting this PR assessment, results provide information about whether particular forms of attention continued to be reinforcers even when the response requirement was increased.

#### **Participants and Setting**

Ten of the children that participated in Study 1 and Study 2 were included. Sessions were conducted in the same session rooms as Study 1 and Study 2 and were equipped with a table, chairs, and relevant session stimuli. Sessions were up to 15 min in length and were conducted one to five times per day, 3 to 5 days per week. For participants for which sessions lasted 15 min, no more than two sessions were conducted in one day.

#### **Materials**

During all sessions, task materials and alternative-task materials were present, which were identical to those used in Study 2. In addition, as in Study 2, during attention sessions, the pictures depicting one of the three forms of attention was present.

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

Trained observers recorded participant and experimenter behavior using handheld data-collection devices and pencil and paper data collection. As in Study 2, the dependent variable was the frequency of correct, independent responses on the alphabet-matching task, which was converted to a rate measure. Correct responses, incorrect responses, and frequency and duration of experimenter attention delivery were recorded as they were in Study 2. As in Study 2, our data show incorrect responding rarely occurred. That is, the range of the mean rate of incorrect responding across participants was 0-.12 (see Table 4 for individual mean rates and ranges), which suggests that the participants were not missing out on the opportunity to access attention because of incorrect responding. Similar to Study 1 and Study 2, duration of the delivery of each form of attention was removed from the session time to control for the opportunity to respond across sessions. An additional dependent variable in Study 3 was the terminal progressive-ratio (PR) schedule in each session (i.e., the last schedule that was completed during the implementation of the PR schedule). To determine this, data collectors marked through (using paper and pencil) the PR schedules that the participant completed throughout the session. The last PR schedule that was completed was considered the terminal schedule (break point).

Interobserver agreement was assessed by having a second observer independently collect data on participant and therapist behavior for 39% (range: 12% - 61%) of sessions for all participants throughout the study. Observers' records were divided into 10-s intervals and compared on an interval-by-interval basis. Interobserver agreement was calculated for each response 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 Sara, mean IOA was 98% (range: 95%-



100%). For Jake, mean IOA was 95% (range: 77%-100%). For Bay, mean IOA was 98% (range: 91%-100%). For Colton, mean IOA was 99% (range: 98%-100%). For Bella, mean IOA was 99% (range: 85%-100%). For Gary, mean IOA was 98% (range: 88%-100%). For Cynthia, mean IOA was 99% (range: 90%-100%). For Ed, mean IOA was 98% (range: 90%-100%). For Matilda, mean IOA was 98% (range: 95%-100%). For Cody, mean IOA was 98% (range: 91%-100%).

Procedural integrity with which the experimenter delivered attention according to the correct PR schedule requirement was calculated for 48% (range: 18%-91%) of sessions across phases and participants. This was calculated by going through the data streams after sessions and determining the percentage of correct implementation of the PR schedule. That is, after each schedule, if attention was delivered within 2 s after the completion of the last response for that PR schedule, it was counted as a correct delivery of attention. However, if attention did not follow within 2 s of completion of that schedule, it was counted as an incorrect delivery of attention. Furthermore, if attention was delivered at a time in which a PR schedule was not completed, it was counted as an incorrect delivery of attention. For each session in which procedural integrity was calculated, the total number of correct deliveries of attention was divided by the number of correct and incorrect deliveries of attention and multiplied by 100%. For Sara, mean procedural integrity was 90% (range: 71%-100%). For Jake, mean procedural integrity was 91% (range: 81%-100%). For Ed, mean procedural integrity was 100%. For Bella, mean procedural integrity was 100%. For Bay, mean procedural integrity was 89% (range: 67%-100%). For Colton, mean procedural integrity was 100%. For Cynthia, mean procedural integrity was 90% (range: 0%-100%). For Matilda, mean procedural integrity was 96% (range: 71%-100%). For Gary, mean procedural integrity was 97% (range: 66%-100%).

For Cody, mean procedural integrity was 97% (range: 20%-100%). Unfortunately, for some participants, procedural integrity ranges were low. However, these low percentages only occurred for one or two sessions. The reason for low percentages in these few sessions is that these sessions had only one or a few response(s) such that if the experimenter incorrectly delivered attention after one response the percentage of correct implementations was automatically zero.

### **Procedures**

During all sessions, the tasks, materials, rules, and pre-session prompts were identical to Study 2. However, an additional rule was given to the participant during pre-session prompts. That is, the experimenter also said, “Sometimes you will have to match more than one time.” During attention sessions, a pencil and a piece of paper and a silent timer were used to collect data on the PR schedule that was met and the schedule for which responding ceased within session. During the attention sessions, a PR schedule was increased by one after two implementations of a particular schedule (e.g., FR1, FR1, FR2, FR2, FR3, FR3, etc.). The terminal PR schedule (break point) was determined when 2 min elapsed with no responding or after 15 min. The therapist started a silent timer after each correct response, if the participant responded within 2 min, the timer was reset and the session was continued. If the participant did not respond during a 2-min period, the session ended. If the participant continued to respond at a rate in which 2 min did not elapse in which no responding occurred, the session lasted 15 min. The forms of attention delivered were identical to those used in Study 1 and Study 2.

**Baseline.** Baseline sessions were conducted as the control condition for some participants. Prior to the start of each baseline session, the experimenter conducted pre-session prompts and told the participant, “You can match the letters or you can do this (pointed to the

alternative task), but I can't talk to you while we are sitting here." During baseline sessions, no pictures depicting attention were present, and no programmed consequences were delivered.

***Noncontingent attention (all forms).*** Noncontingent attention sessions were conducted as the control condition for some participants that responded during baseline probes in which no consequences were delivered. Prior these sessions, the experimenter conducted two pre-session prompts and 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 whole time." During these sessions, all three pictures, each depicting a different form of attention, were present. In addition, the experimenter delivered all three forms of attention in a quasi-random order continuously throughout the session.

***Praise.*** Prior to the start of each praise session, the experimenter conducted pre-session prompts and told the participant, "You can match the letters or you can do this (pointed to the alternative task); if you match the letters, I will say 'you are doing a great job', 'your work is awesome', and 'you are a terrific student.' Sometimes you will have to match more than one time." During praise sessions, the picture depicting the delivery of praise was present. Correct matching resulted in the delivery of a praise statement for 1-2 s on a progressive-ratio (PR) schedule. The praise statements delivered by the experimenter were varied in a quasi-random fashion as was done in Study 1 and Study 2.

***Physical attention.*** Prior to the start of each physical-attention session, the experimenter conducted pre-session prompts and told the participants, "You can match the letters or you can do this (pointed to the alternative task); if you match the letters, I will give you tickles, high-fives, or hugs; and sometimes you will have to match more than one time." During physical-attention

sessions, the picture depicting the delivery of physical attention was present. Correct matching resulted in the delivery of physical attention for 1-2 s on a progressive-ratio (PR) schedule. The physical attention delivered by the experimenter was varied across the three types of physical attention in a quasi-random fashion.

**Conversation.** Prior to the start of each conversation session, the experimenter conducted pre-session prompts and told the participants, “You can match the letters, or you can do this (pointed to the alternative task); if you match the letters, I will talk to you; and sometimes you will have to match more than one time.” During conversation sessions, the picture depicting the delivery of conversation was present. Correct matching resulted in delivery of conversation for approximately 5 s on a progressive-ratio (PR) schedule.

### **Experimental Design**

A multielement design was used for experimental control. All sessions ended if no responding occurred for 2 min or after 15 min elapsed. As in Study 2, either a no consequence or a noncontingent attention baseline condition was implemented.

### **Study 3 (Reinforcer Assessment [PR Schedule]) Results**

Results of the reinforcer assessments (PR schedule) are depicted in Figures 13 and 14. Figure 13 shows the results for Sara, Jake, Bay, Colton, and Bella. Both Sara and Jake engaged in low levels of correct responding (alphabet-matching task) in baseline. In addition, these participants engaged in higher and more stable levels of responding for conversation as compared to the other two types of attention. In addition, there were higher break points in the conversation condition ( $M= 7$ ) as compared to praise ( $M= .33$ ) and physical attention ( $M= 2.6$ ) (for Sara) and in the conversation condition ( $M= 6.4$ ) as compared to praise ( $M= .6$ ) and physical attention ( $M= 1.8$ ) for Jake. The results of both Sara and Jake’s attention assessment and

reinforcer assessment also showed higher levels of responding for conversation suggesting that there was a match between all three assessments for these two participants.

Bay (top, right column of Figure 13) engaged in low levels of responding during the baseline condition and high and similar levels of responding and break points across all three forms of attention in the reinforcer assessment (PR schedule). The results of Bay's attention assessment showed preference for conversation and his reinforcer assessment showed similar levels of responding across all forms of attention. Therefore, across assessments, there was partial match for conversation across all assessments and an identical match between the reinforcer assessment and reinforcer assessment (PR schedule). Colton (middle, right column of Figure 13) engaged in low levels of responding during the baseline condition and variable levels of responding across the conversation ( $M = .8$  RPM), physical attention ( $M = 1.7$  RPM), and praise ( $M = 2.5$  RPM) conditions. Furthermore, the break points were relatively variable across conversation ( $M = 1.4$ ), physical attention ( $M = 1.8$ ), and praise ( $M = 2.8$ ) conditions. Colton's attention assessment showed that physical attention was preferred and his reinforcer assessment showed higher levels of responding for physical attention and praise. Overall, these results show a partial match for physical attention across all assessments and a partial match for physical attention and praise for both reinforcer assessments. Bella engaged in low levels of responding during baseline conditions and variable levels of responding in the conversation ( $M = 1.3$  RPM), physical attention ( $M = .6$  RPM), and praise ( $M = 1$  RPM) conditions. In addition, break points were similar across conversation ( $M = 1.8$ ), physical attention ( $M = .6$ ), and praise ( $M = 1.4$ ) conditions. Bella's attention and reinforcer assessment showed higher levels of responding for conversation. Therefore, across the three assessments there was a partial match for conversation.

Figure 14 shows the results for Gary, Cynthia, Ed, Matilda, and Cody. Gary (top, left column of Figure 14) engaged in similar levels of responding in baseline conditions ( $M = .8$  RPM) as compared levels of responding for conversation ( $M = 1.5$  RPM), physical attention ( $M = .9$  RPM), and praise ( $M = 1.3$  RPM) in the initial reinforcer assessment (PR schedule). Given this, the experimenter implemented noncontingent attention and showed low levels of responding. Next, the experimenter replicated the procedures from the reinforcer assessment in Study 2 by showing an increase in responding across all forms of attention with somewhat higher levels occurring in some of the physical attention sessions. A reversal back to the reinforcer assessment (PR schedule) phase showed somewhat of a decrease in responding to levels similar to those in the previous PR schedule phase (except for one praise session). Additional sessions could not be conducted with Gary because he left the program. Gary's attention assessment and reinforcer assessment results showed high levels of responding for all forms of attention. In addition, the replication of the conditions of the reinforcer assessment in the reinforcer assessment (PR schedule) evaluation show these results. However, during the PR schedule, Gary engaged in similar but lower (similar to baseline) levels of responding. Cynthia engaged in zero levels of responding during baseline. During the PR schedule, she engaged in decreasing levels of responding with corresponding decreasing break points. When the experimenter attempted to replicate the reinforcer assessment procedures from Study 2 (FR1 schedule), Cynthia displayed an increase in responding; however, responding continued to be variable with somewhat higher overall levels occurring for conversation ( $M = 2.5$  RPM) as compared to physical attention ( $M = .8$  RPM), and praise ( $M = .5$  RPM). When the experimenter replicated the PR schedule phase, Cynthia continued to display some responding in conversation ( $M = 1.9$  RPM) and physical attention ( $M = .8$  RPM) conditions; however, overall there was a decrease in responding.

Cynthia's attention assessment showed preference for physical attention and her reinforcer assessment showed high levels of responding across all forms of attention. Although the PR schedule showed continued responding in some of the sessions, overall levels decreased across the phases. Ed, Matilda, and Cody engaged in low levels of responding during baseline and initially high levels of responding in one or several sessions of the PR schedule; however, responding quickly decreased to zero levels. Therefore, results for these participants show that increasing the response requirement resulted in a decrease in the reinforcing efficacy of all of these forms of attention.

Overall, results of all three assessments are depicted in Table 5. Results showed that for two (Sara and Jake) out of 11 participants, there was a clear match between the three assessments, and those matches were for conversation. For a third participant, Gary, although levels of responding were lower in the PR schedule, there was a match for all forms of attention across assessments. In addition, for 3 (Bay, Colton, and Bella) out of 10 participants there was a partial match, and the type of attention varied across participants. For a fourth participant (Cynthia), although levels of responding decreased to low or zero levels in the PR schedule phase, when responding did occur it occurred across all three forms of attention showing a partial match across assessments. Finally, for 3 (Ed, Matilda, and Cody) out of 10 participants responding quickly decreased and maintained at zero levels in the PR phase suggesting that the increased response requirement decreased the reinforcing efficacy of the forms of attention. Therefore, there was no match for these three participants from the reinforcer assessment (PR schedule) as compared to the other assessments. Overall, these results suggest that there was at least a partial match between the attention assessment and the reinforcer assessment (PR schedule) for 7 out of 10 participants.

## General Discussion

The purpose of Study 1 was to determine preference for common forms of attention that are typically delivered in early childhood environments (i.e., praise, conversation, and physical attention) with a relatively large population ( $N = 31$ ) of young, typically developing children. The majority of participants either showed a preference for conversation (13 out of 31) or physical attention (13 out of 31). Two participants out of 31 preferred conversation and physical attention equally, and 3 participants out of 31 preferred all three forms equally. Very few of the participants (3 out of 31) preferred praise, and this was only the participants that preferred all three types of attention.

There are several important findings from Study 1. First, the results suggest that two common forms of attention that are delivered in early childhood environments (conversation and physical attention) were preferred for the majority of participants in Study 1. Second, the results suggest that some forms of attention are more preferred than others for particular participants. Third, the results suggest that praise was not a highly preferred form of attention for the majority of participants. There are several possible reasons for these results. First, the high level of praise (and other forms of attention) delivered in the classrooms that the participants attended each day and prior to all sessions may have influenced the preference for praise during the attention assessment. Second, it is important to note that the type of praise used in the current study was general praise rather than descriptive praise. Some previous research has suggested that descriptive praise may be more effective than general praise for increasing appropriate behavior (Brophy, 1981; Chalk & Bizo, 2004; Haydon & Musti-Rao, 2011); however, these effects are often transient and the conditions under which descriptive praise may be more effective than general praise is unknown. As mentioned above, descriptive praise may be a more effective



reinforcer for acquisition tasks as compared to mastered tasks; however, both types of praise or only general praise may be a reinforcer for mastered tasks. Regardless, it is possible had I used descriptive praise, I may have observed different results. Future researchers should conduct further evaluations to determine the conditions under which descriptive praise is or is not more preferred and effective than general praise and to compare the preference and efficacy of descriptive praise as compared to other common forms of attention delivered in early childhood environments.

The purpose of Study 2 was to determine whether the common forms of attention assessed in Study 1 would function as reinforcers and whether the outcome of the reinforcer assessment would match the outcome of our attention assessment from Study 1. Overall, results showed that for the majority of participants (14 out of 17 participants) at least one form of attention that was preferred in the attention assessment also functioned as a reinforcer in the reinforcer assessment. More specifically, for 7 out of 17 participants, the results of the two assessments was an exact match. For 6 out of the 7 participants, conversation was the form of attention for which there was a match; for 1 out of 7 participants, all three forms of attention resulted in high levels of responding across both assessments. For 7 out of 17 participants their results were a partial match (e.g., physical attention was the only preferred form of attention in the attention assessment but both physical attention and conversation functioned as a reinforcer in the reinforcer assessment). For three out of 17 participants, their results were a nonmatch (e.g., physical attention was the preferred form, but conversation was the form that functioned as a reinforcer).

There are several interesting findings from Study 2 (and the comparison of results from Study 1 and Study 2). Results of Study 2 suggest that conversation functioned as a reinforcer for

16 out of 17 participants, suggesting that conversation may be a powerful reinforcer for young children. There are several possible reasons why conversation may have been a more potent reinforcer than physical attention or praise. First, it is possible that there was a lot more variability in attention delivery in conversation as compared to praise and physical attention. In fact, we controlled for the number of different types of physical attention delivered, and although we told experimenters to deliver varied praise statements and conversation statements within and across sessions, it is possible that this was done more so for conversation as compared 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., Dunlap & Koegel, 1980; Egel, 1981; Keyl-Austin et al., 2012; Koehler et al., 2005; Wine & Wilder, 2009). Second, it is possible that the preference for the topics that we discussed during conversation delivery influenced the efficacy of conversation. That is, conversation statements included topics such as preferred items and activities and activities that the participant was observed to engage in earlier in the day. Furthermore, the experimenters were very familiar with the topics of conversation that the participants preferred. In fact, Roscoe et al. (2010) showed that access to high preference conversation topics resulted in more responding than access to low preference conversation topics. Third, it is possible that conversation was a more potent reinforcer because it involved reciprocity in that when a conversation statement(s) was delivered by the experimenter, the participants typically conversed with the experimenter. Given these possible variables influencing the reinforcing efficacy of conversation, future researchers might determine the influence of these variables on the efficacy of conversation as a reinforcer.

In addition, the comparison of results from Study 1 and Study 2 show that for 14 out of 17 participants, there was at least a partial match between the attention assessment and the

reinforcer assessment. These data suggest that our attention assessment was a valid method for determining form(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 attention assessment functioned as a reinforcer in the reinforcer assessment. That is, for only one participant was there a false positive result of the attention assessment. Finally, for 6 out of 17 participants, praise functioned as a reinforcer; however, for 4 of these 6 participants, all forms of attention functioned as a reinforcer. Similarly, 8 out of 17 participants' results showed that at least one form of attention that was not shown to be preferred in the attention assessment functioned as a reinforcer in the reinforcer assessment. It is possible that this difference in results is due to the different arrangements used across studies. That is, during the attention assessment, a concurrent-operants arrangement was used in which relative response rates were determined when all three forms 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 form of attention is available per session. Future researchers should consider comparing the two assessment procedures under similar arrangements. That is, a single-operant procedure could be used in both the attention assessment and the reinforcer assessment or a concurrent-operant procedure could be used in both.

The purpose of Study 3 was to determine whether common forms of attention evaluated in Study 1 and Study 2 would function as reinforcers under increasing progressive-ratio schedules and whether the outcome of this reinforcer assessment (PR schedule) would match the outcome of our attention assessment and the reinforcer assessment. Overall results of Study 3 showed that for 3 out of 10 participants, the same form(s) of attention that was preferred in the

attention assessment functioned as a reinforcer in the reinforcer assessment and the reinforcer assessment (PR schedule). For two of these participants, this form of attention was conversation, and for the third participant, all forms of attention. For 4 of the 10 participants, at least one form of attention that was preferred in the attention assessment also functioned as a reinforcer in the reinforcer assessment and the reinforcer assessment (PR schedule). For 3 out of 10 participants, the form(s) of attention that were preferred in the attention assessment did not function as a reinforcer in the attention assessment or the reinforcer assessment (PR schedule). In fact, for these three participants, responding decreased and maintained at low levels in the PR schedule evaluation.

There were several interesting results of Study 3 (and the comparison of Study 3 results with Study 1 and Study 2 results). Data for the 7 of the 10 participants that showed at least a partial match between the reinforcer assessment (PR schedule) and the attention assessment, suggests additional support for the validity of the attention assessment. Furthermore, data for the five participants that showed partial matches show that the attention assessment only showed false negative results. That is, there were forms of attention that functioned as reinforcers under the PR schedule that were not shown to be preferred in the attention assessment; however, there were no forms of attention that were shown to be preferred in the attention assessment that were not shown to be reinforcers in the PR schedule assessment.

Second, results for the three participants that showed decreased and zero levels of responding in the PR schedule suggest that although some forms of attention were preferred and functioned as a reinforcer under low schedule requirements, they were not potent reinforcers (i.e., they did not maintain responding under larger schedule requirements). In fact, for several participants that we determined to show partial matches between the attention assessment and

reinforcer assessment, low and sometimes decreasing levels of responding occurred in the PR schedule. In fact, across participants, the break point did not exceed an FR 10 schedule. Overall, these data suggest that attention may not be a potent reinforcer, particularly if the schedule requirements are rapidly thinned. However, it is possible that had we thinned the schedule slower or used a progressive ratio schedule that was thinned across sessions, we may have observed different results. To address whether we may have thinned the schedule too quickly resulting in extinction of responding, we assessed the PR schedule using preferred edibles with two participants. Results of these probes suggested high and sustained levels and very high break points for edibles as compared to attention.

Overall, the results of the three studies suggest that our attention assessment is a valid and efficient procedure for determining forms of attention that will function as a reinforcer (sometimes even under large work requirements). Furthermore, the results validate the notion that conversation, physical attention, and praise are important forms of attention to include in early childhood environments. More specifically, these data suggest that early childhood educators might consider increased use of conversation and physical attention in early childhood environments, particularly if praise is ineffective.

Although we did not find that age or gender was related to preference or reinforcing efficacy of forms of attention, it may be the case that functioning level or the diagnosis of autism spectrum disorder (ASD) (Nuernberger et al., 2012; Smaby et al., 2007), or another intellectual or developmental disability, may allow for the prediction of forms of attention that are more likely to function as reinforcers. For example, Smaby et al. (2007) conducted a free-operant preference assessment with three children diagnosed with ASD to determine preferred forms of social interactions (i.e., tickles, head rubs, and praise). For all three participants, physical forms

of attention were preferred. Two participants responded at higher rates for head rubs and the other participant responded at the highest rate for tickles. Future researchers should conduct studies similar to the current studies with individuals with ASD and other IDD to determine (a) whether any of the common forms of attention are preferred or function as reinforcers, (b) and if so, which forms of attention are preferred and function and reinforcers. Furthermore, researchers might begin determining ways to increase the reinforcing efficacy of common forms of attention given their ubiquity in early childhood education and intervention environments.

Although the results of the studies provide important information regarding preference and reinforcing efficacy of common forms of attention and validate a simple assessment procedure for determining forms of attention that will function as reinforcers, there are several limitations of the current studies. One potential limitation across studies was that the duration of attention delivery was not held constant across the different forms of attention. As mentioned above, I decided to do this because I wanted to deliver the different forms of attention in ways that were similar to how they were delivered in the classroom environment. Although, the differences in duration of attention were minimal across attention forms, it is possible that a certain form of attention (e.g., conversation) might be more preferred or function as a reinforcer because it was longer in duration. Although the period of time in which a stimulus was delivered (or consumption time) was removed from each session duration to determine rate of responding, an additional limitation may have been that session time in which the establishing operation was not present (i.e., time during which the reinforcer was delivered or being consumed) was not added back on to the session time to equate session time across sessions. However, the results do not suggest that removing access time affected preference or the reinforcing efficacy of the forms of attention. For example, levels of responding for conversation were higher for a large

number of participants and conversation (because of longer durations of access time) was still responded to at higher levels than other forms of attention even though there was less opportunity to respond for conversation. To account for session duration, future researchers could stop the timer during the start of attention delivery and start the timer again at the end of attention delivery. This would allow for the same session duration across all forms of attention, thus, removing any potential for fewer opportunities to respond for attention.

As mentioned above, another possible limitation was that the variability in attention delivery was not held constant within or across different forms of attention or within and across participants. Therefore, it is possible that the amount of variability in the delivery of a specific form of attention may have influenced responding. The only type of attention for which I programmed variability was physical attention in which experimenters were told to quasi-randomly deliver the three different types of physical attention (tickles, high-fives, and hugs). In addition, experimenters were told to vary the different praise and conversation statements presented. Therefore, it is possible that the number of different praise and conversation statements used in a particular session or across sessions may have been very high or very low, which may influence responding. For example, given that only three types of physical attention were delivered, whereas numerous different conversation statements could have been delivered, it is possible that the preference and efficacy of conversation over physical attention may be due to this variable. In addition, because physical attention was programmed to vary, and conversation and praise were not, it is possible that there was less variability in conversation and praise statements delivered by an experimenter, resulted in more responding to access physical attention. Furthermore, a similar limitation is that the things that were said by certain experimenters when praise, physical attention, or conversation was delivered may have

influenced responding. For example, some experimenters may have said things that were more preferred than other experimenters, which may have influenced responding across participants.

A possible limitation of Study 1 is that the control card was not introduced for the specific participants at a similar point in the assessment. That is, for the first participants who showed undifferentiated responding, the control card was introduced relatively later in the assessment; whereas, for the subsequent participants, the control card was introduced earlier for determining discrimination more efficiently. Future researchers should include a control card from the beginning of the assessment to prevent any question as to whether discrimination between the cards (and the contingencies) is an issue and to possibly increase efficiency of the assessment.

A possible limitation of Study 3 was that the session duration was not held constant in (i.e., the session could end after two minutes), which may have resulted in participants stopping responding to escape the sessions. Although this procedure may be considered a limitation, this pattern of responding further suggests that attention was not a very potent reinforcer and was potentially aversive. To control for this, future researchers could have the participant stay in the session room regardless of responding; however, it may be considered unethical to restrict the participant to leave the room until after 13 min.

As mentioned above, future researchers should consider using a concurrent-operants arrangement within a multielement design in replicating Studies 2 and 3. In the current study, only Study 1 included a concurrent-operants arrangement, whereas, in Studies 2 and 3 a single-operants arrangement was used. Thus, results from Study 1 show participant's relative preference; in contrast, Studies 2 and 3 show absolute reinforcing effectiveness. It is possible



that participants might have responded differently if a concurrent-operants arrangement was used in the latter two studies.

Future researchers might consider comparing the reinforcing strength of attention by measuring responding for access to attention on maintenance tasks versus acquisition tasks. It is possible that certain forms of attention may be more valuable when learning a new task as compared to engaging in a known task. In addition, future researchers could assess the reinforcing value of other forms of attention that were not included in the current study. That is, it could be that the forms of attention we assessed are not as preferred as other forms (e.g., smiles, back pats, singing, and piggy-back rides) that may be more preferred and may be more likely to function as reinforcers for young children. Furthermore, future researchers could determine whether other variables such as increased duration of attention increases the reinforcing efficacy of common forms of attention, particularly under increasing schedule requirements.

Finally, future researchers could extend the current study 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 forms 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 forms of attention, then teachers might program in deprivation periods of particular forms of attention if they are going to subsequently use that type of attention to teach a new skill.

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<b>Participant</b>	<b>Age</b>	<b>Gender</b>	<b>Preferred Attention Form</b>
Ed	4 yrs. 7 mo.	M	Conversation
Jake	4 yrs. 10 mo.	M	Conversation
Bella	3 yrs. 2 mo.	F	Conversation
Arthur	4 yrs. 10 mo.	M	Conversation
Lilly	3 yrs. 9 mo.	F	Conversation
Zora	4 yrs. 3 mo.	F	Conversation
Bay	3 yrs. 7 mo.	M	Conversation
Milo	4 yrs. 8 mo.	M	Conversation
Brandy	3 yrs.	F	Conversation
Carrie	3 yrs. 11 mo.	F	Conversation
Murray	3 yrs. 10 mo.	M	Conversation
Sara	4 yrs. 9 mo.	F	Conversation
Holly	5 yrs. 2 mo.	F	Conversation
Jules	5 yrs. 1 mo.	F	Physical
Cain	4 yrs. 1 mo.	M	Physical
Colton	4 yrs. 9 mo.	M	Physical
Aaron	5 yrs. 9 mo.	M	Physical
Sasha	3 yrs. 1 mo.	F	Physical
Cynthia	4 yrs. 10 mo.	F	Physical
Kent	3 yrs. 7 mo.	M	Physical
Luke	2 yrs. 8 mo.	M	Physical
Janet	4 yrs. 7 mo.	F	Physical

Rory	5 yrs.	M	Physical
Matilda	4 yrs. 10 mo.	F	Physical
Cori	5 yrs. 1 mo.	F	Physical
Brandon	5 yrs. 3 mo.	M	Physical
Ben	4 yrs. 4 mo.	M	Conversation & Physical
Stella	4 yrs. 8 mo.	F	Conversation & Physical
Katrina	5 yrs.	F	All Three
Gary	3 yrs. 10 mo.	M	All Three
Cody	4 yrs. 8 mo.	M	All Three

Table 1. Table 1 depicts demographic information (age and gender) of the participants who were included in Study 1. In addition, the last column depicts the outcome of the attention assessment for each participant.

<b>Participant</b>	<b>Incorrect Responding</b>
Jake	M=.01 (range: 0-.2)
Arthur	M=.02 (range: 0-.57)
Lilly	M=.03 (range: 0-.98)
Bella	M=.05 (range: 0-.77)
Sara	M=.03 (range: 0-.72)
Ed	M=.17 (range: 0-1.0)
Gary	M=.18 (range: 0-.82)
Cody	M=.04 (range: 0-.32)
Matilda	M=.03 (range: 0-.9)
Colton	M=.06 (range: 0-.28)
Ben	M=.02 (range: 0-.56)
Zora	M=.03 (range: 0-.4)
Bay	M=0
Cynthia	M=.08 (range: 0-.7)
Kent	M=.06 (range: 0-.42)
Jules	M=.02 (range: 0-.89)
Cain	M=.03 (range: 0-.48)

Table 2. Table 2 depicts the mean rate and range of incorrect responding to the matching task for Study 2.



<b>Participant</b>	<b>Attention Assessment</b>	<b>Reinforcer Assessment</b>	<b>Match?</b>
Jake (age: 4 yrs. 10 mo.)	Conversation	Conversation	Match
Arthur (4 yrs. 10 mo.)	Conversation	Conversation	Match
Lilly (age: 3 yrs. 9 mo.)	Conversation	Conversation	Match
Bella (age: 3 yrs. 2 mo.)	Conversation	Conversation	Match
Sara (age: 4 yrs. 9 mo.)	Conversation	Conversation	Match
Ed (age: 4 yrs. 7 mo.)	Conversation	Conversation	Match
Gary (age: 3 yrs. 10 mo.)	All Three Forms	All Three Forms	Match
Cody (age: 4 yrs. 8 mo.)	All Three Forms	Conversation	Partial Match
Matilda (age: 4 yrs. 10 mo.)	Physical	Physical & Conversation	Partial Match
Colton (age: 4 yrs. 9 mo.)	Physical	Physical & Praise	Partial Match
Ben (age: 4 yrs. 4 mo.)	Conversation & Physical	All Three Forms	Partial Match
Zora (age: 4 yrs. 3 mo.)	Conversation	All Three Forms	Partial Match
Bay (age: 3 yrs. 7 mo.)	Conversation	All Three Forms	Partial Match
Cynthia (age: 4 yrs. 10 mo.)	Physical	All Three Forms	Partial Match
Kent (age: 3 yrs. 7 mo.)	Physical	Conversation	No Match
Jules (age: 5 yrs. 1 mo.)	Physical	Conversation	No Match

Cain (age: 4 yrs. 1 mo.)	Physical	Conversation	No Match
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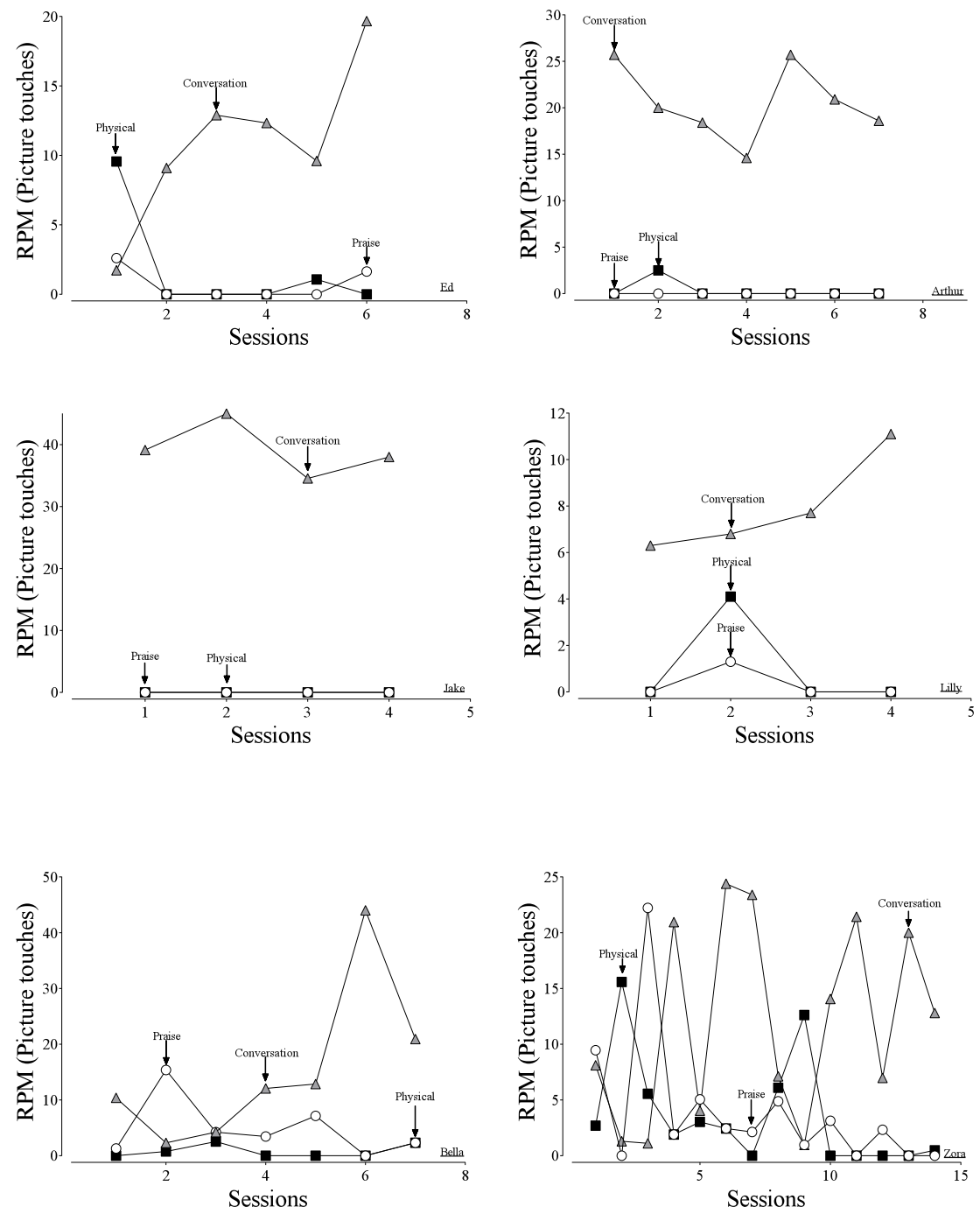
Table 3. Table 3 depicts results for the participants who were included in both Study 1 and Study 2.

<b>Participant</b>	<b>Average Rate of Incorrect Responding</b>
Sara	M=0
Jake	M=0
Bay	M=.02 (range: 0-.23)
Colton	M=.03 (range: 0-.55)
Bella	M=0
Gary	M=.12 (range: 0-1.1)
Cynthia	M=.01 (range: 0-.4)
Ed	M=.01 (range: 0-.16)
Matilda	M=.08 (range: 0-.13)
Cody	M=0

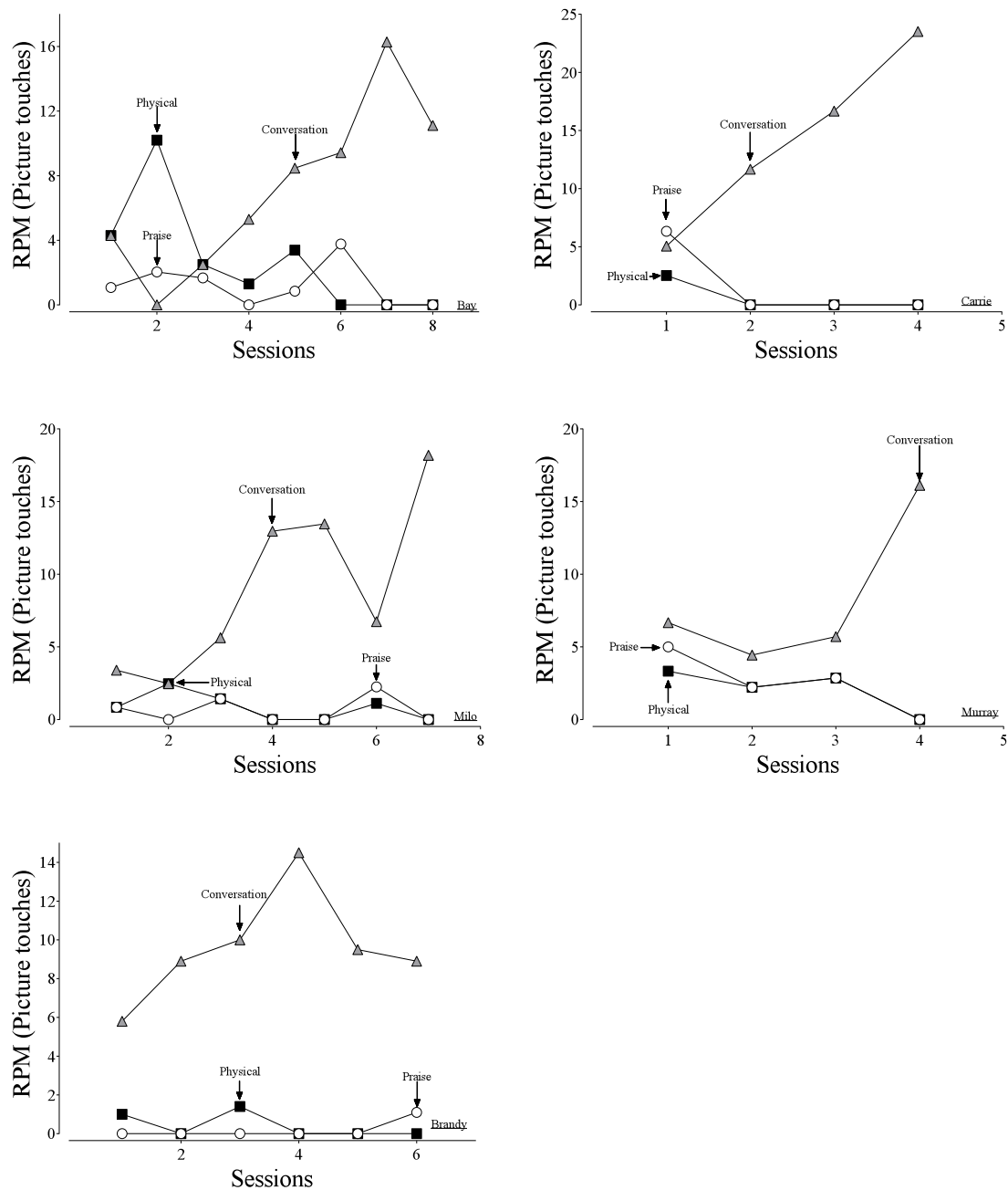
Table 4. Table 4 depicts the mean rate and range of incorrect responding to the matching task for Study 3.

<b>Participant</b>	<b>Attention Assessment</b>	<b>Reinforcer Assessment</b>	<b>Reinforcer Assessment (PR schedule)</b>	<b>Match?</b>
Sara (age: 4 yrs. 9 mo.)	Conversation	Conversation	Conversation	Match
Jake (age: 4 yrs. 10 mo.)	Conversation	Conversation	Conversation	Match
Bay (age: 3 yrs. 7 mo.)	Conversation	All Three Forms	All Three Forms	Partial Match
Colton (age: 4 yrs. 9 mo.)	Physical	Physical & Praise	All Three Forms	Partial Match
Bella (age: 3 yrs. 2 mo.)	Conversation	Conversation	All Three Forms	Partial Match
Gary (age: 3 yrs. 10 mo.)	All Three Forms	All Three Forms	All Three Forms	Match?
Cynthia (age: 4 yrs. 10 mo.)	Physical	All Three Forms	All Three Forms	Partial Match?
Ed (age: 4 yrs. 7 mo.)	Conversation	Conversation	None	No Match
Matilda (age: 4 yrs. 10 mo.)	Physical	Physical & Conversation	None	No Match
Cody (age: 4 yrs. 8 mo.)	All Three Forms	Conversation	None	No Match

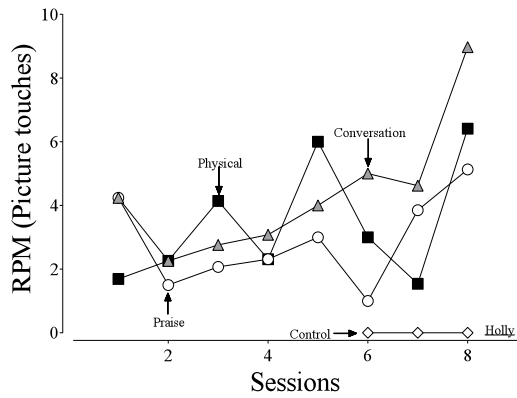
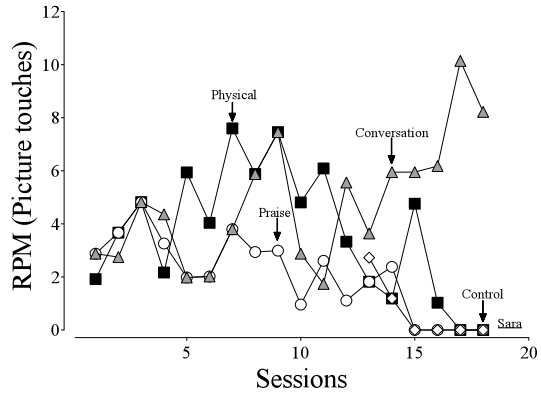
Table 5. Table 5 depicts results for the participants who were included in Study 1, Study 2, and Study 3.



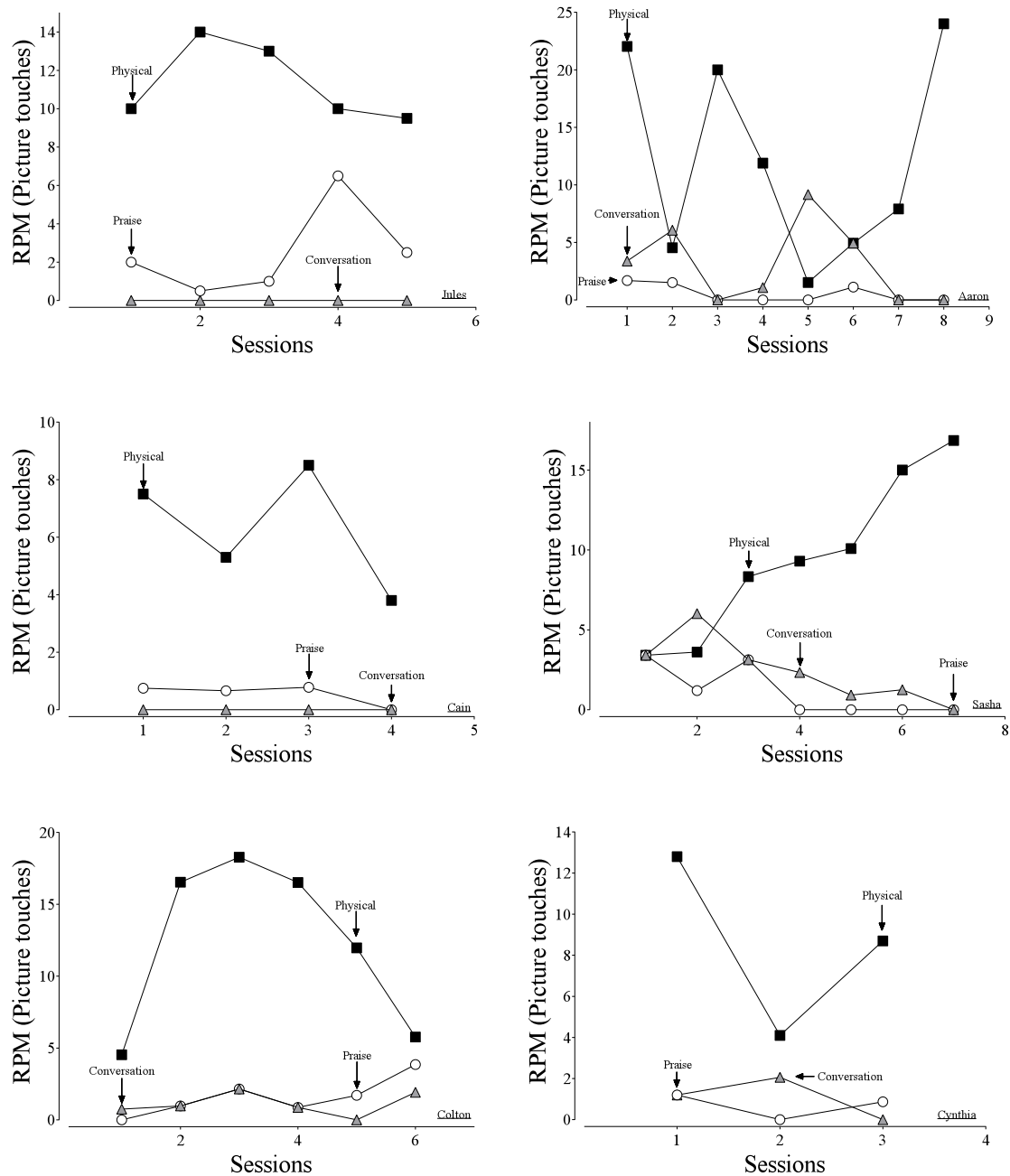
**Figure 1.** Figure 1 depicts attention-assessment data for Ed, Jake, Bella, Arthur, Lilly, and Zora. These participants responded at higher levels for conversation than they did for physical attention and praise.



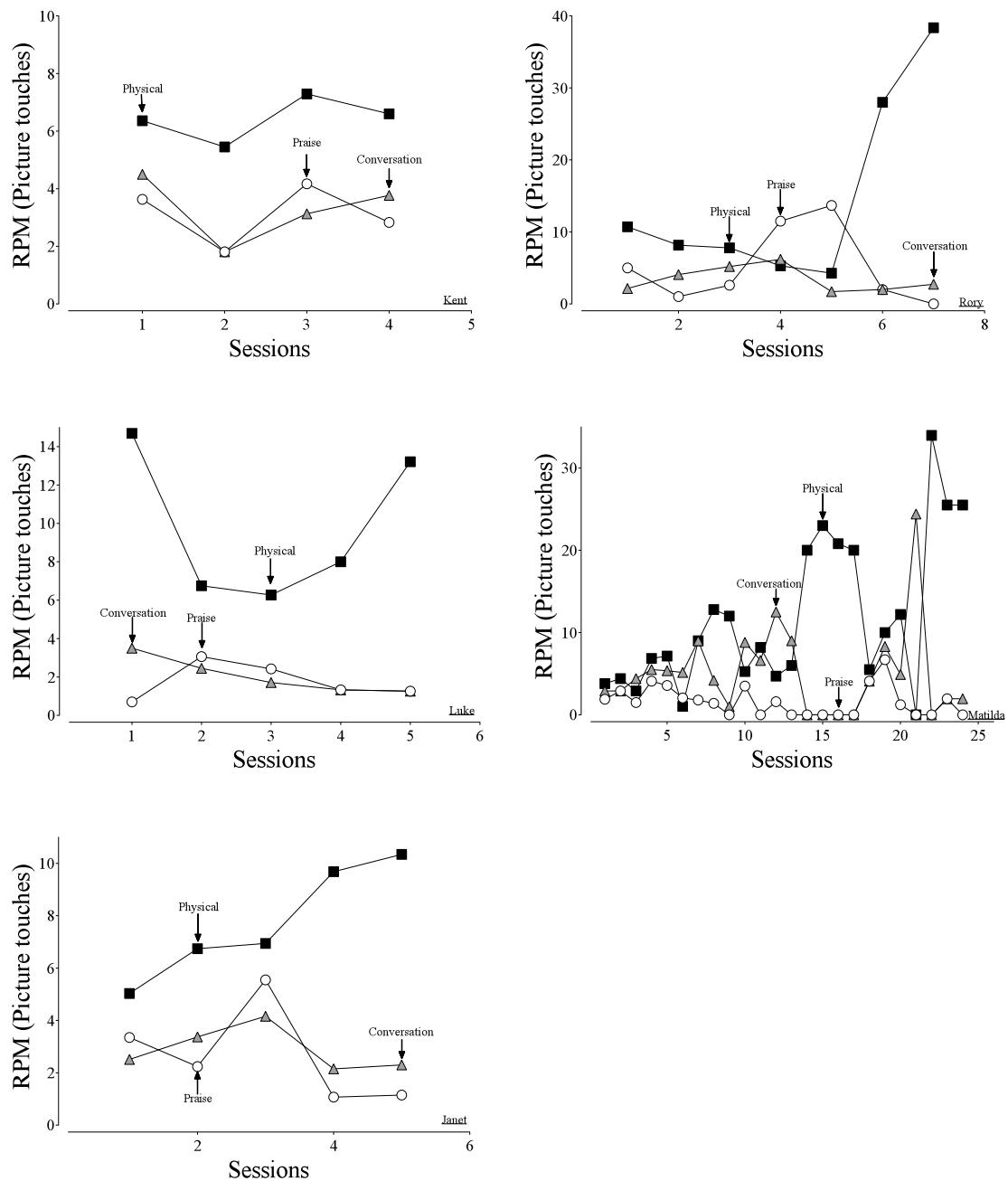
**Figure 2.** Figure 2 depicts attention-assessment data for Bay, Milo, Brandy, Carrie, and Murray. These participants responded at higher levels for conversation than they did for physical attention and praise.



**Figure 3.** Figure 3 depicts attention-assessment data for Sara and Holly. These participants responded at higher levels for conversation than they did for physical attention and praise after the control card was introduced.

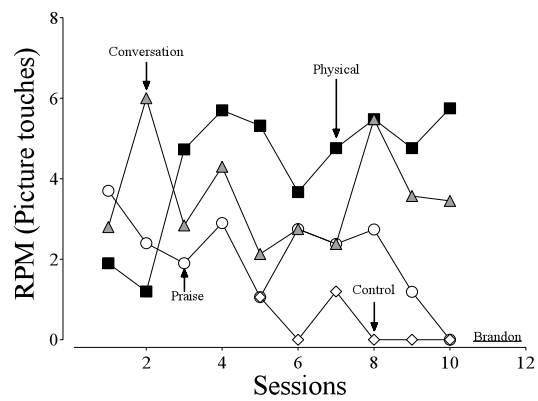
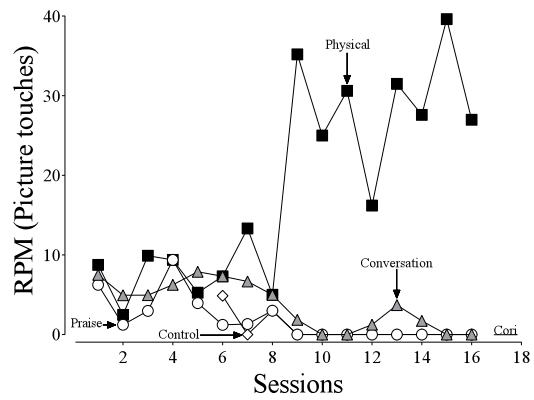


**Figure 4.** Figure 4 depicts attention-assessment data for Jules, Cain, Colton, Aaron, Sasha, and Cynthia. These participants responded at higher levels for physical attention than they did for conversation and praise.

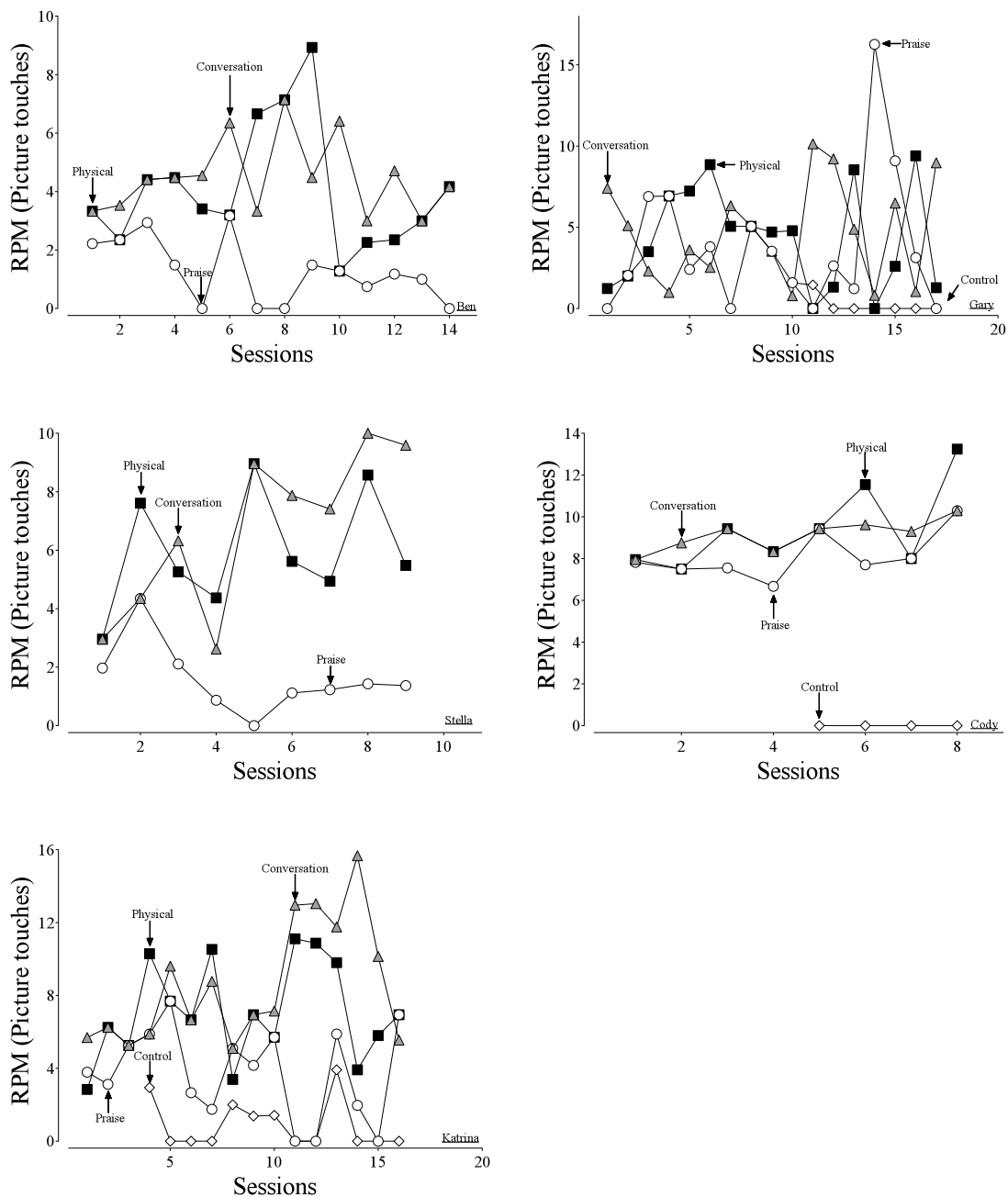


**Figure 5.** Figure 5 depicts attention-assessment data for Kent, Luke, Janet, Rory, and Matilda. These participants responded at higher levels for physical attention than they did for conversation and praise.

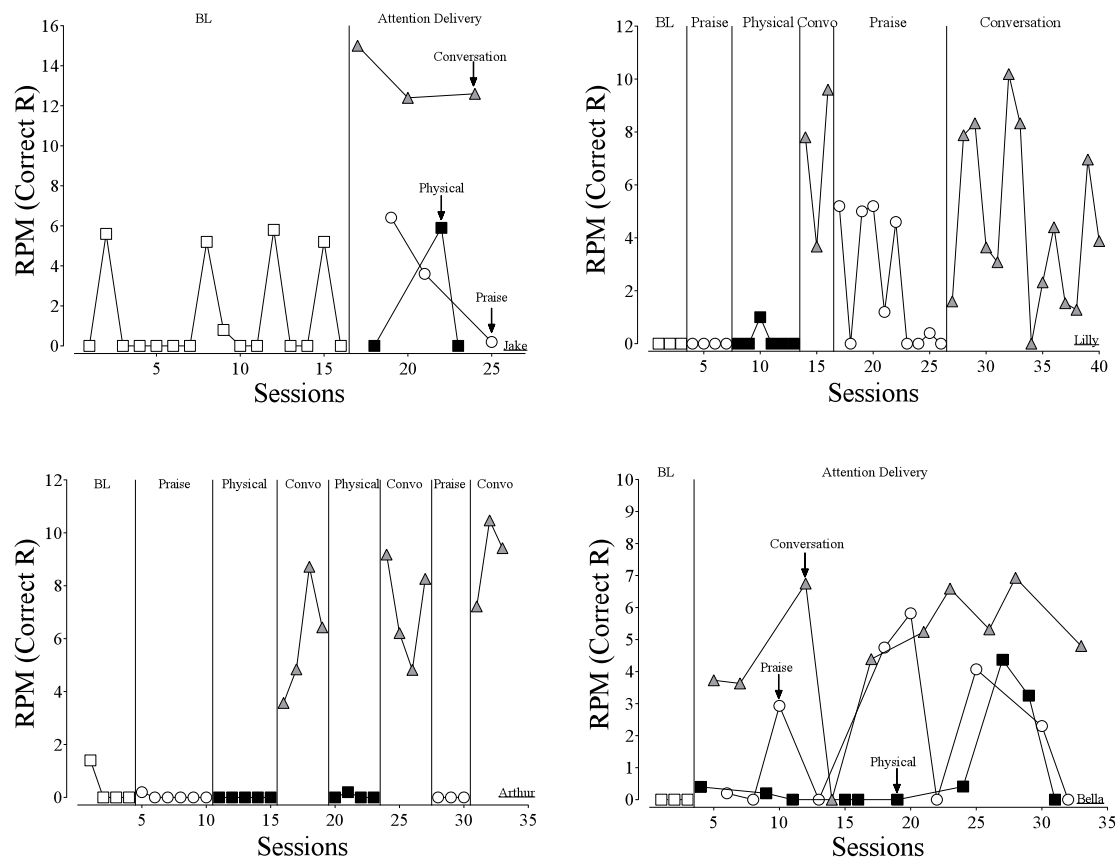




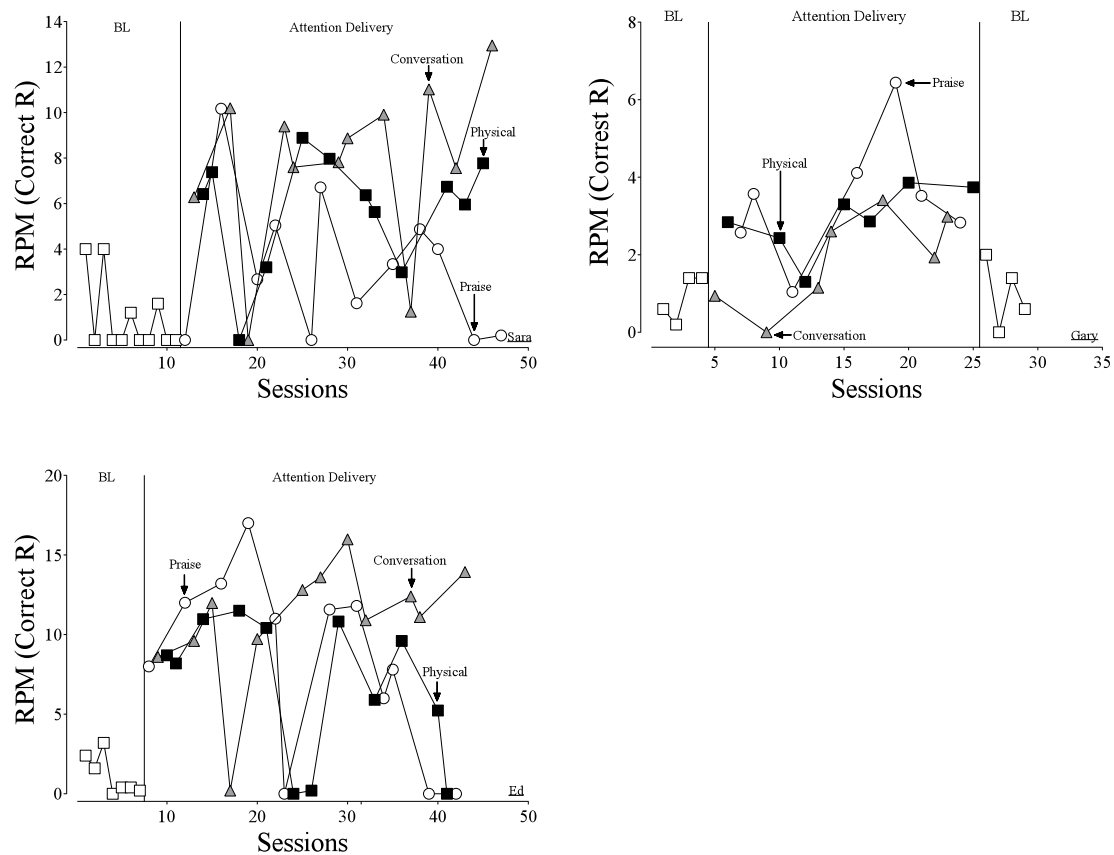
**Figure 6.** Figure 6 depicts attention-assessment data for Cori and Brandon. These participants responded at higher levels for physical attention than they did for conversation and praise.



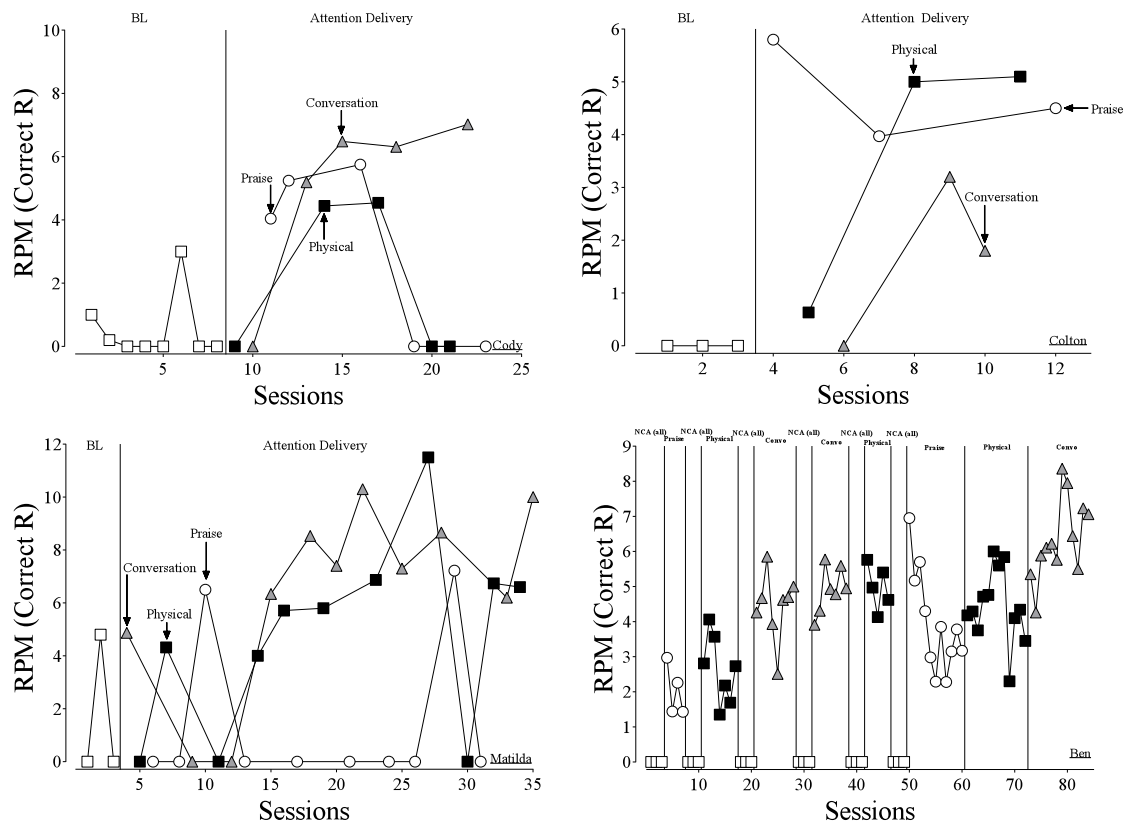
**Figure 7.** Figure 7 depicts attention-assessment data for Ben, Stella, Katrina, Gary, and Cody. Ben, Stella, and Katrina responded higher levels for conversation and physical attention than they did for praise. Gary and Cody responded at similar levels for all three forms of attention.



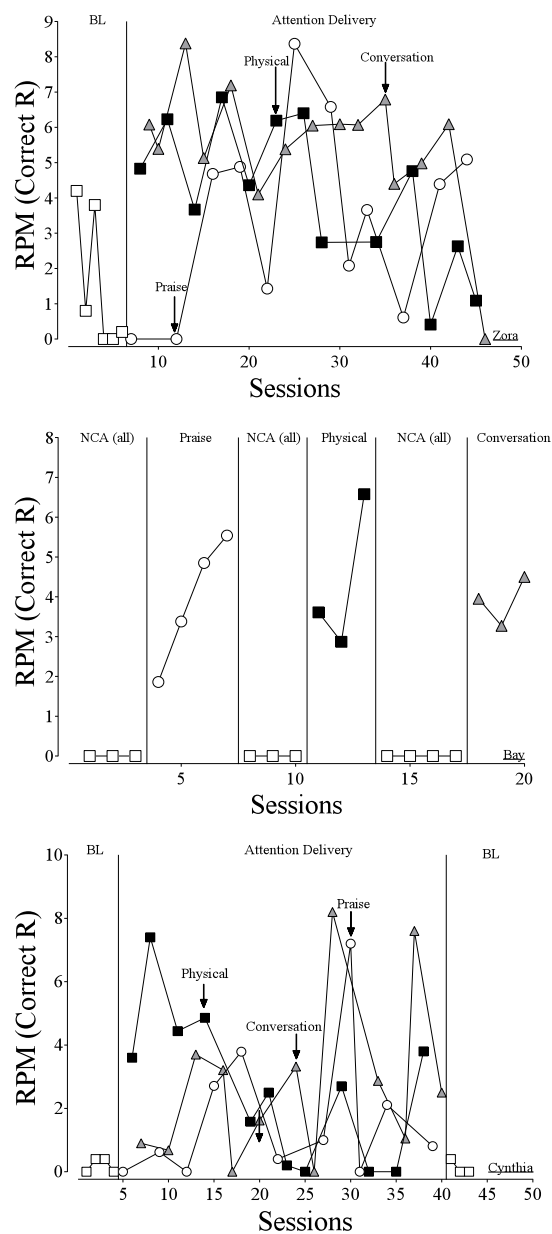
**Figure 8.** Figure 8 depicts reinforcer assessment data for Jake, Arthur, Lilly, and Bella. These participants responded to the task at higher levels when conversation was the attention form delivered contingent on the task. These participants showed a match between the attention assessment and the reinforcer assessment.



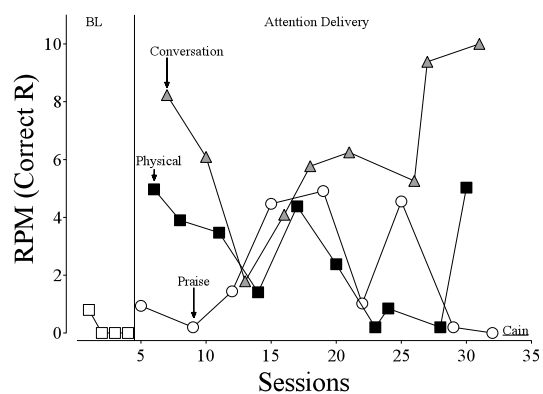
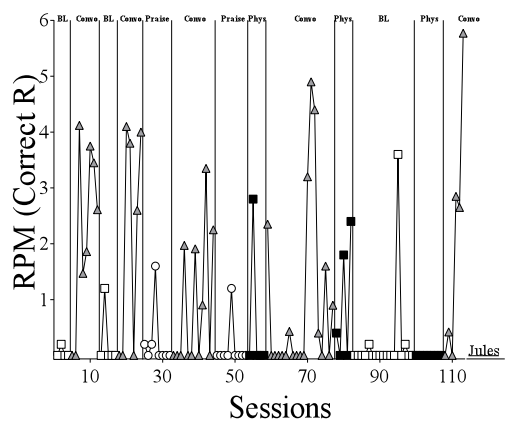
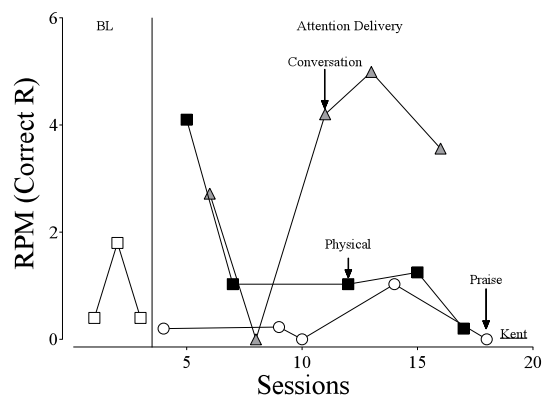
**Figure 9.** Figure 9 depicts reinforcer assessment data for Sara, Ed, and Gary. Sara and Ed responded to the task at slightly higher levels when conversation was the attention form delivered contingent on the task. Gary responded at similar levels for all three forms of attention when they were delivered contingent on the task. These participants showed a match between the attention assessment and the reinforcer assessment.



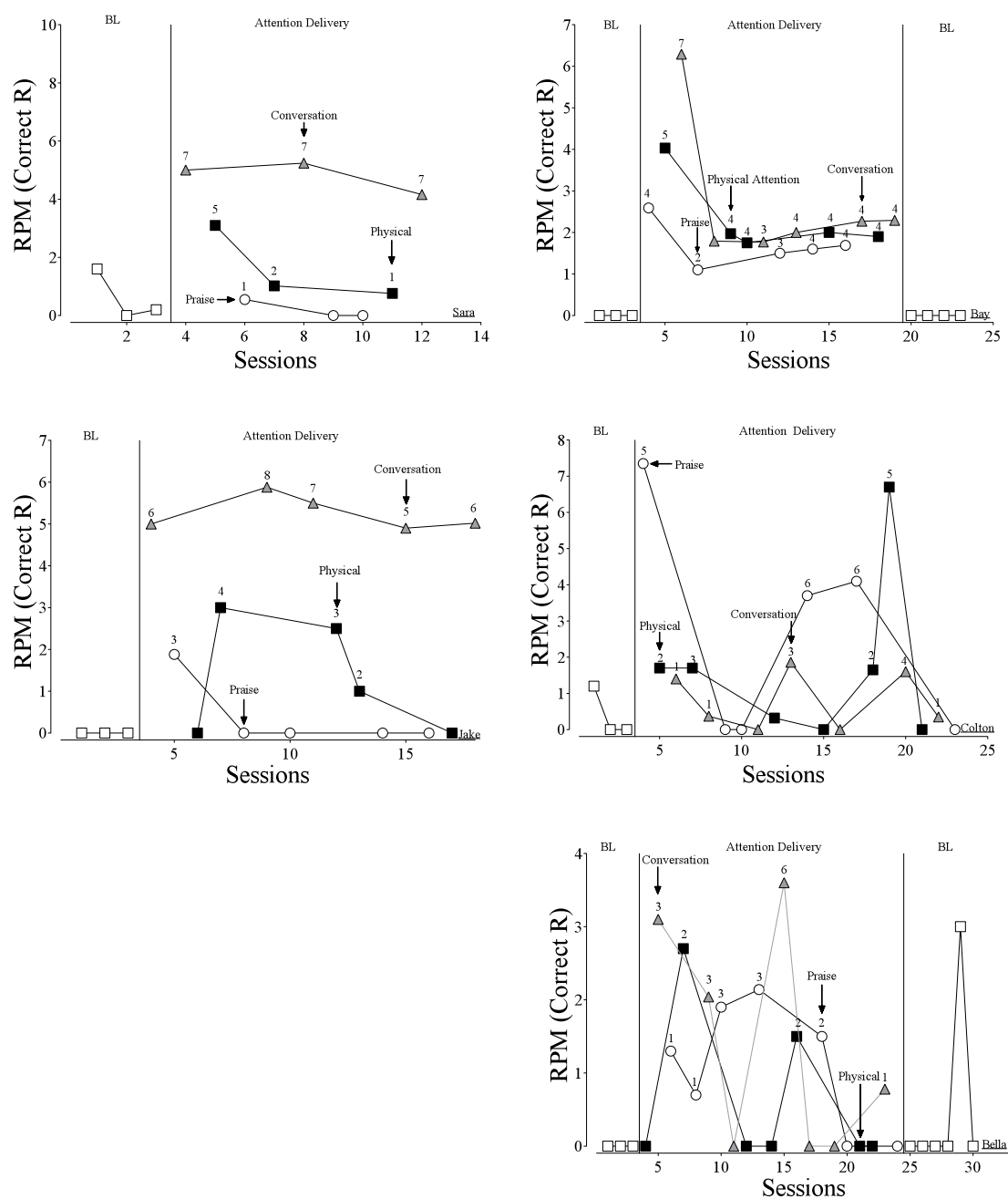
**Figure 10.** Figure 10 depicts reinforcer assessment data for Cody, Matilda, Colton, and Ben. Cody responded at higher levels when conversation was the attention form delivered contingent on the task. Matilda responded at higher levels when conversation and physical attention were the attention forms delivered contingent on the task. Colton responded at higher levels when physical attention and praise were the attention forms delivered contingent on the task. Ben responded for all forms of attention and increased responding across all forms over time. These participants showed a partial match between the attention assessment and the reinforcer assessment.



**Figure 11.** Figure 11 depicts reinforcer assessment data for Zora, Bay, and Cynthia. These participants responded to the task at similar levels when all three forms of attention was delivered contingent on the task. These participants showed a partial match between the attention assessment and the reinforcer assessment.

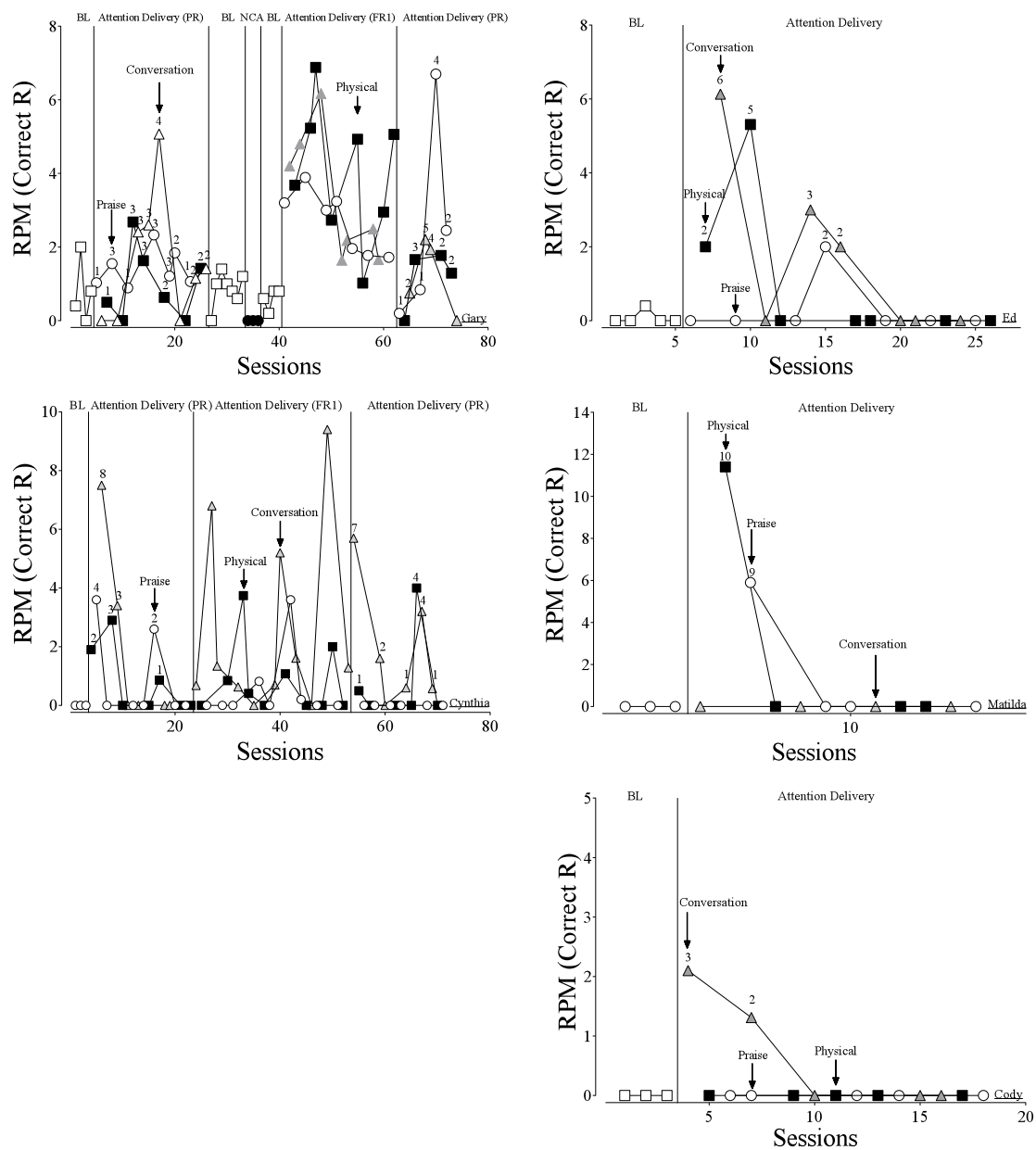


**Figure 12.** Figure 12 depicts reinforcer assessment data for Kent, Jules, and Cain. These participants responded to the task at higher levels when conversation was the attention form delivered contingent on the task. These participants did not show a match between the attention assessment and the reinforcer assessment.



**Figure 13.** Figure 13 depicts reinforcer assessment (PR) data for Sara, Jake, Bay, Colton, and Bella. Sara and Jake showed a higher rate and higher break points (numbers above condition symbols) for conversation as compared to praise and physical attention. Both of these participants showed a match across all three assessments. Bay, Colton, and Bella showed a similar rate and similar break points (numbers above condition symbols) for all three forms of attention. These participants showed a partial match across all three assessments.





**Figure 14.** Figure 14 depicts reinforcer assessment (PR) data for Gary, Cynthia, Ed, Matilda, and Cody. Gary and Cynthia showed a similar rate and similar break points (numbers above condition symbols) for all three forms of attention. These participants showed a partial match across all three assessments. Ed, Matilda, and Cody showed decreasing levels (that eventually dropped to zero) for all three forms of attention. These participants did not show a match across all three assessments.



Appendix A. Appendix A depicts the session materials and set-up for a session in the attention assessment (without the control card).



Appendix B. Appendix B depicts the session materials and set-up for a session in the reinforcer assessment and the reinforce assessment (PR).