

Effects of Social Reinforcement on the Emission of Tacts by Preschoolers

Carly Moher Eby and R. Douglas Greer
Teachers College, Columbia University

We conducted 2 experiments on the effects of social attention versus token contingencies on the emission of verbal operants by preschoolers, with and without a disability diagnosis. Four participants, 3 females and 1 male, 3 to 4 years old, were selected to participate in Experiment 1 and 6 participants, 5 females and 1 male, 2 to 4 years old, in Experiment 2. Experiment 1 compared effects of the 2 contingencies on numbers of child-initiated tacts in 3 different settings using an alternating treatment design. Experiment 2, using a multielement design, compared the automated delivery of tokens versus adult attention on the percentage of peer-to-peer and adult conversational units. Participants in both experiments initiated more tacts with contingent social attention than with contingent tokens. Implications are that tacts and conversational units are maintained more by social reinforcers than nonsocial generalized conditioned reinforcers (i.e., tokens). Social control of tacts may be essential to social verbal behavior.

Keywords: generalized conditioned reinforcement, social reinforcement, tacts, tokens, verbal behavior analysis

The acquisition of language begins with an environment rich in language and social interactions (Hart & Risley, 1995). A critical component of that environment is the presence of speaking adults and the interactions that occur between adult caretakers and children. For instance, in Hart and Risley's study, parents who were (a) more responsive to their children, (b) spent more time talking to their children, (c) used a greater variety in language, and (d) engaged in longer interactions, had children with greater vocabulary growth, better use of vocabulary, and higher IQ scores.

In the study of language and its development in children, one central issue concerns the conditions under which children come to learn the meaning of words (Bloom, 2002; Hoff & Shatz,

2009; Tomasello & Bates, 2001). In Skinner's analysis of verbal behavior, a major component of vocabulary use is known as a tact repertoire (Skinner, 1957). Skinner defined the tact as a "verbal operant in which a response of a given form is evoked by a particular object or event or property of an object or event" (pp. 81–82). Tacts are responses in a given community that are occasioned by objects, events, people, or actions that the speaker contacts in his or her current environment. Learning a fluent tact repertoire is the cornerstone of being a true speaker and is a necessary component of becoming truly verbal (Greer & Speckman, 2009).

When Skinner (1957) first defined the tact as one of the elementary verbal operants, he identified its functional reinforcer as generalized conditioned reinforcement. By definition, generalized conditioned reinforcers are reinforcers that have been paired with unconditioned or conditioned reinforcers, and as a result the momentary conditions of the organism (e.g., motivating operations, such as satiation or deprivation) are not likely to affect their efficacy. However, Skinner's discussion about tacts and generalized conditioned reinforcers preceded the development of the token as a generalized reinforcer in applied behavior analysis (Ayllon & Michael, 1959; Ayllon & Azrin, 1968).

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Carly Moher Eby and R. Douglas Greer, Department of Health and Behavior Studies, Teachers College, and the Graduate School of Arts and Sciences, Columbia University.

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Correspondence concerning this article should be addressed to Carly Moher Eby, who is now at The New England Center for Children, 33 Turnpike Road, Southborough, MA 01772. E-mail: ceby@necc.org

Moreover, Skinner emphasized that one of the defining characteristics of verbal behavior is that it's behavior that is socially mediated.

Generalized conditioned reinforcers, according to their use in applied behavior analysis, are not necessarily social in nature. Money, tokens, and social attention are all classified together as generalized conditioned reinforcers, despite their vastly different physical dimensions and their different social functions. Money is a generalized conditioned reinforcer or token for a range of behaviors because it can lead to many unconditioned reinforcers (e.g., food, warmth) or conditioned reinforcers (e.g., travel, books, music) and so it is relatively independent of momentary deprivations (Catania, 2007; Cooper, Heron, & Heward, 2007; Greer & Ross, 2008; Kazdin, 1984; Moore, 2008; Skinner, 1953, 1957). In educational research and applications, token economies are commonly used as generalized conditioned reinforcers. Another type of generalized conditioned reinforcer, social attention or approval, differs from both money and tokens in terms of its stimulus properties, how it's delivered as a reinforcer, and the absence of an exchange for a "back-up" reinforcer (Skinner, 1953). In the case of attention and approval of a listener, the reinforcement for a speaker is the direct outcome of the response, whereas nonsocial generalized conditioned reinforcers are representative or *tokens* of reinforcement. For example, the child who notices a passing cat and says to her mother, "I see a cat," experiences a reinforcing consequence when her mother replies, "Yes, I see the cat, too. There goes the cat." This illustrates a social generalized conditioned reinforcer. In contrast, the child who has learned that desirable classroom behavior affords her tokens that can be exchanged for activities or privileges, such as access to hall passes or extra recess time, experiences a reinforcing consequence when the tokens have been exchanged for the special activity or privilege, and this is arguably independent of any attention or approval that occur as part of that exchange, thus illustrating the nonsocial generalized conditioned reinforcer.

Some evidence suggests that the tact is fundamentally a social operant that is controlled by social attention of others (Greer & Ross, 2008; Schmelzkopf, 2010). That is, if the tact and related social verbal behavior is indeed social,

then requiring social reinforcement as part of the objective for teaching or inducing the tact rather than other forms of generalized conditioned reinforcers (e.g., tokens) may be critical (Greer & Du, 2015). Research with infants and the development of preverbal skills may provide a better understanding of the role that social reinforcement plays in the tact operant. In a series of studies with infants, Pelaez, Virues-Ortega, and Gewirtz (2011a, 2011b) demonstrated that infant vocalizations increased with contingent maternal vocalizations, and that contingent maternal vocalizations (either vocal imitation or motherese speech) produced greater effects (infant vocalizations increased more) than did noncontingent maternal vocalizations.

The available definitions and uses of the vocabulary pertaining to generalized conditioned reinforcers have varied widely, and subsequently the applications in the verbal behavior research of the use of generalized conditioned reinforcers have also shown inconsistencies. For instance, investigators have included operations such as "non-specific" reinforcement including food and toys (Braam & Sundberg, 1991; Stafford, Sundberg, & Braam, 1988), praise (Carroll & Hesse, 1987; Sundberg, Juan, Dawdy, & Arguelles, 1990), food and praise (Partington & Bailey, 1993), tokens and praise (Williams, Carnerero, & Perez-Gonzalez, 2006), or opportunities to mand (Greer & Ross, 2008). When it comes to the reinforcement of tacts, a necessary condition may be that there is a social dimension to the reinforcement that maintains them. The lack or low incidences of initiated language interactions in individuals with autism diagnoses may be a related issue. As outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; American Psychiatric Association, 2013), the diagnostic criteria for autism spectrum disorder includes, "Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interest, emotions, or affect; to failure to initiate or respond to social interactions" (American Psychiatric Association, 2013, p. 50).

Prior research has not addressed the possible distinction between the various types of generalized conditioned reinforcers as they apply to social verbal behavior. This distinction is an important one to make because it is critical that

a relevant reinforcer that controls a particular operant is present. Catania (2007) noted that it is not only the behavior that is learned but also the entire three-term contingency including the reinforcer. Skinner (1957) proposed that verbal behavior was essentially social behavior. The mand requires that another mediate the environment for the speaker, but its function is only indirectly social. The social function for the mand is that of a social contract where the listener provides something other than social interaction. In fact, some have argued that the mand is indistinguishable from nonverbal behavior unless certain contextual factors are in place (Barnes-Holmes, Barnes-Holmes, & Cullinan, 2000). The tact appears to be the basic speaker verbal operant that is directly controlled by social contingencies. The onset of the tact as a verbal behavioral developmental cusp may depend on the onset of social attention as a conditioned reinforcer (Greer & Du, 2015).

The research reported here was designed to examine whether and how young children would respond differentially to social attention (such as adult praise or approval) versus non-social generalized reinforcers (such as tokens). In Experiment 1, we sought to determine whether contingent experimenter delivered social attention or contingent experimenter-delivered tokens differentially affected the emission of child-initiated tacts in an applied setting. In Experiment 2, the research was extended to a laboratory analysis where we eliminated adult social contact for token delivery by comparing social reinforcers delivered by an adult versus tokens delivered through a chute, on the emission of participant-initiated tacts and other social verbal operants in social settings.

General Method

Overview

In both experiments, we investigated the effects of adult social attention versus token contingencies on the emission of verbal operants. The method components that were common between both experiments will be reported here, whereas components that were specific to only one of the experiments will be reported separately in the Method sections of each experiment.

Participants

Refer to Table 1 for detailed information about the participants. The participants in Experiment 1 were three girls and one boy, ages 3 to 4 (Participants A, B, C, and D). The participants in Experiment 2 were five girls and one boy, ages 3 to 4 (Participants A, B, E, F, G and H). Two of the participants (A and B) were selected for both experiments. Participants were recruited from local preschools.

Dependent Variable and Operational Definitions

The primary dependent variable of interest was frequency of tacts. The tact was defined by Skinner's (1957) as "a verbal operant in which a response of a given form is evoked by a particular object or event or property of an object or event" (pp. 81–82). Examples of tacts emitted in the experiments reported here include verbal statements such as, "look at the snow," "this is a coconut tree," and "I'm doing a puzzle."

In addition to tacts, four other verbal responses were recorded. These included mands, intraverbals, conversational units, and wh-questions. A mand, as defined by Skinner (1957), is "a verbal operant in which the response is reinforced by a characteristic consequence and is under the functional control of relevant conditions of deprivation or aversive stimulation" (p. 36). An example of a mand emitted in the current study was a participant stating "can we go inside the room now?" when the door was closed and she had been asked to wait outside of the room. Intraverbal behavior is verbal behavior evoked by another verbal response, without correspondence between the two responses (Skinner, 1957). An example of an intraverbal response emitted in the current study was when one participant stated, "what letter is it?" and a second participant stated, "S." "Wh" questions refer to any "Who," "What," "Where," "Why," or "How" questions. Conversational units are verbal episodes in which at least two individuals exchange roles of speaker and listener. That is, *Person A* emits a verbal response in the presence of a listener (*Person B*) and *Person B* responds as both a listener and speaker, then *Person A* responds as a listener, completing the conversational unit (Donley &

Table 1
Experiment 1 and 2 Participant Characteristics

Participants	Age/Gender	Level of verbal cusps/verbal capabilities	Diagnosis/Standardized test scores
A (Experiment 1 & 2)	3.4/Female	- Listener/Speaker - Instructional control, independent mands/tacts with autoclitics, self-talk, conversational units, book stimuli conditioned reinforcement for observing	-Expressive Language Disorder and Adjustment Disorder - Weschler Preschool & Primary Scales of Intell.-III Full Scale SS:101; Performance SS:97; Verbal SS:104
B (Experiment 1 & 2)	4.0/Female	- Listener/Speaker/Early reader/ Early writer -Instructional control, independent mands/tacts with autoclitics, naming, observational learning, self-talk, conversational units, say-do in speaker as own listener function, book stimuli conditioned reinforcement for observing	- No diagnosis/"Typically developing"
C (Experiment 1 only)	3.9/Male	-Listener/Speaker/Early reader/ Early writer -Instructional control, independent mands/tacts with autoclitics, listener half of Naming, appropriate self-talk during fantasy play, conversational units, book stimuli conditioned reinforcement for observing, emits some palilalia	-PDD-NOS -Preschool Language Scale-4: Expressive: SS:112; Auditory Comprehension: SS:110
D (Experiment 1 only)	4.0/Female	-Listener/Emergent speaker -Instructional control, independent mands with autoclitics, book stimuli conditioned reinforcement for observing	- "Preschooler with a disability" - Preschool Language Scale-4 Auditory Comprehension SS:75; Expressive SS:73 - Weschler Preschool & Primary Scales of Intell.-III Full Scale: SS:79; Performance: SS:76; Verbal:84
E (Experiment 2 only)	4:0/Male	-Listener/Speaker/Early reader/ Early writer -Instructional control, independent mands/tacts with autoclitics, listener half of Naming, observational learning, self-talk, conversational units, say-do in speaker as own listener function, book stimuli conditioned reinforcement for observing	- No diagnosis/"Typically developing"
F(Experiment 2 only)	3:11/Female	-Listener/Speaker/Early reader/ Early writer -Instructional control, independent mands/tacts with autoclitics, self-talk, conversational units, say-do in speaker as own listener function, book stimuli conditioned reinforcement for observing	- No diagnosis/"Typically developing"

Table 1 (continued)

Participants	Age/Gender	Level of verbal cusps/verbal capabilities	Diagnosis/Standardized test scores
G (Experiment 2 only)	4:1/Female	- Listener/Speaker/Early reader/ Early writer - Instructional control, independent mands/tacts with autoclitics, self-talk, conversational units	- No diagnosis/"Typically developing"
H (Experiment 2 only)	2:10/Female	- Listener/Speaker/Early reader - Instructional control, independent mands/tacts with autoclitics, self-talk, conversational units	- No diagnosis/"Typically developing"

Greer, 1993; Greer & Ross, 2004; Lodhi & Greer, 1989).

Independent Variable

The independent variable in both experiments was the manipulation of the reinforcement contingency. Thus, the variable that was manipulated was either the delivery of tokens or the delivery of social attention, depending on the experimental condition in effect. In the attention condition, any tact emitted by participants was followed by vocal and nonvocal social attention from the experimenter. For example, if the participant said, "It's a guitar," the experimenter responded with a vocal response such as, "you're right, that is a guitar!" as well as a nonvocal response, such as a smile, a nod, or a light pat on the back. This was consistent across both experiments.

In the token condition, any tact emitted by the participants was followed by delivery of a token into the participant's clearly labeled cup. In Experiment 1, tokens were experimenter-delivered. In Experiment 2, tokens were delivered through a chute. Across both experiments, no vocal responses were given by the experimenter in the token condition, and at the end of the session in the token condition, participants were given the opportunity to exchange their tokens for a preferred food or activity item.

Experiment 1

Method

Participants. Four participants, 3 girls and 1 boy, were selected for this experiment (Participants A, B, C, and D). They were selected from a preschool that served children, 2- to

5-years old, with and without disabilities. The school employed the Comprehensive Application of Behavior Analysis to Schooling (CABAS) model of education. In this model, scientific procedures are applied to pedagogy, curriculum design, classroom management, staff training, and parent education. A description of the participants is presented in Table 1.

Setting and materials. Sessions were conducted in three noninstructional settings: free play, structured play, and transition. The first setting, free play, consisted of an area of the classroom that measured 2.4 m by 3 m. The play area contained a variety of age-appropriate toys, including blocks, puzzles, books, toy vehicles, toy animals, dolls, cause-effect toys, and musical toys. In the second setting, structured play, participants were instructed to go to a specific table within the classroom. Imaginative play toys were present, including a play farm with toy animals, a dollhouse with toy people, and a car garage with toy cars. In the third setting, transition, participants were asked to wait in a specified hallway area before starting a new activity. The hallway was an open space outside of the classroom that measured approximately 1.5 m by 2.7 m. It was a small "nook" at the end of a longer hallway. There were two classrooms and one office and the doors to these rooms remained closed during sessions. There were two bulletin boards hanging on the walls. The bulletin boards were covered with colored paper and colorful borders. One bulletin board contained graphs depicting class-wide data. Another bulletin board displayed a *winter* theme, with artificial snowflakes and photographs of students. On one wall, there were two trees made of paper taped to the wall. One tree resembled an apple tree. These stimuli were often

what evoked tacts emitted by the participants in this setting. This setting was set up to resemble a "waiting" condition, in which the participants were waiting to enter the classroom.

Token cups and tokens were present in the token reinforcement sessions. The token cups were plastic water coloring paint cups with lids that had a hole in the center (where tokens were inserted). The participants were familiar with the token cups as they were the same as those used for reinforcement of academic and social responding in their classrooms. The cups were labeled with the participant's names and the children could identify their names. Tokens were small, colored, plastic disks. These were the same tokens that the participants earned in their classroom token economies already established. There was a video camera present during all sessions. The video camera was a Flip digital camera measuring 10.5 cm × 5.5 cm. It was mounted on an adjustable tripod that extended to a maximum height of 134 cm.

Design. The design was an alternating treatment design (Kennedy, 2005). In this design, the researcher alternates between two or more experimental conditions from session to session. The two alternating conditions were token reinforcement and social attention reinforcement. Experimental conditions rotated daily. The condition was randomly assigned each day by "picking out of a hat" the name for which reinforcement operation to implement. Thus, two pieces of paper each with a condition written down (i.e., "token" or "attention") were placed in an opaque container and somebody other than the primary experimenter selected a paper. If the selected paper said "token" then the token condition was implemented. Likewise, if it said "attention" then the attention condition was implemented. A total of three sessions took place daily, one in each setting (i.e., transition, free play, structured play). The experimental condition (token or attention) remained the same for each setting on a given day. If time ran out on a given day and fewer than three sessions, or one in each setting, took place, then those sessions were carried over to the next day. Once one session for each setting had taken place under the most recently selected condition (token or attention), then the next condition was selected using the "pick out of a hat" method. A minimum of 18 sessions was conducted for each participant. Thus, at least

three sessions were conducted in each setting/condition combination. For instance, there were three transition/attention sessions, three free play/attention sessions, and three structured-play/attention sessions. The data for each of the three sessions under each contingency condition were also blocked and reported as total responses across all three settings.

Procedure. Two participants were brought to the experimental setting prior to beginning the session. Participant pairs varied across sessions. Thus, each of the six participants was paired with every other participant at some point. However, the pairings were not systematically programmed nor were they counterbalanced. This variable was not controlled for in this initial experiment; however, they were controlled for in Experiment 2. Both of the participants received the same experimental conditions at the same time. Although they were observed in pairs, each participant was treated as a single participant and their responses were followed by individualized contingencies. For instance, if only Participant A emitted a tact, specific reinforcement was delivered to her individually, such that either the experimenter delivered vocal praise and also said her name (e.g., "that's right, A!"), or a token was delivered into Participant A's clearly labeled cup. If both participants emitted tacts at the same time, specific reinforcement was again delivered on an individual basis. That is, in the case of attention reinforcement, the experimenter delivered specific vocal praise to each participant by saying their names clearly (e.g., "Yes A, it's a cat! You're right B, that's a school bus!"). Or, in the case of token reinforcement, a token was dispensed into both of the cups as the only consequences, one for each of the participants. Once the participants and the experimenter were in the experimental setting, the experimenter started the video camera. All sessions were five minutes in duration.

In the free play setting, sessions began with the experimenter saying, "We are going to play in the toy area. You can talk about anything you want while we play." In the structured play setting, sessions began with the experimenter saying, "We are going to play with toys at the table and you can talk about anything you want while we play." In the transition setting, sessions began with the experimenter saying, "We

need to wait here while we get ready for the next activity, but you can talk while we wait.”

All sessions were videotaped and the experimenter remained present during all sessions. The experimenter did not initiate conversations with the participants in either condition, unless it was absolutely necessary to give a vocal direction for safety purposes. An example of a direction that was given for safety purposes was when a participant stood on a chair and the experimenter said “please keep your feet on the floor.” She responded to any verbal operants emitted by the participants according to the experimental condition that was in effect. For example, when the attention condition was in effect, tacts emitted by the participants resulted in a vocal response. Wh- questions also resulted in vocal responses during the attention condition. Mands sometimes resulted in vocal responses, such as when a participant emitted a mand for something from the experimenter and its delivery was not possible. For example, when a participant said, “Can we go in the classroom now?” the experimenter responded, “Not now, we need to wait.” Otherwise, mands were not followed by their specified reinforcer, as a way to control for reinforcement of the target behavior, which was tacts.

In the token condition, the experimenter did not initiate any social interactions with the participants, unless it was necessary to give a direction, such as for safety purposes. Tacts emitted by participants resulted in a token delivered into his or her token cup, but no vocal response. Wh- questions and mands did not result in vocal responses during the Token condition. Mands were not followed by their specified reinforcer.

Data collection. Data were collected on all verbal operants emitted in a session. Sessions were videotaped and viewed at a later time to ensure accurate data recording. Data were recorded by marking an “X” in the appropriate column to identify the type of verbal operant emitted. In the next column, the observer wrote the exact word or phrase spoken. In cases where certain words were unintelligible, the observer marked this with the word *unclear* in parentheses. In the next column, the observer recorded the type of consequence that was delivered. She wrote a T to denote token delivery, A to denote attention, MR to denote mand reinforcement, or NR to denote no reinforcement. Next, the observer recorded the audience to whom the ver-

bal response was directed. The columns were labeled S (Self), P (Peer), and A (Adult), by placing an “X” in the appropriate column. Finally there was a “Notes” column where the observer recorded any additional information. In cases where a participant emitted a tact and a wh- question within the same sentence, both verbal operants were counted and recorded separately. Similarly, any conversational units or intraverbals that also contained tacts were counted and recorded as both. Refer to [Table 2](#) for an example of the verbal operants that were observed in one of the sessions in Experiment 1, and how they are recorded and consequated.

Interobserver agreement. A second observer, who was a graduate of a Master’s level program in applied behavior analysis and who was trained in the analysis of verbal behavior, independently viewed and transcribed the video recorded sessions, and recorded data on the custom-made data form. Point-by-point interobserver agreement was calculated by dividing the smaller number of tacts measured by the larger number of tacts measured, then multiplying by 100. For Participant A, IOA was conducted in 44% of sessions and mean agreement was 87.2% (range: 83%–100%). For Participant B, IOA was conducted in 39% of sessions and mean agreement was 89.1% (range: 80%–100%). For Participant C, IOA was conducted in 11% of sessions and mean agreement was 93.8% (range: 88.9%–100%). For Participant D, IOA was conducted in 27% of sessions and mean agreement was 83% (range: 81.8%–100%).

Experiment 1 Results

[Figure 1](#) displays a bar graph showing a comparison of total emissions of verbal operants under the conditions of social attention reinforcement (A) and token reinforcement (T) of tacts in Experiment 1 for Participants A, B, C, and D. It is important to keep in mind that tact emission was the primary dependent variable that was directly contacted by the tested variable. The additional behaviors that were measured were conversational units, intraverbals, wh- questions, and mands. There was no programmed reinforcement for these behaviors, except when a tact was emitted as part of a conversational unit, intraverbal, or wh- question. Participant A emitted a total of 103 tacts under attention conditions, versus 71 tacts under token

Table 2
Example of the Verbal Responses Recorded in One of the Transition–Attention Sessions in Experiment 1, in Which Tacts Were Reinforced With Social Attention From an Adult

Speaker	Target audience	Words spoken	Verbal operant code	Adult response
Participant B	Adult	“Who was eating in here? I see a Dorito.”	WH, T	“Oh you see a Dorito, B?”
Participant A	Adult	“I see a Dorito.”	T, IV	“You see it too, A?”
Participant B	Adult	“It was raining when I came here.”	T	“It was raining when I came, too.”
Participant B	Adult	“When I came out of my mommy’s car I felt a drip on my head.”	T, IV, CU	“You did? Whoa!”
Participant A	Adult	“I have my Tinkerbell umbrella.”	T, IV	“That’s a good thing, A.”
Participant B	Participant A	“You got a Tinkerbell umbrella?”	IV	
Participant A	Participant B	“Yeah, Tinkerbell umbrella.”	IV, CU	
Participant B	Adult	“What are we waiting for?”	WH, M	“We’re waiting to go inside the classroom.”
Participant B	Participant A	“Who drove you here? Mommy or the bus?”	WH	
Participant A	Participant B	“Mommy.”	IV, T	“That’s nice that you came with your mom, A.”
Participant B	Participant A	“Me too, my mommy.”	CU, IV, T	“You too, B? Neat!”

Note. WH = Wh- question; T = tact; IV = intraverbal; CU = conversational unit; M = mand.

conditions. Participant B emitted 120 tacts under attention conditions and 70 tacts under token conditions. Participant C emitted 73 tacts under attention conditions and 43 tacts under

token conditions. Participant D emitted 47 tacts under attention conditions and 32 tacts under token conditions. Refer to [Table 3](#) for the numbers of verbal operants (tacts, conversational

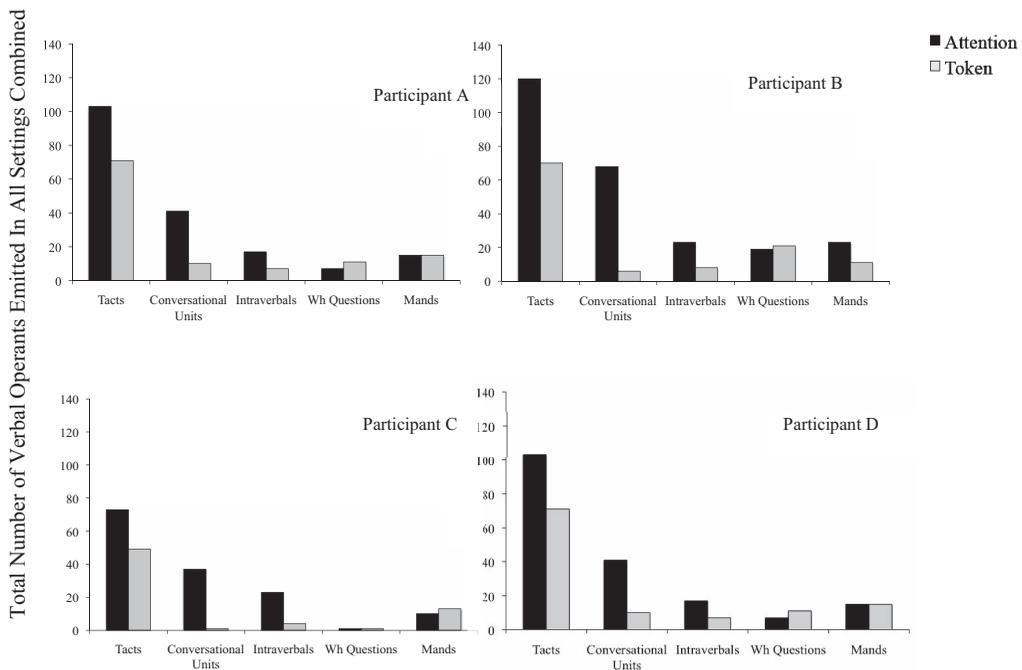


Figure 1. The sum of verbal operants emitted across attention and token conditions for Participants A, B, C, and D in Experiment 1.

Table 3
Numbers of Verbal Operants (Tacts, Conversational Units, Wh- Questions, Intraverbals, and Mands) Emitted in Each Setting Type (Transition, Structured Play, Free Play), Under Two Different Conditions (Attention Condition and Token Condition), for Participants A, B, C, and D, in Experiment 1

Participant	Tacts		CU		WH		IV		Mands	
	A	T	A	T	A	T	A	T	A	T
Participant A										
Transition	46	42	24	4	5	7	6	0	4	2
Structured play	27	19	8	6	0	0	2	0	7	3
Free play	30	10	9	0	2	4	0	4	4	10
Total	103	71	41	10	7	11	8	4	15	15
Participant B										
Transition	40	32	29	1	10	12	11	1	6	3
Structured play	49	24	30	4	6	8	9	4	3	4
Free play	31	14	9	1	3	1	3	3	14	4
Total	120	70	68	6	19	21	23	8	23	11
Participant C										
Transition	47	23	21	4	0	1	15	9	4	8
Structured play	10	9	4	1	1	0	1	2	5	6
Free play	16	17	12	0	0	0	7	2	1	1
Total	73	49	37	5	1	1	23	13	10	15
Participant D										
Transition	16	5	6	2	13	10	4	3	6	2
Structured play	21	15	2	1	0	0	5	6	4	5
Free play	10	8	4	0	3	4	1	0	3	5
Total	47	28	12	3	16	14	10	9	13	12

Note. CU = conversational units; WH = Wh- questions; IV = intraverbals; A = attention condition; T = token condition.

units, wh- questions, intraverbals, and mands) emitted in each setting type (transition, structured play, free play), under both conditions (attention condition and token condition).

Figure 2 is a line graph showing a comparison of the numbers of tacts emitted in the attention versus token conditions. Each data point represents the total number of tacts emitted in a combined 15-min session that was the sum of all three 5 min settings. All participants emitted more tacts in the attention condition than in the token condition. Participant A emitted a mean of 34 tacts in the attention condition and a mean of 23 tacts in the token condition, across experimental days. Participant B emitted a mean of 40 tacts in the attention condition and a mean of 23 tacts in the token condition. Participant C emitted a mean of 24 tacts in the attention condition and 16 tacts in the token condition. Participant D emitted a mean of 15 tacts in the attention condition and a mean of 10 tacts in the token condition. In most cases the repeated rotation across the two contingencies resulted in more distinctive differences in responding under the two conditions, with greater responsiveness to the social attention condition.

Discussion of Experiment 1 and Rationale for Experiment 2

The results of Experiment 1 showed that tacts occurred more frequently under social attention reinforcement conditions as compared with token reinforcement conditions for four participants for whom both adult attention and tokens functioned as reinforcers, although Participant D showed only slight differences. These results suggest that for these children tacts were reinforced more by social verbal reinforcement. These data suggest that distinctions between social generalized reinforcement and nonsocial generalized reinforcement may be important in verbal behavior development.

Two of the settings used in this experiment presented with some limitations. The data were more variable in the Structured Play and Free Play settings than in the Transition setting for 3 of the participants (A, C, and D). A possible reason for the variable data observed in the Structured Play setting is that this setting had anthropomorphic toys and there may have been more self-talk speaker-listener exchanges (speaker-as-own-listener) involving

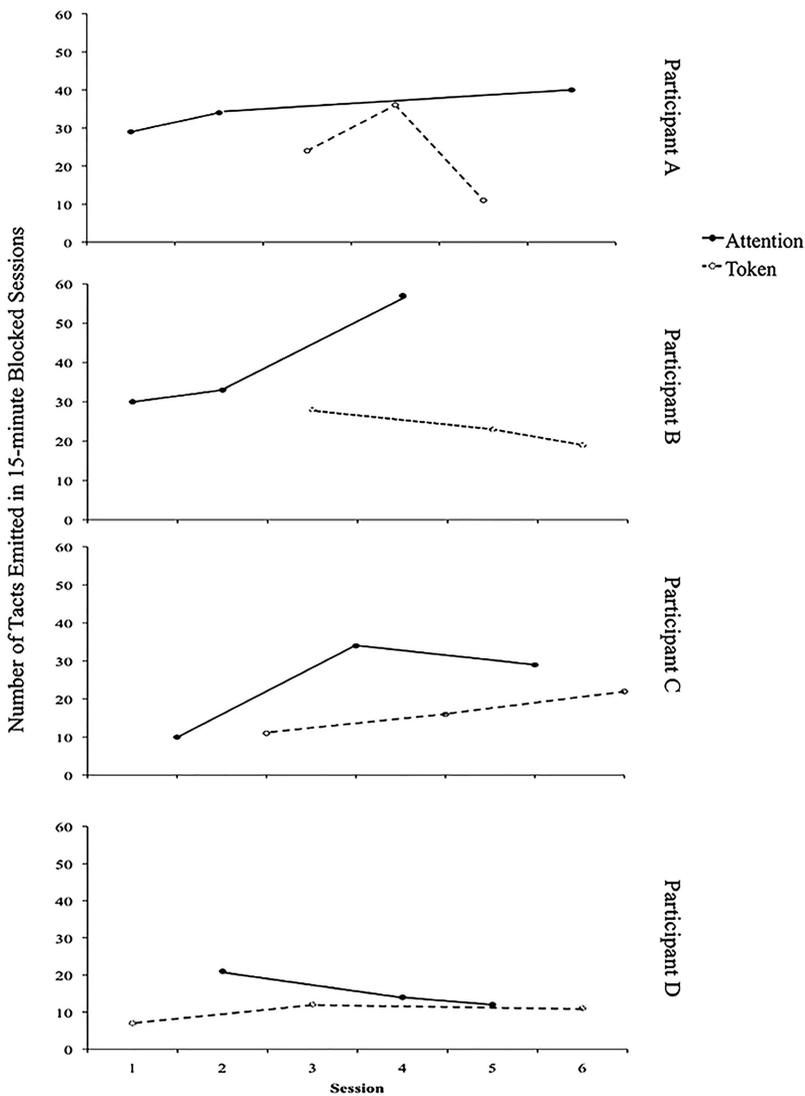


Figure 2. Number of tacts emitted in all three settings combined for Participants A, B, C, and D.

fantasy play with the anthropomorphic toys and fewer social interactions with the adult or peer present. Thus, the structured play setting appeared to act as a setting event in which the audience was the self as a listener rather than the peer or adult as a listener. [Lodhi and Greer \(1989\)](#) reported similar findings in their investigation of the effects of anthropomorphic toy play conditions on the age-appropriate self-talk of young children during fantasy play.

Another unique setting event was also noticed in the Free Play setting and this may have accounted for some variability in the data for Participants C and D. The Free Play setting included toys that made noise, such as musical toys and talking toys. These noisy toys may have functioned as competing items for talking. When participants played with these toys, they appeared less likely to talk, thus the noisy toys appeared to have an abolishing effect on the reinforcement available for verbal operants.

The data here show that, overall, each of the four participants emitted a greater number of tacts when social attention was delivered than when token reinforcement was delivered. Between 30% and 51% more tacts occurred when social attention was delivered contingently.

It is, however, important to explore why tacts continued to occur when contingent tokens were delivered. One possible explanation is that there may have been carry-over effects created by the alternating treatment design. To eliminate these effects, in Experiment 2 we used a token cup as a discriminative stimulus to signal a changeover schedule from one condition to the next. Even with a changeover schedule in place, carryover effects are common in alternating treatment designs and may be impossible to eliminate completely (Kennedy, 2005). Finally, it is possible that the delivery of tokens, which required a physical movement by the experimenter, could have had an element of social attention, albeit nonvocal, but social nonetheless. In Experiment 2, we adopted a method of “automated” token delivery designed to eliminate the adult as much as possible. Zrinzo and Greer (2013) achieved this by using a token chute system, which effectively removed the adult from the token delivery process because the participant could not see the adult who was delivering the tokens through the chute.

The purpose of Experiment 2 was to continue to investigate the emission of tacts under conditions of social verbal reinforcement versus token reinforcement. However, the methodology was revised and refined based on some of the limitations that were identified in Experiment 1. First, we selected a single setting in which to observe the participants, rather than three settings. This was done to achieve a more controlled experimental setting so that the effects of certain extraneous variables could be further eliminated. For example, in Experiment 2, we attempted to better control the number of opportunities to tact by presenting a slideshow of pictures. The setting for Experiment 2 was a laboratory setting designed to eliminate any social contact in the delivery of tokens. We also simulated the transition setting from Experiment 1 because that was the setting in which participants emitted the greatest numbers of tacts. Also of note, the participants in Experiment 2 were all typically developing children with the exception of Participant A who still

carried a diagnosis of language and adjustment disorder. Finally, in Experiment 2, we strengthened the research design with a multi element design that included an alternating treatment phase followed by repeated sessions under each of the contingencies.

Experiment 2

Method

The dependent variables remained the same for Experiment 2 as those used in Experiment 1.

Participants. Six participants were selected for Experiment 2. Five female and one male preschooler participated. Two of the participants from Experiment 1, Participants A and B, also participated in Experiment 2. Participants C and D from Experiment 1 did not participate in the second experiment. To be consistent and to avoid confusion, we did not assign the labels C or D in this experiment. Participants G and H were selected from the same preschool classroom as Participants A and B. Participants J and I were selected from a different preschool. The preschool that Participants J and I attended was characterized as a private, nonprofit, community-based, cooperative preschool. The school was run out of a large graduate college located in a major metropolitan city. Parent members of the cooperative preschool served as the teachers on a rotating cycle. In addition, Participants G and H were sisters. Table 1 displays participant information.

Setting and materials. The setting for Participants A, B, G, and H was a small therapy room within the preschool that was typically used for physical therapy. It had a door, a window looking out on a playground, and a closet door containing materials in it that remained closed. There were some materials present that were used for physical therapy, such as mats and therapy balls; however, these were removed during experimental sessions. Materials that were used during experimental sessions included a table that measured 58 cm × 118 cm with a custom-made partition mounted on it. The partition (shown in Figure 3) was constructed using white foam filled tri-fold display board that measured 60.96 cm × 91.44 cm in the middle panel and 30.48 cm × 91.44 cm in each of the side panels. It was mounted on the table using white duct tape. Two holes 5 cm in

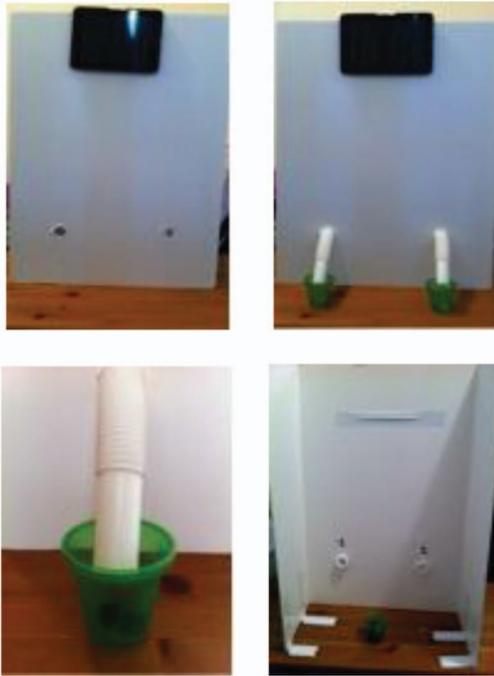


Figure 3. Apparatus used in Experiment 2.

diameter were cut in the foam board in the middle panel using an Exacto knife. A white plastic flexible corrugated pipe (i.e., drain pipe) was inserted through each of the holes to form a chute through which tokens could be delivered. Thus, there were two token chutes. Just below the chutes, identical plastic cups were mounted on the table and secured with Velcro. The cups were transparent and had no lids. The chutes were positioned so that tokens would traverse the chutes and into the participants' respective cups. The token chutes were present only when the experimental condition called for token reinforcement. During sessions when tokens were not being delivered, the chutes were removed from the tri-fold board and the holes were sealed with white duct tape. The setting for Participants I and J was a living room in the principle investigator's apartment. Sessions were not conducted at their preschool because of scheduling conflicts that required their sessions to be conducted outside of school hours. The same partition described above was present.

An Apple iPad was mounted at the top of the tri-fold board, positioned in the center of the

middle panel (see Figure 3). Photos were displayed in a slideshow format on the iPad using the iPhoto software. The photos were preselected and organized into five different sets. Each set contained 30 photos. Five categories were equally represented in each set. The categories were Animals, Sports, Basic Shapes/Letters/Numbers, Cartoon/Book Characters, and Miscellaneous. These categories were selected because they contained items that were age-appropriate and commonly known among preschoolers. The slideshow ran on an automatic timer. The timer was set so that each photo was displayed for 10 s, then it automatically changed to a new picture within the set. The slideshow function "shuffle" was turned on so that the order of pictures was randomized. In addition, if the set was viewed again within the experiment, a new order of photos was displayed. There were five sets and these were counterbalanced across the two experimental conditions (attention and token) so that each set was displayed an equal number of times in each experimental condition.

Two child-size chairs were positioned in front of the table/partition. A white line was positioned on the floor using duct tape in between the two chairs and the table as a visual boundary for the participants to indicate that they should remain behind the line. A video camera was placed at one end of the room, positioned so that both participants could be captured in the frame. Tokens used in sessions under token conditions were stored behind the partition, outside of the participants' view.

Design. The design was a multielement design that included an initial alternating treatment phase, followed by reversal phases. This entailed rapid alternation between token reinforcement and social attention reinforcement, followed by repeated exposure to both conditions in an A-B-A (Participants A and B) or B-A (Participants E, F, G, and H) sequence. In the multielement assessment, order of sessions was a simple alternation if only one session per day took place. For instance, on Day 1 the attention condition was implemented and on Day 2 the token condition was implemented. If, however, two sessions took place in one day, the order of sessions was counterbalanced to minimize any sequence effects. Thus, on day one the sequence was Attention, and then the Token condition; on

day two the sequence was Token, then Attention.

Dependent variable. The dependent variables were the numbers of tacts emitted and the numbers of peer-to-peer conversational units. As in Experiment 1, mands, intraverbals, conversational units, and Wh- questions were also measured. Frequency measures were used for all variables of interest.

Independent variable and procedure. Similar to the first experiment, two participants were present in each session. However, in the second experiment, pairs were held constant. Thus, the pairs throughout the study were: A with B, G with H, and I with J. Participants were brought to the experimental setting and asked to sit in the chairs. The photo slideshow described in the materials section was in progress when they arrived. To communicate to the participants which experimental condition would be in effect, the experimenter delivered an antecedent such as, "Look, what's that?" while pointing to the picture on the screen. If the participants responded by emitting a correct tact for the picture, either a token was delivered through the token chute (by a second experimenter located behind the partition not observed by the participants) or attention was given by the primary experimenter, depending on the experimental condition in effect for that session. This was done twice at the beginning of each session to ensure that the contingency was established for each participant. Next, the experimenter said, "Please wait in your chairs while I get something ready for our next activity," and then the experimenter sat approximately 1 m away from the participants and pretended to be occupied with her work. This marked the beginning of the 5-min "waiting" period that served as the experimental session. The participants were given no further instructions and they were not asked to talk about the pictures in the slide show.

In the attention condition, any tacts emitted by a participant while he or she "waited" were followed by attention from the experimenter in the form of vocal approvals (e.g., "That's right! It is a leopard" or "I see Mickey Mouse too!"), nonvocal approvals, such as smiles, laughter, or thumbs up, and physical attention, such as tickles and light pats.

In the token condition, any tacts emitted by a participant while he or she "waited" were fol-

lowed by the delivery of a token through the chute into his or her cup. For this condition, a second experimenter sat behind the partition out of the participants' view, but such that the second experimenter could see the primary experimenter, who sat 1 m from the participants. The primary experimenter used hand gestures to signal to the second experimenter when to deliver a token and into which chute. Prior to each session, the two experimenters established the hand signals to be used. The signals were a single extended index finger to signal a token for chute #1 (left side) and two extended fingers to signal a token for chute #2 (right side). Thus, if the participant sitting in the chair closest to chute #1 emitted a tact, the primary experimenter discretely held up one finger and the second experimenter then deposited a token into chute #1. If both participants emitted a tact at the same time, the primary experimenter gestured with one finger then two fingers, then the second experimenter deposited a token into both chutes. No vocal responses were given in this condition.

In token sessions, the participants were given the opportunity to exchange their tokens for a small snack (e.g., a Skittle, M&M, Starburst, or Hershey chocolate kiss). Across both token and attention conditions, participants were asked to participate in a brief activity after the 5 min of "waiting" (in actuality, the "waiting" period served as the experimental session). The activity was not included in any of the experimental measures. It simply served as a "reason" for the participants to have to wait in the experimental setting. Examples of activities included molding shapes using play-doh, drawing on dry-erase boards, building with blocks, and completing a puzzle. After 2 to 3 min of the activity, the experimenter ended the activity and the participants left the setting.

Interobserver agreement. A second observer independently viewed the video recorded sessions and recorded data on the custom-made data sheet. Transcripts of what was said were compared across observers. Interobserver agreement (IOA) was calculated by dividing the numbers of agreements by the number of agreements plus disagreements, then multiplying by 100%. For Participant A, IOA was conducted in 30% of sessions and mean agreement was 91% (range: 82%–100%). For Participant B, IOA was conducted

in 30% of sessions and mean agreement was 91% (range: 83%–97%). For Participant E, IOA was conducted in 37% of sessions and mean agreement was 91% (range: 86%–94%). For Participant F, IOA was conducted in 37% of sessions and mean agreement was 95% (range: 84%–100%). For Participant G, IOA was conducted in 31% of sessions and mean agreement was 96% (range: 89%–100%). For Participant H, IOA was con-

ducted in 31% of sessions and mean agreement was 89% (range: 83%–94%).

Experiment 2 Results

Figure 4 shows total sum of the frequency of tacts emitted across all sessions by conditions. The number of tacts emitted was significantly higher under attention reinforcement than token reinforcement for all six participants.

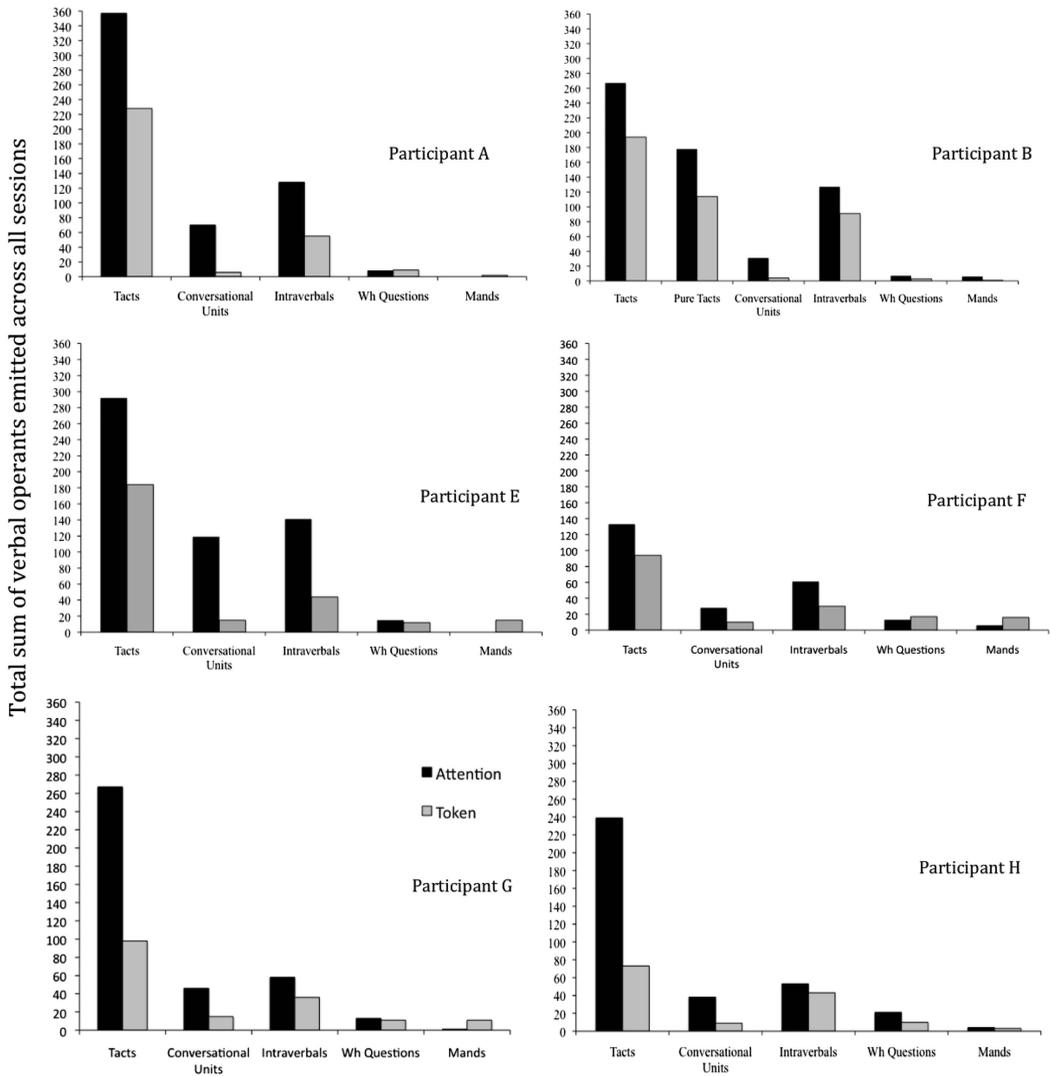


Figure 4. The total sum of tacts, conversational units, intraverbals, wh- questions, and mands emitted across all sessions, when attention was delivered contingently (black bar) and when tokens were delivered contingently (grey bar), for Participants A, B, E, F, G, and H.

Figure 5 displays line graphs for Participants A and B, depicting the numbers of tacts emitted session by session. Participant A's graph shows an immediate differentiation in her tacts across the rapidly alternating conditions. Tacts were consistently higher in the attention condition. In the second phase, attention reinforcement was delivered in repeated sessions. Participant A showed very stable responding, and a reversal was implemented after three sessions. In the third phase, only token reinforcement was delivered. There was an immediate drop in the level of responding and after five sessions another reversal back to Attention was implemented. There was an immediate increase in

level from the last token session, however, the level of responding did not immediately return to the response level observed in the initial phase.

Participant B's graph shows that it took 3 sessions before differentiation was observed. However, there was a clear separation in the data paths for the remainder of the first phase of alternating treatments, and tacts were clearly occurring more frequently under attention reinforcement. In the second phase, only attention reinforcement was delivered for repeated sessions. After three sessions, there was stability in her tacts, and a reversal was implemented. In the third phase, only token reinforcement was

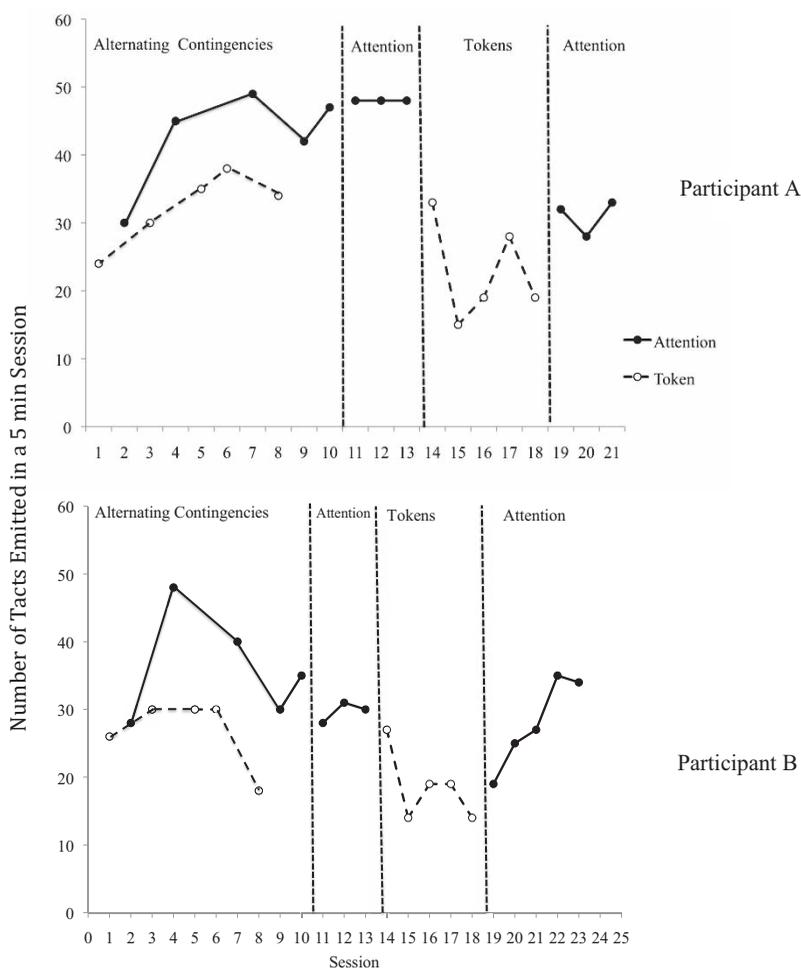


Figure 5. Numbers of tacts emitted under attention reinforcement (closed circle) and token reinforcement (open circle) for Participants A and B.

delivered for repeated sessions. The data showed a descending trend and after five sessions, another reversal was implemented back to attention. The data in this phase show a sharp ascending trend and a return to initial levels of responding.

Figure 6 shows graphs for Participants E and F. Participant E's graph shows an immediate differentiation of responding between the two conditions, with a higher number of tacts consistently occurring in the attention condition. In the second phase, only token reinforcement was

delivered and this resulted in a low, descending trend in the data. After four sessions and stable responding, a reversal to attention reinforcement was implemented and there was an immediate increase in the level of responding.

Participant F had some initial variability in her responding; however, the two data paths did show some separation and tacts occurred more frequently in the attention condition. In the second phase, only tokens were delivered and Participant F's tacts dropped to zero by the third repeated session. In a reversal to

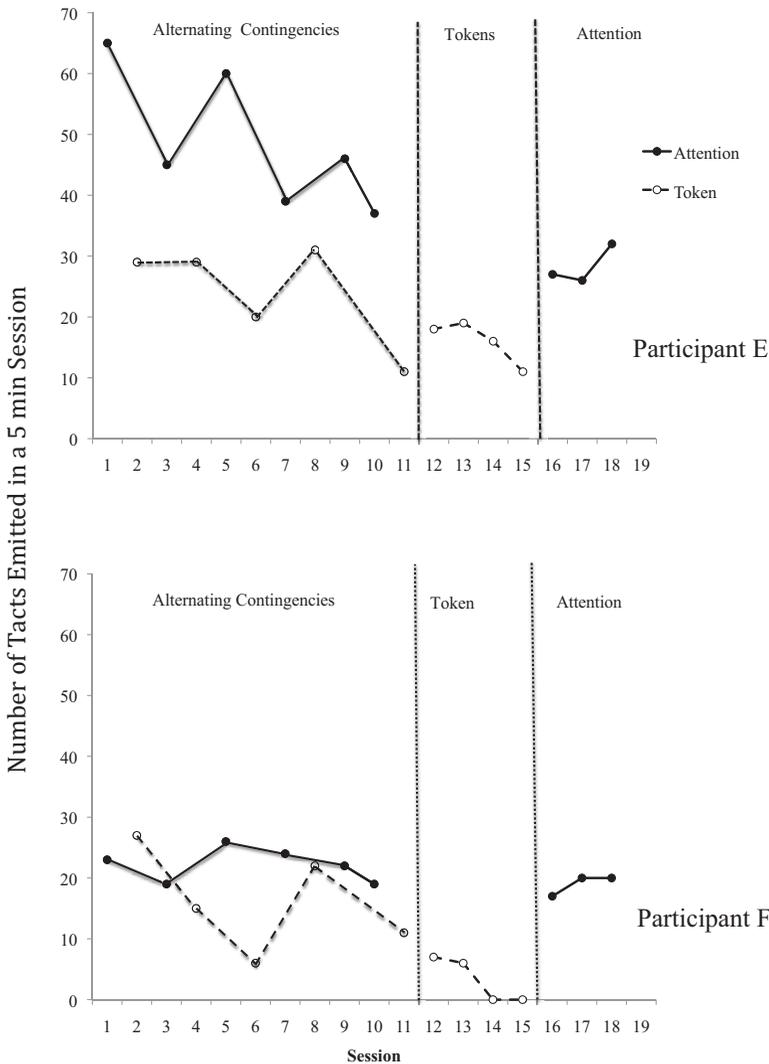


Figure 6. Numbers of tacts emitted under attention reinforcement (closed circle) and token reinforcement (open circle) for Participants E and F.

attention, Participant F showed an immediate increase in the number of tacts emitted and this remained stable across three consecutive sessions.

Figure 7 shows graphs for Participants G and H. Participant G showed some initial variability in her responding, however, differentiation of the reinforcement conditions was clearly achieved after the first four sessions. In the second phase, tacts were maintained under attention reinforcement for four repeated sessions. In a reversal to token reinforcement, the number of tacts emitted showed an immediate drop in level and declined over two consecutive sessions.

Participant H showed an immediate and clear differentiation in responding across the two conditions. In the second phase, tacts were maintained under attention reinforcement for four repeated sessions. In a reversal to token reinforcement, the number of tacts emitted showed an immediate drop in level and then declined over two consecutive sessions. For all six participants a functional relation was demonstrated between contingent adult attention and the emission of tacts.

The results of Experiment 2 revealed a functional relation between contingent adult attention and the emission of tacts in typically developing preschoolers. These data support the

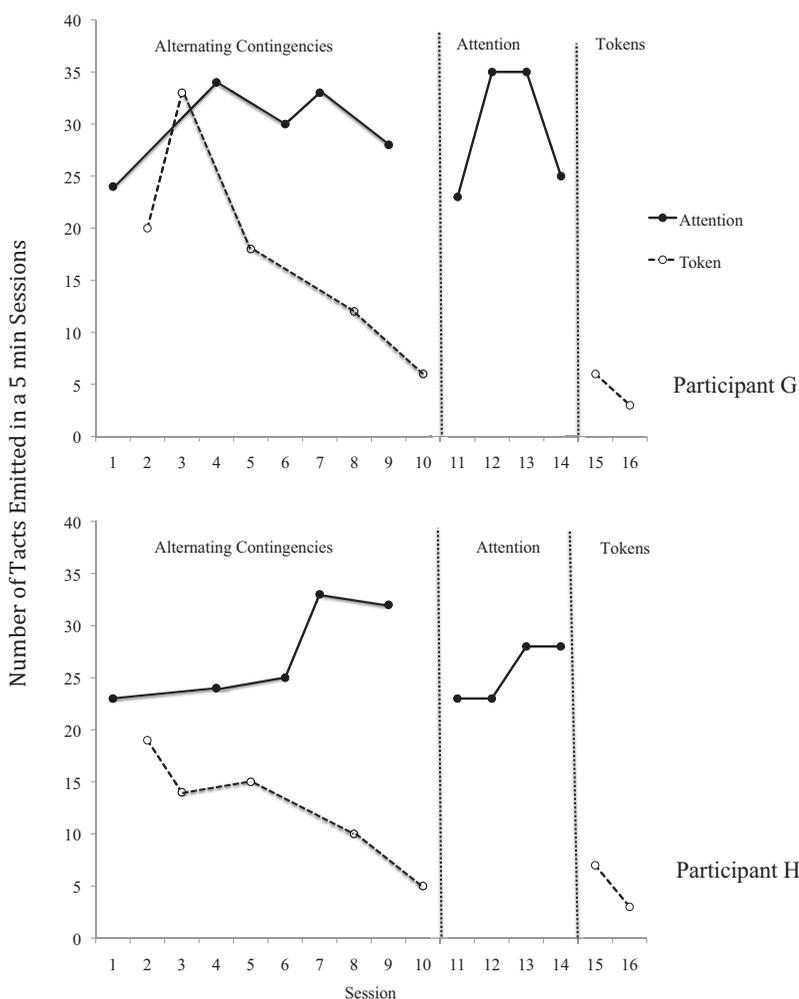


Figure 7. Numbers of tacts emitted under attention reinforcement (closed circle) and token reinforcement (open circle) for Participants G and H.

theory that tacts are maintained by a specific type of generalized conditioned reinforcement, social attention, and not by other nonspecific types (i.e., tokens).

General Discussion

We suggest that these data support the theory that the advancement of the tact repertoire that is basic to the initiation of verbal episodes or conversational units requires that the reinforcement be social (Donley & Greer, 1993; Lodhi & Greer, 1989). If the reinforcement operations being applied to the instruction of tacts are faulty, this will negatively impact the acquisition of tact repertoires and, in turn spontaneous verbal episodes or conversational units by children (Schmelzkopf, 2010).

The results provide empirical support for the theory that tacts function to recruit social attention. In the current investigation, social reinforcers were more effective than tokens in the reinforcement of tacts, suggesting that a—or the—major function of tacts is to recruit social reinforcement, such as attention or approval. When Skinner (1957) first defined the tact, he emphasized the importance of discriminative stimuli for the tact: “The tact emerges as the most important of verbal operants because of the unique control exerted by the prior stimulus” (p. 83). Skinner (1957) called this “the essence of the tact” (p. 82). However, the current findings suggest that the consequence relation is equally important and contributes greatly to the “essence” of the tact. Since Skinner’s (1957) early treatment of the tact, several researchers have suggested tacts are socially learned behavior (Delgado & Oblak, 2007; Greer & Du, 2010; Pistoljevic, 2008; Pistoljevic & Greer, 2006; Schaffler & Greer, 2006; Schmelzkopf, 2010). Alternately, there may be different types of tacts where the differentiation between the types of tacts might be a function of the particular type of conditioned social reinforcers as suggested by Greer and Du (2015).

The current findings have provided evidence that preschoolers’ tacts are strengthened when they result in adult attention as compared with other types of nonsocial reinforcers. In Skinner’s (1953) treatment of social reinforcers, he suggested that signs of approval and disapproval become generalized conditioned reinforcers and punishers when they are paired with

a variety of primary reinforcers and punishers during early child development. These early social experiences in conjunction with biologically important events (e.g., food, warmth, physical contact with caregivers) would be cause for the strength and power of social reinforcers later in life. Moreover, research points to a social learning role for the establishment of new reinforcers (Greer & Singer-Dudek, 2008; Singer-Dudek, Oblak, & Greer, 2011). Evidence that children with language delays as old as three and four years of age may not be reinforced by attention and praise, but that it can be established as reinforcers through observational social learning conditions, was reported by Greer, Singer-Dudek, Longano, and Zrinzo (2008) and replicated by Schmelzkopf (2010). The current findings contribute to the literature by adding evidence for the strength of social reinforcers specific to select types of verbal behavior in young children.

The effectiveness of the social reinforcement delivered in these experiments may also depend on the nonvocal properties, such as eye contact, facial expressions (e.g., smiles) and physical contact (e.g., pat on the back, high five). Other researchers have empirically demonstrated this effect. For example, Kazdin and Klock (1973) found that the use of smiles and physical contact enhanced the effectiveness of verbal approval. Park, Pereira-Delgado, Choi, and Greer (2008) found that playful physical contact enhanced the reinforcement delivered during academic instruction. One of the challenges of using social stimuli as reinforcers is that they are difficult to describe and quantify in the way that other reinforcers, such as food or tokens, can be. Social reinforcers come in a variety of forms and are delivered in a variety of ways and not all these forms of social reinforcement are equivalent. Consistent with this viewpoint, the type of social reinforcement delivered in the current studies would be difficult to quantify and it seems that there may be a need to investigate this further to enhance our understanding of social reinforcement and its effects on verbal behavior.

The participants in Experiment 1 represented a relatively wide range of levels of verbal capabilities. Participant B was the only participant who did not have any diagnosis or classification. Participant A did have a diagnosis of “expressive language disorder” and “adjustment

disorder”; however, her IQ was tested in the average range and she had similar verbal capabilities to Participant B. Participants C and D were both selected from a different classroom than the rest of the participants. It was a nonintegrated classroom setting; therefore, all of the students in their classroom carried a classification as “preschooler with a disability” and the levels of verbal capabilities demonstrated by Participant C and D were overall lower than those of the rest of the participants.

These differences in levels of verbal capability became apparent in the results from Experiment 1. Participants C and D emitted relatively few tacts overall as compared with the other participants. Participants C and D emitted a total of 73 and 47 tacts, respectively, whereas Participants A and B emitted between 103 and 120 tacts, respectively. In addition, their tacts were noticeably less varied and less “sophisticated” than the tacts emitted by the rest of the participants. For example, Participant C emitted many of the same tacts across sessions, such as, “tickle,” “apple tree,” “a car,” and “a dinosaur.” Similarly, Participant D repeated tacts within and across sessions, such as “a baby,” “baby lion,” “a dirty baby.” As a comparison, some of the tacts emitted by the other participants were more varied in terms of the range of words used and their sophistication in terms of use of autoclitics. For example, Participant B said, “It was raining when I came here . . . When I came out of my Mommy’s car I felt a drip on my head . . . Who drove you here? Mommy or the bus?”

Although the results obtained from Participants C and D were consistent with the rest of the participants in Experiment 1 in that tacts did occur more frequently under social reinforcement than token reinforcement, the overall effect was smaller for these two participants. The strength of social reinforcers was less powerful for these two participants and one possible cause is their lower levels of verbal capabilities, as outlined in Greer and Speckman (2009).

In Experiment 2, all six of the participants were typically developing, with the exception of Participant A; however, her verbal capabilities matched those of the other participants. In contrast to Experiment 1, the results in Experiment 2 were very consistent across participants in terms of the frequency of tacts emitted and the strength of the functional relation between tacts and social reinforcement. Also, Experiment 2

eliminated the role of the adults in the delivery of tokens because tokens were delivered through a chute so that the participants could not see where they came from. One exception was Participant F, who emitted fewer tacts, relative to the rest of the participants. However, she was paired with Participant E, who emitted the highest number of tacts across all participants, so the relatively low emission of tacts by Participant F may have been a direct effect of Participant E’s frequency of tacts. Individual participant characteristics and their impact on the peer with whom they were paired were not investigated in this study. However the data from Participant E and Participant F are compelling and it would be interesting to investigate the effects of participant characteristics such as age, gender, and the characteristics of the peer with whom they are paired, on the outcomes of this type of study.

The inclusion of typically developing children in Experiment 2 was important for gaining a better understanding of how social reinforcers impact language in the absence of any known language disorders. With a clearer picture of how language functions for the typically developing children included in this study, this information can be used to investigate the same phenomenon in children with language disorders. With Participants C and D in mind, will such investigations reveal that for children with language disorders, social reinforcers do not function to reinforce tacts, either to the same degree as their typically developing peers, or not at all? This may be an important future direction in this line of research.

In Experiment 2, participants were shown pictures on an iPad as a measure to provide opportunities to tact. The pictures were organized into five different sets of stimuli and exposure to each set was counterbalanced so that the participants each set in both experimental conditions an equal number of times. However, the repeated exposure to the same stimuli may have resulted in an overall decrease in participant levels of responding over time. Skinner (1957) discussed the “novelty of the occasion” in relation to tacts: “A given object does not remain the inevitable occasion for the reinforcement of an appropriate response, and the probability of response therefore comes to vary with the occasion” (p. 85). If more novel stimuli had been present during experimental sessions, tacts

may have been maintained at a higher level. However, the repeated exposure was an important control measure. Stimulus sets were counterbalanced across experimental conditions and this controlled for any variability across conditions due to the experimental stimuli.

The current findings have implications for future research. As noted, there was a weaker relation for some of the participants with the lowest levels of verbal behavior, relative to their participant counterparts. This suggests that there is a need to extend this research to other children who demonstrate lower levels of verbal behavior, such as children with autism, for whom the relation between tacts and social reinforcers may be weak or not present at all. One of the best predictors of outcomes for children with autism is the development of “spontaneous language” before age 6 (Szatmari et al., 2003). The dilemma with this is that social reinforcers are often ineffective for children with autism (Greer et al., 2008), but they are necessary for the acquisition of critical speaker repertoires. Thus, acquiring the social function of the tact appears to be an important verbal developmental cusp. Acquiring and emitting language under this reinforcement control is probably necessary for the acquisition of more advanced speaker capabilities, such as a fluent tact repertoire and Naming. Future research should further investigate social reinforcement as a critical verbal developmental cusp.

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