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Determining the reinforcing value of social consequences and establishing social consequences as reinforcers

Hilary A. Gibson
Northeastern University

Determining the Reinforcing Value of Social Consequences and Establishing

Social Consequences as Reinforcers

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Hilary A. Gibson

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Author: Hilary A. Gibson

Department: Counseling and Applied Educational Psychology

Approved for Thesis Requirements of Master of Science Degree

_____   _____

D. Daniel Gould, Ph.D., BCBA   Date

_____   _____

Karen E. Gould, Ph.D., BCBA   Date

_____   _____

Pamela M. Olsen, MSEd, BCBA   Date

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by

Hilary A. Gibson

B.A., Rollins College

Submitted in partial fulfillment of the requirements for the degree of
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Determining the Reinforcing Value of Social Consequences and Establishing Social

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Abstract

A reinforcer assessment of social consequences was conducted to determine the pre-pairing

reinforcing value of two social stimuli, praise and back pats. A pairing procedure and an S^D

procedure were evaluated to determine which, if either, would effectively condition social

consequences as effective reinforcers. One child with autism participated in the study. It was

determined that prior to conditioning neither social stimulus functioned as a reinforcer. Social

consequences were not effectively conditioned as reinforcers using the pairing procedure,

however praise and back pats may have been conditioned as weak reinforcers using the S^D

procedure.

Determining the Reinforcing Value of Social Consequences and Establishing Social

Consequences as Reinforcers

Positive reinforcement is the backbone of Applied Behavior Analysis (ABA). The use of

positive reinforcement has been extensively researched and presented in the ABA literature.

Results of these studies have supported a conclusion that in order for a response to be increased

effectively, a stimulus with potent reinforcing properties must be provided contingent on that

response. Positive reinforcement is used in clinical settings to increase a wide variety of

desirable behavior and to decrease undesirable behavior. The reinforcing effectiveness of stimuli

is often idiosyncratic and must therefore be assessed accurately and frequently in order for

effective treatment to be administered (Kelleher & Gollub, 1962). While numerous studies have

highlighted the utility of primary, or unconditioned, positive reinforcement in the applied

settings, problems can arise with its use. These problems include a delay between the time a

target response occurs and the delivery of a primary reinforcer, and satiation with a particular

primary reinforcer (Kadzin & Bootzin, 1972).

While primary reinforcement can be used to effectively and efficiently teach and

maintain performance of a wide range of skills, situations exist in which it is beneficial to utilize

conditioned reinforcement. Kazdin and Bootzin (1972) present the benefits associated with the

use of conditioned reinforcement in the applied setting. Conditioned reinforcers can help reduce

the time that elapses between when a response occurs and when a reinforcer is delivered, that is,

they allow a response to be reinforced at any time. Performance on a task can be maintained for

long periods of time and components of a sequence or chain do not need to be interrupted to

deliver conditioned reinforcers. Further, generalized conditioned reinforcers may be less

sensitive to the effects of satiation than primary reinforcers.

Social consequences can function as conditioned reinforcers. Praise statements such as "That's right" or "Good" can effectively reinforce behavior in typically developing individuals and in many individuals with disabilities. The praise statements gain their reinforcing properties through their relation to other reinforcers (Skinner, 1953). Parents reinforce and punish their children's behavior from a young age and social stimuli such as praise statements, smiles, and frowns come to shape children's behavior. Individuals with autism, however, often do not respond to social consequences as a typically developing individual would (Lovaas, 1966). It is important to identify preferred social stimuli of individuals with autism and additionally to determine whether these stimuli function as reinforcers (Smaby, MacDonald, Ahearn, & Dube, 2007).

Smaby et al. (2007) evaluated a method for assessing preference for social consequences of individuals with developmental disabilities by determining the levels at which various social stimuli supported responding. The assessment yielded differentiated results from which a preferred social consequence could be determined for each participant. The preferred social consequence was the one that increased rates of responding the most over baseline levels. Smaby et al. effectively evaluated preference of individuals with autism for three different social consequences and also evaluated their effectiveness as reinforcers by comparing responding maintained by each social consequence for each participant to responding during an extinction condition. Although Smaby et al. assessed the effectiveness of social consequences as conditioned reinforcers, they did not examine methods for establishing these reinforcers.

The establishment of conditioned reinforcers in applied settings is a topic that has not been sufficiently researched. Williams (1994) describes some factors affecting the establishment of stimuli as conditioned reinforcers and the persistence of conditioned reinforcement effects. These

variables include the schedule of pairing of the stimulus with the primary reinforcer and the

percentage of times the stimulus was followed by reinforcement. Previous research has

determined that the effectiveness of a conditioned reinforcer is dependent on the number of

pairings of that stimulus with back-up reinforcers (Kelleher & Gollub, 1962). The number of

pairing trials necessary and the most effective pairing methods, however, are not well

understood.

In one of the few studies of social stimuli as conditioned reinforcers, Dozier, Iwata,

Thomason, and Wilson (2008) investigated the establishment of verbal praise as a conditioned

reinforcer. Three procedures were evaluated: a new response procedure, an established response

procedure, and a procedure that included the established response procedure with schedule

thinning. In the new response procedure, a neutral stimulus was paired with a primary reinforcer.

The previously neutral stimulus was then delivered contingent on a new free operant response

and the subsequent rate of responding was measured to determine whether the stimulus had

acquired reinforcing properties. In the established response procedure, the neutral stimulus was

delivered, paired with a primary reinforcer, contingent on a response. The neutral stimulus alone

was subsequently delivered contingent on a free operant response to determine if the stimulus

had been conditioned as a reinforcer. The third procedure investigated was similar to a brief

stimulus presentation procedure. In such a procedure a brief stimulus is occasionally paired with

a primary reinforcer to determine whether responding can be maintained in components of

second-order schedules of reinforcement (Kelleher, 1966). It was determined that the new

response procedure was ineffective for all four participants. Praise was effectively conditioned

for four of eleven participants using the established response procedure. The established

response procedure with food-schedule thinning effectively conditioned praise as a reinforcer for

all seven participants, however it was noted that thin food schedules yoked to the schedule of

food delivery in the established response condition also maintained responding during a

reinforcer assessment for five of five participants assessed (Dozier et al.).   Although the Dozier

et al. study contains promising results, the study has not been published and therefore many

procedural details are lacking.

Additional research has examined the establishment of to-be-conditioned neutral stimuli

as discriminative stimuli (S^Ds). Although discriminative stimuli can function as reinforcers, the

literature suggests that it is not necessary to establish a stimulus as an S^D in order for it to be

conditioned as a reinforcer (Kelleher & Gollub, 1962). Holth (personal communication,

September 2008) investigated one procedure, referred to as the "S^D procedure", for establishing

social stimuli as conditioned reinforcers. First, a neutral social stimulus was established as an S^D

for a specific response. This response then produced the primary reinforcer. The conditioned

reinforcer value of the social stimulus was then tested by delivering the stimulus as a

consequence contingent on an arbitrary response. The results suggested that the initially neutral

social stimulus had been established as a conditioned reinforcer. Lovaas et al. (1966) utilized a

similar S^D procedure and reported that while a traditional pairing procedure (similar to the Dozier

et al., 2007, new response procedure) did not effectively condition social stimuli as reinforcers,

social stimuli were effectively conditioned as reinforcers when they were established as S^Ds for

responses that produced food.

Applied research has demonstrated the importance of positive reinforcement in increasing

target behaviors, managing challenging behaviors of individuals with developmental disabilities,

and establishing new behaviors. Research has also investigated conditioned reinforcement and its

application for treatment of individuals with developmental disabilities. The effective and

efficient establishment of conditioned reinforcers, including social reinforcers, is an ongoing area

of interest in applied research because of the utility of these stimuli in applied settings. The

purpose of the current study was to determine the pre-pairing reinforcing value of social

consequences and to evaluate a pairing procedure and an S^D procedure to determine which, if

either, would effectively condition social consequences as reinforcers.

Method

Participant

Mary was a 4-year-old girl diagnosed with autism. She was enrolled in an intensive early

intervention preschool program for children with autism. She had previous experience with

conditioned reinforcement, using tokens during academic programming. The tokens had

previously been paired with edibles and the edibles were gradually faded out until the participant

earned 10 tokens and then traded these tokens in for a toy or edible.

Mary had deficits in social skills and often needed prompting to participate in group

activities. Her teachers reported that she would likely be integrated into a typical classroom in

the next year. She was selected to participate in the present study because effective naturalistic

reinforcers such as praise would be much easier to deliver and less stigmatizing when delivered

in a public school classroom rather than other stimuli (e.g., edibles, tokens, etc).

Setting and Materials

All sessions were conducted in either the student's individual classroom area or in an

assessment room. Each area contained a desk and two chairs. A timer, a stopwatch, a video

camera, and a counter were all used in the study. Other materials included a variety of edible

stimuli presented in the preference assessment and the high-preference edible item selected in

this assessment (chips). The same tokens and token board used in the participant's academic

programming were used in the token reinforcer assessment.

Dependent Variable and Response Definition

The dependent variable during the preference assessment was a selection response.

Selection was defined as picking up an item and putting it in the mouth.

The dependent variable during all reinforcer assessments was hand raising. Hand raising

was defined as lifting her arm so that her hand and her elbow were above shoulder height. In

order for the next response to be scored she must first lower her hand and elbow below shoulder

height. If she raised both hands at the same time, one response was scored.

The social consequences investigated were praise and back pats. Praise was delivered by

the experimenter in a normal conversational tone. Three phrases were alternated: "Good work",

"Nice job," and "That's great." Back pats were delivered by the experimenter by lightly tapping

the participant behind the shoulder with an open hand two times.

Measurement Method and IOA

The experimenter or another trained therapist served as the primary observer for each

session. During preference assessment sessions, the experimenters collected selection data for

each trial. The data sheet included which stimuli were presented, the positioning of the stimuli,

and which stimulus was selected. Percent selection was determined for each stimulus by dividing

the number of times the item was selected by the total number of times it was presented and

multiplying this number by 100. A second observer collected reliability data during 33.3% of sessions. Interobserver agreement (IOA) for selection was 100%.

During reinforcement sessions, experimenters tallied responses or used a counter hidden from the view of the participant to determine the frequency of responses. Response rate was calculated by dividing the number of responses in the session by the duration of the session.

Interobserver agreement data were collected during at least 33% of reinforcer assessment sessions in all phases of the study. A trained second observer either collected data during the sessions or watched the video tape after the session and scored responses using the same criteria as the primary observer. Agreement was calculated for each session with a second observer by dividing the smaller count by the larger count and multiplying by 100. The mean IOA score for all reinforcer assessment sessions was 98.6% agreement.

Procedure

Phase 1. A preference assessment was conducted to establish a highly-preferred edible item. A 16-item Paired Stimulus preference assessment included only edible items and closely followed the procedures outlined by Fisher et al. (1992). The 16 stimuli were presented within arm's reach of the participant in pairs. Each stimulus was paired with every other stimulus and delivered in a quasi-random order. The stimuli were available for 10 s. Selection was recorded when the participant touched one of the items with her hand. Attempts to select both items were blocked. The participant was allowed to immediately consume the selected edible and the other stimulus was removed from the table. If no selection was made in 10 s, both items were removed and no response was scored.

Phase 2a. A reinforcer assessment was conducted to determine whether the high-preference item (chip) chosen from the preference assessment would function as a reinforcer. Hand raising was the free-operant response used in the assessment. The two conditions were FR1 and Extinction. During the FR1 condition, the edible selected in the preference assessment (chips) was delivered contingent upon every response. The experimenter delivered the chip into the participant's mouth. During the extinction condition, there were no programmed consequences. Prior to the sessions, the experimenter conducted two demonstration trials. The experimenter said "Raise hand." Contingent on hand raising, the experimenter delivered either a chip during the FR1 condition or nothing during the extinction condition. After these two demonstration trials the experimenter delivered the following instructions to the participant, "You can raise your hand as many times as you want and you will earn chips." During the extinction condition, the experimenter instructed the participant, "You can raise your hand as many times as you want but you will not earn anything." Sessions lasted for 3 min. FR1 and extinction sessions were alternated and sessions were run until there was stable responding or differential responding in the FR1 and Extinction conditions.

Phase 2b. A reinforcer assessment was conducted to determine whether social consequences functioned as reinforcers prior to conditioning. The conditions in this assessment were verbal praise, back pats, extinction, and high-preference edible. These conditions were alternated in a multielement design. Edible and extinction sessions were identical to Phase 2. During the verbal praise condition, the experimenter delivered the following instructions to the participant, "You can raise your hand as many times as you want and you will earn 'nice job', 'good work', or 'that's great'." One of the utterances was delivered following each response during the two demonstration trials. During the back pats condition, the experimenter delivered

the following instructions to the participant, "You can raise your hand as many times as you want and you will earn (experimenter patted participant's back two times)." Two back pats were delivered following each response during the two demonstration trials. The praise, back pats, and extinction conditions were alternated in quasi-random order. Sessions were run until stable responding was achieved. The high-preference edible condition was re-introduced at the end of the phase to show differential responding between conditions and to demonstrate that the social consequences did not function as reinforcers, as compared to an edible reinforcer, prior to conditioning.

Phase 3. Pairing was conducted to try to establish the neutral social stimuli (NS) as conditioned reinforcers. Procedures were similar to the new response procedure (Dozier et al., 2007). A praise statement was delivered and immediately followed by a piece of chip. There were 10 pairings per session. The three praise statements, "Good job," "Nice work," and "That's great" were alternated. A similar procedure was used with back pats. Two pats were delivered by the experimenter and followed immediately by a piece of chip. There were 10 pairings per session. Four pairing sessions were carried out with each NS (40 pairings of each) before moving on to Phase 4.

Phase 4. Probe sessions were conducted to determine the reinforcing value of the previously NS. The sessions were identical to Phase 2b except the conditions were presented in the ratio of 3 praise as consequence, 3 back pats as consequence, 1 extinction, and 1 FR1 edible. Phase 3 and Phase 4 were alternated until stable responding was observed in Phase 4 sessions or until the response rates in Phase 4 sessions matched those of Phase 2a.

Phase 5. Another baseline reinforcer assessment of the social consequences was conducted prior to the second conditioning procedure. The procedure was identical to Phase 2b. The conditions praise, back pats, extinction, and high-preference edible were alternated in quasi-random order until stable responding was observed.

Phase 6. An S^D procedure was used to establish the NS as conditioned reinforcers. Ten pieces of chip were placed on a plate. The plate was located on the table directly in front of the participant and within arm's reach. On each of 10 trials, the experimenter delivered the S^D (one of the praise statements) and the participant took one chip from the plate and consumed it. This procedure was repeated until all chips were consumed. The procedure was carried out similarly with back pats, except the S^D was two back pats. Sessions of praise and back pat pairings were alternated. There were four praise pairing sessions and four back pat sessions, or 40 total pairings of each, before moving on to Phase 7.

Phase 7. Probe sessions were conducted to determine the reinforcing value of the previously NS. The sessions were identical to Phase 4.

Phase 8. A reinforcer assessment was conducted to determine whether the tokens that the participant used during daily programming functioned as conditioned reinforcers. Sessions were the same as other reinforcer assessment sessions except that contingent on hand raising the experimenter put a token on the token board. When 10 tokens had been accumulated on the board, the participant traded the tokens in by handing the board to the experimenter. The experimenter delivered a chip to the participant in exchange for the board. The timer was stopped from the time the participant handed the board over until the time the participant consumed the chip.

Results and Discussion

Results for the preference assessment are shown in Figure 1. Chips were selected on 86.7% of presentations. Chips were used as the high-preference edible stimulus in subsequent phases because of their availability in the classroom.

The results of Phase 2a and Phase 2b are depicted in Figure 2. Response rates are significantly and differentially higher than baseline when hand raising resulted in access to the high-preference edible stimulus (chips). Mean responding across FR1 sessions was 8.7 responses per minute (range, 4.3 to 12), and no responding occurred during Extinction sessions. Therefore, chips were validated as a reinforcer for the participant. In Phase 2b, variable low rates of responding were observed in all conditions (praise, pats, and extinction). Rates of responding decreased and remained stable at zero after session 46 for extinction and praise, and after session 56 for back pats. When chips were delivered contingent on responding at the end of Phase 2b responding increased to a mean of 16.3 (range, 15.7 to 17.3) and differentiation in response rate was evident among conditions. Low- or zero rates of responding continued when praise or back pats were delivered contingent on responding. Thus, in the absence of explicit establishment of praise and back pats as conditioned reinforcers, neither social consequence functioned as a reinforcer for the participant.

Phase 3 consisted of 240 total pairings of the social consequences with primary reinforcement. The results of the Phase 4 reinforcer assessment of social consequences are presented in Figure 3. There was an increase in responding over Phase 2b (baseline) for the first praise session (session 47) after the first pairing session, however rates of responding decreased rapidly to baseline levels after this point. Low rates of responding occurred when praise (mean =

1.2; range, 0.0 to 8.7) or back pats (mean = 0.7; range, 0 to 4.3) were delivered contingent on

responding and differentially higher rates of responding were observed when chips were

delivered contingent on responding (mean = 17; range, 0 to 19.3). Phase 3 pairing and Phase 4

reinforcer assessment of social consequences were alternated until stable responding was

observed. The final three sessions for both praise and back pats resulted in zero responding.

Thus, neither social consequence was effectively conditioned as a reinforcer for this participant

using the pairing procedure.

Results from Phase 5 (which served as a new baseline for Phase 7) are displayed in

Figure 4. Near-zero rates of responding were observed in the praise, back pats, and extinction

conditions. Rates of responding when the high-preference edible was delivered contingent on

responding were differentially higher than rates of responding when either social consequence

was delivered contingent on responding. Prior to implementation of the S^D procedure neither

social consequence functioned as a reinforcer for the participant.

Phase 6 – the S^D procedure – consisted of a total of 320 conditioning trials. Results from

Phase 7 are depicted in Figure 4. Variable low rates of responding were observed in the praise,

back pats, and extinction conditions until session 47. After this point the data paths for the praise,

back pats, and extinction conditions all co-vary and increase substantially until session 61 when

responding in all conditions decreased to previous low rates. An unknown variable appeared to

be affecting responding across all conditions in these sessions.

Slight differentiation was observed between the social consequences conditions and

extinction after session 71. Stable, low rates of responding were maintained when both praise

(mean = 1.9; range, 1.3 to 2.3) and back pats (mean = 2.4; range, 1.3 to 3.0) were delivered

contingent on responding. This rate of responding was differentially higher than the rate of responding in the extinction condition (mean = 0.0). These results suggest that the social consequences may have been established as weak conditioned reinforcers using the S^D pairing procedure.

The results from Phase 8 are presented in Figure 4. Tokens maintained a high rate of responding when delivered contingent on hand raising. Tokens were observed to be effective conditioned reinforcers for the participant. Behavior was maintained at a differentially higher rate when tokens were delivered contingent on responding (mean = 28.1; range, 20.3 to 33.3) compared to rates of responding when social consequences were delivered contingent on responding.

All reinforcer assessment data are summarized in Figure 5. It was determined that neither of the social consequences functioned as reinforcers prior to implementation of the conditioning procedures. Social consequences were not effectively conditioned as reinforcers using the pairing procedure (Phase 3), however praise and back pats may have been conditioned as weak reinforcers using the S^D procedure (Phase 7). The effect of the social consequences as conditioned reinforcers was weak, however, compared to the effectiveness of tokens as conditioned reinforcers.

Data were examined from a random sample of sessions during the S^D conditioning procedure to determine whether each social consequence was established as an S^D for the response which produced reinforcement. This analysis was conducted to rule out a conclusion that a weak reinforcing effect was observed (compared to tokens) due to an insufficient establishment of the social consequences as S^Ds. It was determined, however, that the primary

reinforcer was taken within 3 s of the occurrence of the social consequence on 100% of trials, suggesting that the social stimuli did function as S^Ds for responses which then produced the primary reinforcer.

One limitation to the current investigation was that only two conditioning procedures were implemented. Future research might include a condition similar to the established response procedure, in which pairing is contingent on a response (Dozier et al., 2008). Another limitation was the difference in numbers of pairing trials in the two conditioning procedures. Sessions were carried out in each condition until stable responding was observed, leading to a greater number of trials in the S^D procedure condition.

One question raised by the difference in response rates maintained by the (previously-conditioned) tokens and the social consequences is the role of the tangible tokens. That is, for this participant the tokens were presented and accumulated and thus constantly present. This is contrasted with the social consequences, which were of a more ephemeral nature. Further, during a reinforcer assessment with tangible stimuli, such as tokens, a trade-in usually occurs at some time after each token is earned. This exchange of tokens for backup reinforcers allows for additional pairing of the stimulus with the back-up reinforcer (functionally becoming a second-order schedule of reinforcement). In the reinforcer assessments with social stimuli, however, no trade-in occurred after each session and the stimuli, once presented, were no longer available. Future research might examine the schedule of pairing of social consequences with primary reinforcers. If the stimuli had in fact acquired reinforcing properties during the pairing procedures, it is possible that this value was extinguished between the time that the pairing sessions were conducted and all the subsequent reinforcer assessments had been carried out. Previous research has shown that a conditioned reinforcer can lose its reinforcing value if the

frequency with which it is paired with primary reinforcer is too low (Williams, 1994). A future design might include fewer reinforcer assessment probe sessions between pairings.

Future research might also examine the nature of the stimuli used. As mentioned above, the social stimuli are presented and then terminated. It is not clear whether it was the ephemeral (brief presentation) nature of the stimuli or the social nature of the stimuli that prevented them from functioning as strong conditioned reinforcers. Additional studies might isolate these characteristics and compare the conditioning of tangible, non-social stimuli (e.g., tokens), brief non-social stimuli (e.g., tone) and brief social (praise) stimuli.

It is important that research continues to be conducted in this area so that an effective method can be identified to condition social stimuli as reinforcers.

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Figure Captions

Figure 1. Percent selection of edible stimuli during a paired stimulus preference assessment.

Figure 2. Responding (hand raising) during reinforcer assessments conducted in Phase 2a and Phase 2b. Stimuli delivered contingent on responding were no programmed consequence (EXT), chips (FR1), praise, and back pats.

Figure 3. Responding (hand raising) during reinforcer assessments conducted in Phase 2b and Phase 4. Stimuli delivered contingent on responding were no programmed consequence (EXT), chips (FR1), praise, and back pats. Arrows denote pairing sessions (Phase 3).

Figure 4. Responding (hand raising) during reinforcer assessments conducted in Phase 5, Phase 7 and Phase 8. Stimuli delivered contingent on responding were no programmed consequence (EXT), chips (FR1), praise, and back pats, and tokens. Arrows denote pairing sessions (Phase 6).

Figure 5. Responding (hand raising) during all reinforcer assessments. Stimuli delivered contingent on responding were no programmed consequence (EXT), chips (FR1), praise, and back pats, and tokens.
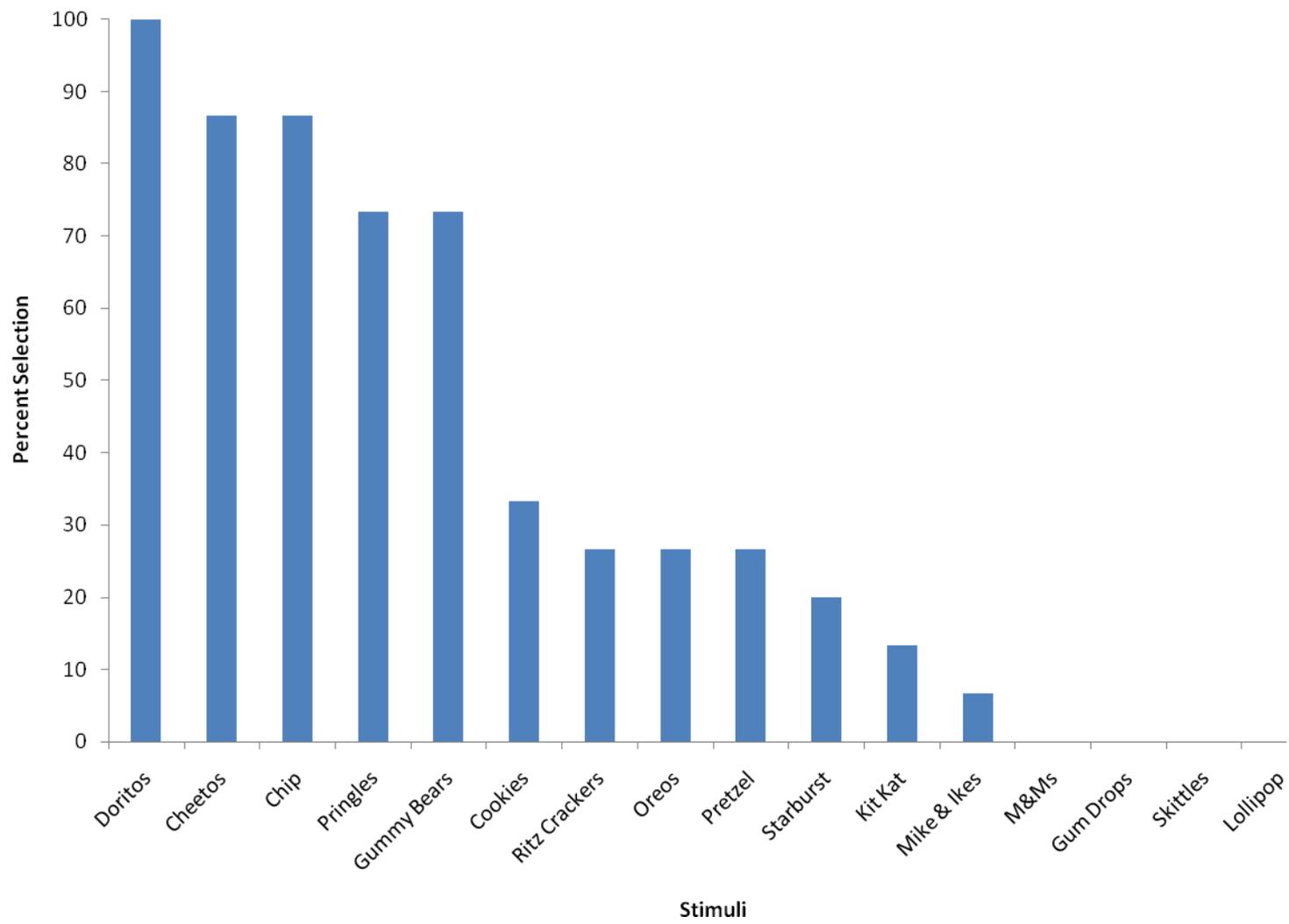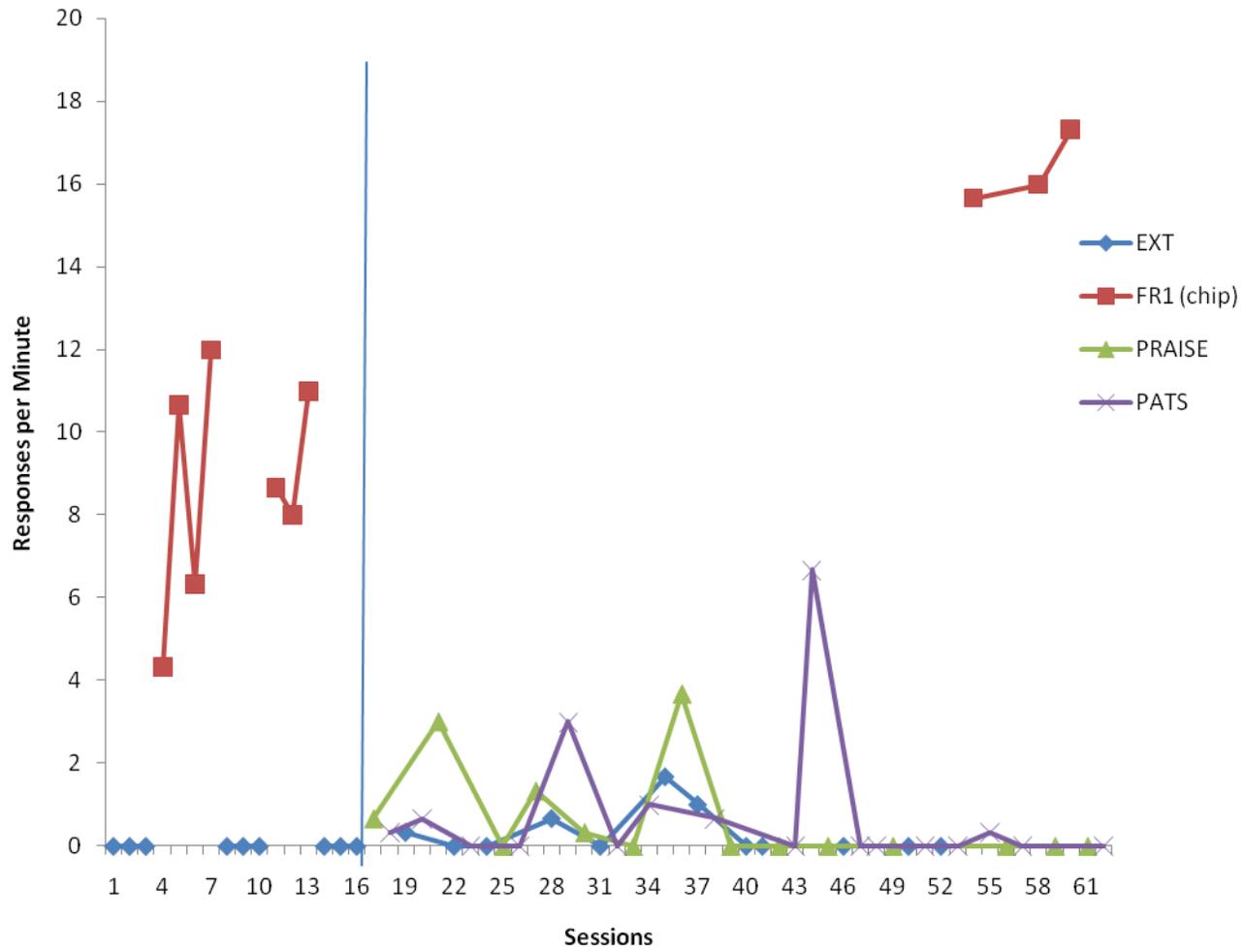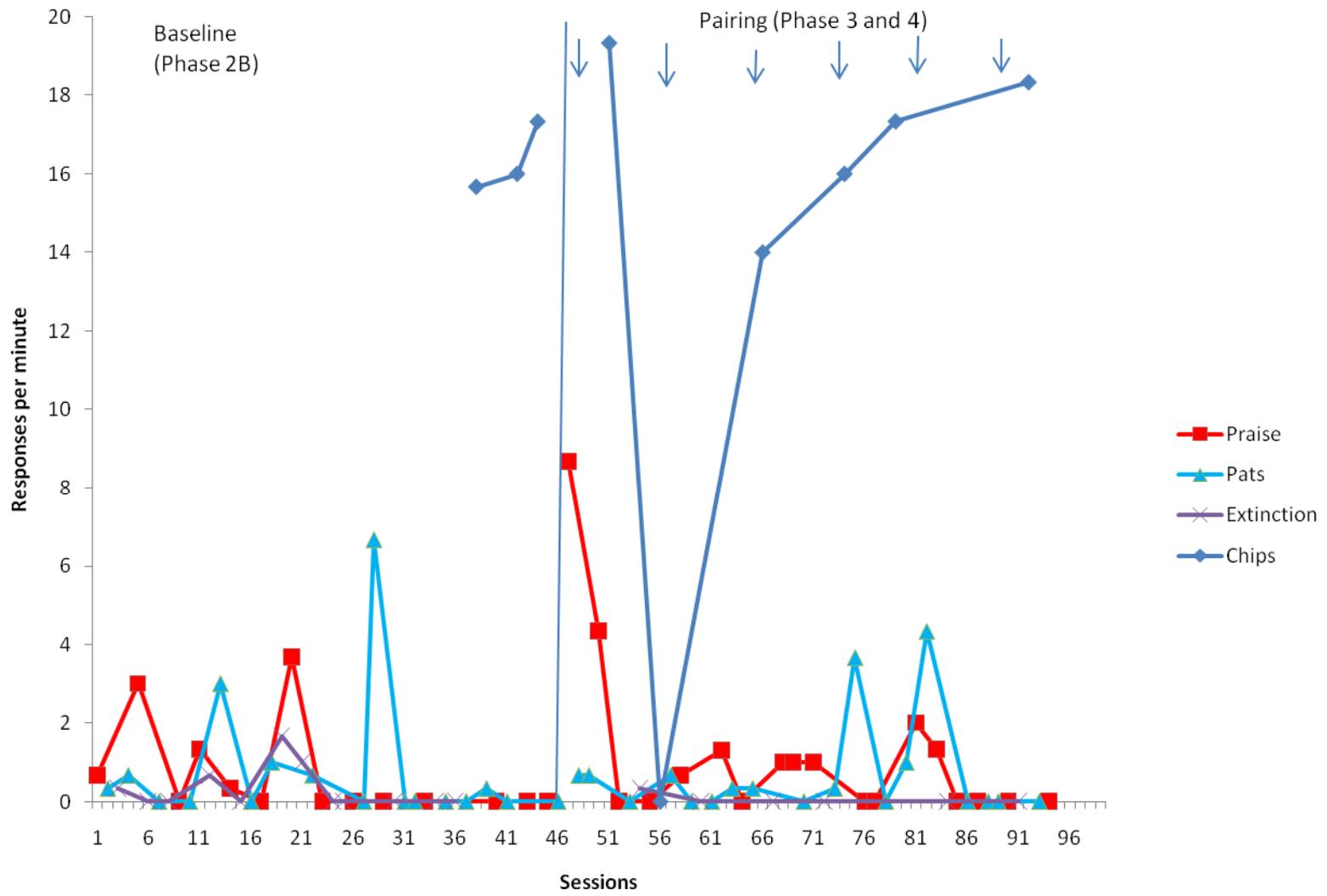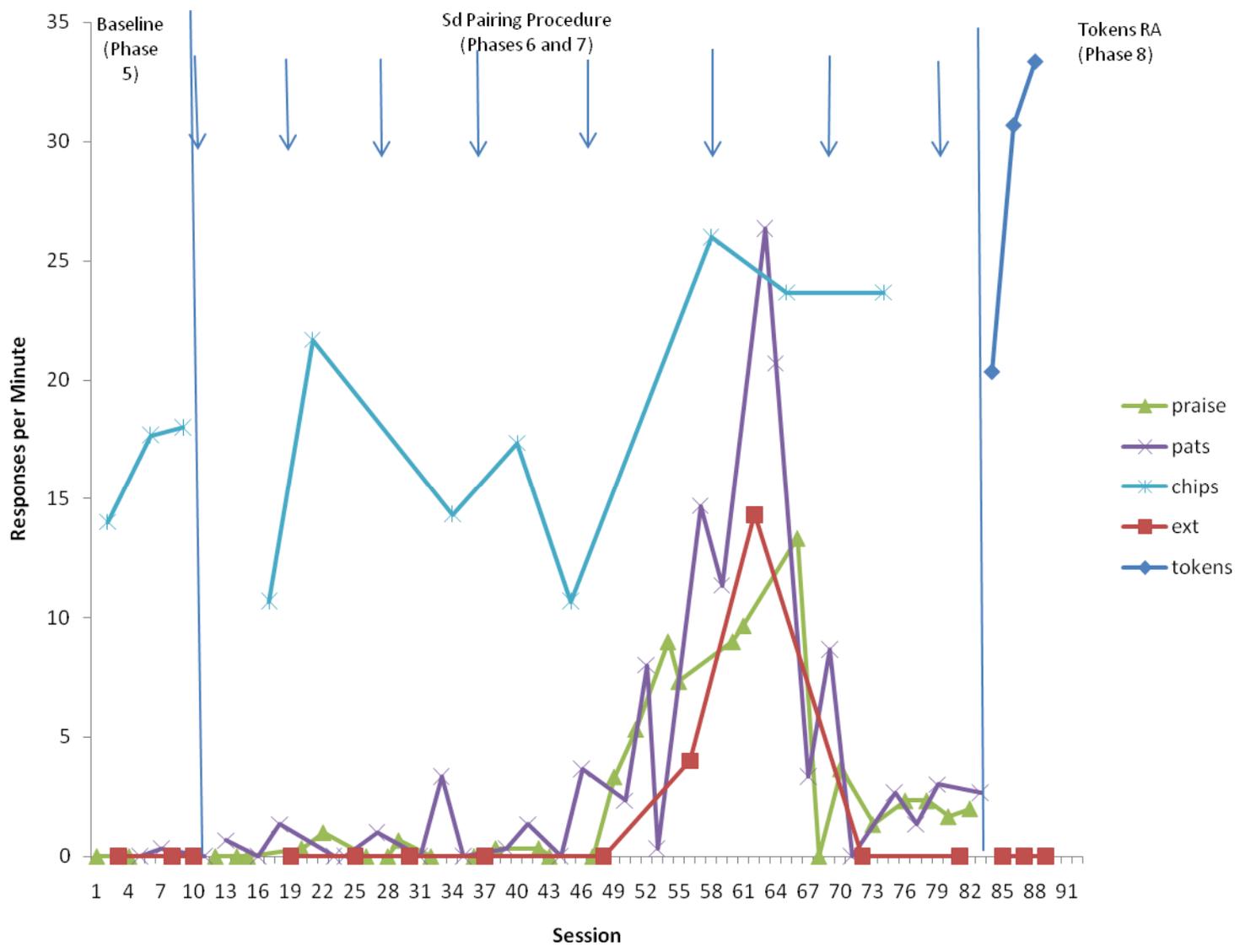
Figure 1

Figure 2

Figure 3

Figure 4

Figure 5