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EFFECTS OF AND PREFERENCE FOR CONDITIONS OF TOKEN EARN VERSUS TOKEN LOSS

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Abstract

The effects of earning and losing tokens on the disruptive behavior of 12 first-grade students were evaluated under symmetrical contingencies of earn and loss. Both contingencies produced decreases in disruptive behavior. For some participants, more consistent decreases were observed during the loss contingency. In addition, participants generally earned or kept more tokens during the loss contingency. When offered a choice of contingencies, most participants preferred the loss contingency. The results showed some consistency with behavioral economic principles of loss aversion and the endowment effect.

Keywords

positive reinforcement; response cost; tokens; loss aversion

Token systems are commonly used in classrooms, clinics, psychiatric hospitals, and prisons, and various token system packages have been demonstrated to be effective at reducing problem behavior, increasing appropriate behavior, or both (Kazdin, 1982). However, more applied research is needed to examine specific features of token systems. One feature in need of additional research is the effect of earn and loss contingencies in token systems that are designed to reduce problem behavior.

Several previous studies have compared token earn and loss contingencies (Broughton & Lahey, 1978; Conyers et al., 2004; Iwata & Bailey, 1974; Kaufman & O'Leary, 1972). Broughton and Lahey (1978) and Kaufman and O'Leary (1972) compared the effects of earn and loss contingencies across groups on correct responding to math problems and disruptive behavior, respectively. Individuals within each group experienced only one contingency.

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There were no apparent differences in the effects of earn and loss contingencies between groups in either study. Iwata and Bailey (1974) and Conyers et al. (2004) exposed all participants to both earn and loss contingencies but presented their data as group averages. Iwata and Bailey found both contingencies to be equally effective at reducing disruptive behavior. Conyers et al. found both contingencies to be effective at reducing disruptive behavior, but the loss contingency produced a greater and more sustained change in behavior across sessions. However, the loss contingency in the Conyers et al. study also included feedback when tokens were lost that was not provided when students did not earn a token in the earn condition, perhaps contributing to the differences in effectiveness between the earn and loss contingencies.

Comparisons between reinforcement and punishment have also been made in the context of the Good Behavior Game, which is a classroom management system, first evaluated by Barrish, Saunders, and Wolf (1969), that involves setting rules about behavior, delivering points contingent on breaking or following the rules, and providing rewards contingent on meeting a specified point criterion. Both Tanol, Johnson, McComas, and Cote (2010) and Wright and McCurdy (2012) compared the effects of the Good Behavior Game when points were delivered contingent on disruptive behavior (and rewards were contingent on earning few points) to a condition in which points were delivered contingent on the absence of disruptive behavior (and rewards were contingent on earning a minimum point amount). These studies reported comparable reductions in disruptive behavior during both the reinforcement and punishment contingencies. Wright and McCurdy assessed participants' acceptability of both versions of the game (contingencies for appropriate behavior and contingencies for disruptive behavior) via a rating scale in which the mean ratings suggested the participants, on average, found both procedures approximately equally acceptable.

Previous applied comparisons of earn and loss have not examined differences between earn and loss contingencies within individual participants or assessed preference directly by allowing students to select and subsequently experience their preferred contingency. The purpose of the current study was to compare the effects of earn and loss conditions on disruptive classroom behavior within individual students and assess individual preference for earn and loss conditions. We also compared the duration of implementation of each condition as a measure of implementation effort.

METHOD

Participants and Setting

Participants were 12 students in a general education first grade classroom. Five girls and seven boys, all either 6 (n = 4) or 7 (n = 8) years old, participated. Eight participants were African American, three participants were Hispanic, and one participant was biracial. The classroom consisted of 23 students: 61% female, 49% male; 48% African American, 35% Hispanic, 9% Caucasian, 4% South Asian, and 4% biracial. Students were selected to participate in the study by meeting the following criteria during baseline: (a) The student engaged in disruptive behavior during baseline observations, and (b) the trend of the student's baseline data was not decreasing. Any students in the class who did not meet those

criteria were excluded from the evaluation. Although not all 23 students in the class participated in the study, all students received the study contingencies.

All sessions occurred in the classroom during either the seat-work center (in small-group rotations) or independent reading (whole class). The student groups for small-group rotations were determined by reading level, so the groups did not necessarily stay the same across sessions. If students were determined to read at a higher or lower level by teacher assessments, they were moved to a different small group. Sessions were conducted with all participants during both types of activities during all phases of the study. During both session times, students were expected to sit in their assigned seats and complete work quietly or read silently. They were allowed to work on seat work with other students at their table as long as they whispered. During centers, the teacher worked with a small group at a separate table. During independent reading, the teacher conducted reading evaluations with individual students.

Response Measurement and Interobserver Agreement

The dependent variables were responses per minute of disruptive behavior across all conditions, the number of tokens earned or kept in each condition in which token earning or keeping was possible, the percentage selection of earn and loss conditions during the choice phase, and the duration of intervention implementation for earn and loss sessions. *Disruptive behavior* included speaking above a whisper without permission from the teacher, standing up and moving away from the student's assigned seat, rocking back in the chair such that at least one leg of the chair was no longer touching the ground, loudly tapping objects (e.g., pencils) on the table, banging on the table, stomping feet, and manipulating objects that were not relevant to the assigned work (e.g., playing with a toy from the student's backpack during seat work or drawing in the student's journal during independent reading). Responses that could occur continuously (e.g., rocking back in the chair, playing with a toy) were scored once when the response was initiated and only scored a second time if the participant discontinued the response for at least 3 s and began again.

In the tokens: choice phase, the selection of earn or loss was recorded for each participant before the start of the session. The number of tokens earned (or kept) for each participant was recorded at the end of the session from the check marks written on each participant's token board. The duration of intervention implementation (i.e., monitoring behavior according to the DRO and delivering or removing tokens) was recorded from the time the clicker sounded until the experimenter signaled to the data collector that she had finished delivering or removing tokens. Data for the duration of intervention implementation were collected during a single session of each of the following types: small-group earn, small-group loss, whole-class earn, and whole-class loss. The estimates of intervention implementation duration were based on implementing the intervention for the entire class, not just the participants.

A second independent observer recorded disruptive behavior during 73% of baseline sessions and 31% of token sessions across all participants. Average interobserver agreement for disruptive behavior was calculated using the proportional agreement method, in which each session was divided into 10-s intervals, the smaller number of responses recorded by an

observer was divided by the larger number of responses recorded by an observer within each interval (if both observers recorded no responses in an interval, that interval was counted as 1), adding the proportions from each interval, and dividing by the total number of intervals. During baseline, interobserver agreement averaged 93% (range, 82% to 100%). During token sessions, agreement averaged 99% (range, 97% to 100%).

Procedure

The effects of earn and loss conditions were evaluated using a combination of a multielement and ABAC reversal design in which A phases were baseline, the B phase was a multielement comparison of earn and loss conditions, and the C phase was a choice condition in which each participant was given the choice to work in either the earn or the loss condition. Sessions lasted 10 min and were conducted once or twice per day, 3 to 5 days per week. The first author implemented all study contingencies. The first author did not serve as a data collector during any token sessions or any sessions during the second baseline but did serve as a data collector during some initial baseline sessions.

Baseline—No programmed consequences were provided to the participants for appropriate or disruptive behavior. The classroom teacher was asked to continue doing what she would normally do during sessions. On several occasions, the teacher reminded the class to be quiet and remain in their appropriate centers.

Tokens—At the start of each session, each participant was given a laminated piece of white paper with 10 open circles that represented token slots. Tokens were check marks in the token slots made with dry erase markers. An experimenter described the contingencies to the participants before the start of the session and reviewed behavior considered to be on task that could earn or keep tokens and behavior that was considered to be disruptive and could not earn or could lose tokens. Token earn and loss schedules were arranged as a momentary differential-reinforcement-of-other-behavior schedule (mDRO) with 10 intervals per session signaled by a clicker sound. This schedule was used to simulate a common classroom schedule in which the teacher is reading a book, writing on the board, or working with a small group of students and looks up to see who is on task to deliver or remove points in the classroom point system. The intervals were based on a random-time 1-min schedule, with the caveat that clicks could not occur within 20 s of each other (to allow the experimenter enough time to deliver all checks in the earn condition).

During all token sessions, the experimenter sounded the clicker at the predetermined intervals, scanned the room to determine which students should earn or lose tokens, and delivered the consequences table by table. The table that received consequences first rotated after each click. At the end of each session, participants exchanged their tokens for back-up reinforcers. A variety of food items were selected as back-up reinforcers. The prices for these reinforcers were as follows: 1 Goldfish = 1 token, 1 pretzel = 2 tokens, 1 M&M = 5 tokens, and 1 Skittles = 5 tokens. The prices were set so that students could easily calculate how many of each item they could purchase with their tokens (counting by 1, 2, and 5 has typically been mastered by first grade). Candy items were valued higher because young

children generally prefer them to pretzels and Goldfish. Pretzels were priced higher than Goldfish because they are larger.

Earn—Before the start of the session, the class was told that they would be starting with zero tokens, their goal was to try to earn tokens, and they would earn a token if they were on task each time they heard a click. Each participant's token board displayed 10 empty token slots at the start of the session. Participants earned one token for the absence of disruptive behavior each time the clicker sounded. The experimenter delivered a token by drawing a check mark in the designated token slot for that interval. Participants who were engaging in disruptive behavior when the clicker sounded did not earn a token, and the experimenter reminded the participant what he or she needed to be doing to earn tokens.

Loss—Before the start of the session, the class was told that they would be starting with 10 tokens, their goal was to try to keep their tokens, and they would lose a token if they were not on task each time they heard a click. Each participant's token board displayed 10 tokens at the start of the session. The timing of clicker sounds and token loss was yoked to the previous earn session. Participants who were engaging in disruptive behavior when the clicker sounded lost a token, and the participant was reminded what he or she needed to be doing to keep tokens. The experimenter removed a token by erasing the check mark from the designated token slots for that interval. Participants who were not engaging in disruptive behavior when the clicker sounded did not lose a token.

Tokens: Choice—Before the start of each session, an experimenter showed each participant a board with 0 tokens and a board with 10 tokens and asked each participant individually if he or she wanted to either "start with zero tokens and try to earn tokens" or "start with 10 and try to keep tokens." Participants chose by saying, "start with 0" or "start with 10." Although each participant was asked to choose individually, other students at their table could hear their choices. Therefore, it was possible for selection to be influenced by peer selection. The contingencies during the sessions corresponded with each participant's selection. The day after the last session was conducted, all students in attendance were asked two questions: "Which did you like better: starting with 0 or starting with 10?" and "why?" Eight participants (Talia, Zane, April, Erik, Evan, Shania, Damon, and Tabitha) responded to both questions.

RESULTS

Figures 1 through 3 display rates (responses per minute) of disruptive behavior for all participants during all phases. Data points are missing for some participants for some sessions because the participant was absent, was working individually with the teacher, or had left the classroom during the session (e.g., some students were removed from class to receive special instruction in English as a second language or to work 1:1 with a volunteer). All participants displayed higher rates of disruptive behavior during baseline phases than in tokens phases. There were often no differences between earn and loss conditions within the tokens phases, although greater variability in responding during the earn phase was observed for Talia, Erik, Tucker, and Lamar.

Table 1 displays the average number of tokens earned or kept for each participant in each condition in which tokens could be earned or kept. In the majority of both earn and loss sessions, students were able to earn or keep all 10 tokens. During the tokens phase (in which the condition was selected by the experimenter), six of the 12 participants (Talia, Tanya, Shania, Tucker, Damon, and Shaun) earned or kept more tokens, on average, in the loss condition than in the earn condition. Only one participant (Erik) earned or kept more tokens, on average, in the earn condition, and five participants (Zane, April, Evan, Lamar, and Tabitha) earned or kept all 10 tokens during every session. Taken together, the average number of tokens earned or kept was slightly greater in the loss condition. There was no apparent relation between the number of tokens earned or kept and participants' selection of earn or loss in the tokens: choice condition.

Figure 4 depicts the percentage of selections for earn and loss conditions in the tokens: choice phase for each participant. Participants are arranged in order from strongest preference for the earn condition (Talia) to lowest preference for the earn condition (Tabitha). One participant (Talia) displayed exclusive preference for the earn condition. Two participants (Zane and April) displayed a preference for the earn condition but did not select it exclusively. Two participants (Erik and Evan) showed indifference (i.e., selected both conditions approximately equally). Three participants (Tanya, Shania, and Tucker) showed a preference for the loss condition but did not select it exclusively. Four participants (Damon, Shaun, Lamar, and Tabitha) displayed exclusive preference for the loss condition.

When participants were asked which condition they liked better ("starting with 0 or starting with 10"), their responses corresponded with their choices. The two participants whose choices were indifferent (Erik and Evan) reported preference for the earn condition. When asked why he preferred the earn condition, Evan responded, "Because so I know if I'm going to get a negative or not a negative, and it's just fun looking at it." Talia, the only participant with exclusive preference for the earn condition, responded "I don't know" when asked "why?" The other participants' answers to "why?" could be categorized as a description of the condition (e.g., "because you can earn them" or "because I don't hardly lose none") or a statement that reflected loss aversion (e.g., "I don't want to get tokens taken away" or "because I don't like losing tokens."). Interestingly, participants with no clear preference for earn or loss conditions reported loss aversion when asked why they liked one condition better.

Figure 5 shows the percentage of participants who selected the loss condition in each session of the tokens: choice phase. On average, 67.3% of participants selected the loss condition (range, 50% to 85.7%). In general, participants were more likely to select the loss condition when given the choice.

Table 2 displays the duration of intervention implementation (for the entire class) for earn and loss sessions during both small-group and whole-class sessions. The earn conditions required considerably more time for the experimenter to implement. When the earn contingency was in effect for the whole class at once, the experimenter spent nearly the entire session delivering tokens. The loss contingency, however, required relatively little time to implement, even when the contingency was in effect for the whole class at once.

DISCUSSION

Both earn and loss conditions effectively reduced the disruptive behavior of all participants. Both contingencies resulted in equivalent effects for eight participants. These results are consistent with the notion that reinforcement and punishment produce symmetrical effects on behavior (Balsam & Bondy, 1983). However, the disruptive behavior of seven of those participants (all but Tanya) was reduced to near-zero levels, which hinders the detection of differences. Previous research that has examined symmetrical effects of reinforcement and punishment has found differing results with respect to symmetry. Both Ruddle, Bradshaw, Szabadi, and Foster (1982) and Magoon and Critchfield (2008) found symmetrical effects of reinforcement and an avoidance contingency on the rate of an arbitrary response (button pressing and mouse clicking, respectively) in adult participants. However, Rasmussen and Newland (2008) found asymmetrical effects of reinforcement and punishment in adult participants when concurrent variable-interval schedules of reinforcement were arranged and a punishment schedule was superimposed on one alternative. One important difference between the human operant studies that compared reinforcement and punishment and the current study was that the punished response had an uncontrolled history of reinforcement in a different form (i.e., disruptive behavior was shaped and maintained by something other than tokens).

Four participants (Talia, Erik, Tucker, and Lamar) engaged in high rates (in the range of baseline levels) of disruptive behavior during at least one earn session, suggesting that the earn contingency did not exert as much control over their behavior as the loss contingency. The data from these participants could be interpreted as consistent with the notion of loss aversion (Kahneman & Tversky, 1979), which suggests that losses are weighted greater than gains when the amount is equivalent. Anecdotally, participants nearly always reported to the experimenter that she “forgot to give me a token” when they failed to earn a token in the earn condition (despite the experimenter’s explanation of why they did not earn the token during token delivery) but never reported suspected treatment integrity failures when a token was removed in the loss condition. Although perhaps not a direct effect of the contingency per se, differences in disruptive behavior in the earn condition could have occurred because failure to earn is a less salient consequence than loss.

One possible contributing factor to the effectiveness of both contingencies might have been extinction of disruptive behavior maintained by attention from peers, because delivery of attention to a peer who is disruptive could also result in token loss or failure to earn a token. Because the contingencies were symmetrical in the earn and loss conditions, this is less of a limitation and perhaps more of an interesting side effect of arranging classwide (albeit individual) contingencies. Future research should compare the effects of classwide contingencies to contingencies arranged specifically for one student (e.g., behavior intervention plans) on the behavior of that targeted student and the class as a whole, as well as assess the effort required to implement both contingencies.

Participants usually earned or kept more tokens in the loss condition. In addition, both participants with a preference for earn and participants with a preference for loss verbally reported finding token loss aversive when asked why they preferred one condition over the

other. Taken together, these findings are consistent with the notion that losses are valued more highly than gains of equal magnitude (i.e., loss aversion). Despite some consistencies with loss aversion, most participants preferred the loss condition. This finding was consistent with Hanley, Piazza, Fisher, and Maglieri (2005), who demonstrated an overall preference for the treatment that included a punishment contingency. One potential way to conceptualize selection of the loss contingency when losses are weighted more heavily than gains is as a self-control response. Participants selected the loss contingency before the start of the session, therefore increasing the likelihood that they would engage in appropriate behavior during the session to avoid losing tokens. Another possibility is that the value of tokens already in the participants' possession, delivered at the start of the loss sessions, held a greater value than tokens that had not yet been delivered in the earn session. The latter possibility is consistent with behavioral economic research on the endowment effect, which demonstrates that items hold greater value when already in one's possession (see Kahneman, Knetsch, & Thaler, 1991).

The duration of implementation was measured for both conditions, and the loss contingencies required considerably less time to implement than the earn contingencies. Because nearly all of the students earned all of their tokens in the earn sessions, the experimenter spent most of the earn sessions delivering tokens. Alternatively, because nearly all of the students kept all of their tokens in the loss sessions, the experimenter spent very little time removing tokens. Therefore, the loss contingency was much more practical. Considering that both contingencies were approximately equally effective, participants had a preference for the loss contingency, and the loss contingency required less time to implement, teachers who use a token system as a behavior management strategy might find arranging loss contingencies to be a better option than arranging earn contingencies.

Although the current data, taken together, favor arranging loss contingencies in token systems, additional research that compares token earn and loss should be conducted to address the limitations of the current study. The token contingencies in the current study were arranged for 10-min sessions; future research should evaluate the efficacy of and preference for earn and loss contingencies when implemented for the entire school day. The multielement design of the initial tokens phase could have affected preference during the tokens: choice phase. Iwata and Bailey (1974) examined choice after repeated exposure to both earn and loss contingencies (order of exposure was counterbalanced across participants) and reported that some participants selected earn during all choice sessions, some selected loss during all choice sessions, and some selected both conditions across choice sessions. However, the authors did not report whether the condition immediately before the choice phase affected preference. That is, it is not clear if all of the participants who were exposed to the loss contingency immediately before the choice phase showed a preference for earn. Future research should examine whether repeated exposure to one contingency affects preference.

Future research should also examine the side effects of earn and loss contingencies on teacher behavior. If a classroom token system were arranged in which only loss contingencies were in effect, the desired effect would be that teachers could allocate the majority of their time used for behavior management to provide attention for appropriate

behavior and would no longer need to spend time reprimanding students or providing attention for minor inappropriate behavior. However, arranging a token system in which only loss contingencies are in effect could produce the opposite effect: an exclusive focus on inappropriate behavior. Future research should determine what training, if any, would be required, in addition to learning to use the token system, to produce the former effect on teacher behavior.

There were several additional limitations that warrant consideration. Because all students were in the same class, phase changes had to occur at the same time for all participants. Decisions on when to change phases were made based on the majority of participants' data, resulting in weaker demonstrations of experimental control for some participants (e.g., Zane and Evan). Also, many participants did not contact the loss contingency or the contingency of not earning tokens. This was due to two procedural components: (a) Rules were stated to the participants before each session, and changes in behavior may have been a result of rule governance; and (b) the mDRO was not sensitive enough to capture disruptive behavior that occurred throughout the intervals. There were also two components related to the choice procedure that may have affected participant choices: (a) The presence of other students nearby and the choices of other students could have affected participants' choices, and (b) seeing 10 tokens already on the token board could have influenced some students to select the loss contingency. Also, data were not collected on treatment integrity.

In the current evaluation, an experimenter implemented the contingencies during all token sessions. Although the researchers were familiar to all of the participants (i.e., they had been involved in their classroom 3 to 5 days per week for at least 5 months before the start of this study), future research should have the classroom teacher implement all of the contingencies to determine teacher preference for implementing earn versus loss contingencies and should evaluate whether teachers are more or less likely to make treatment integrity errors with earn or loss contingencies. The current study may provide a bridge between the basic and applied research that has compared earn and loss contingencies, but there is still more work to do to determine the most appropriate way to arrange token systems in classrooms.

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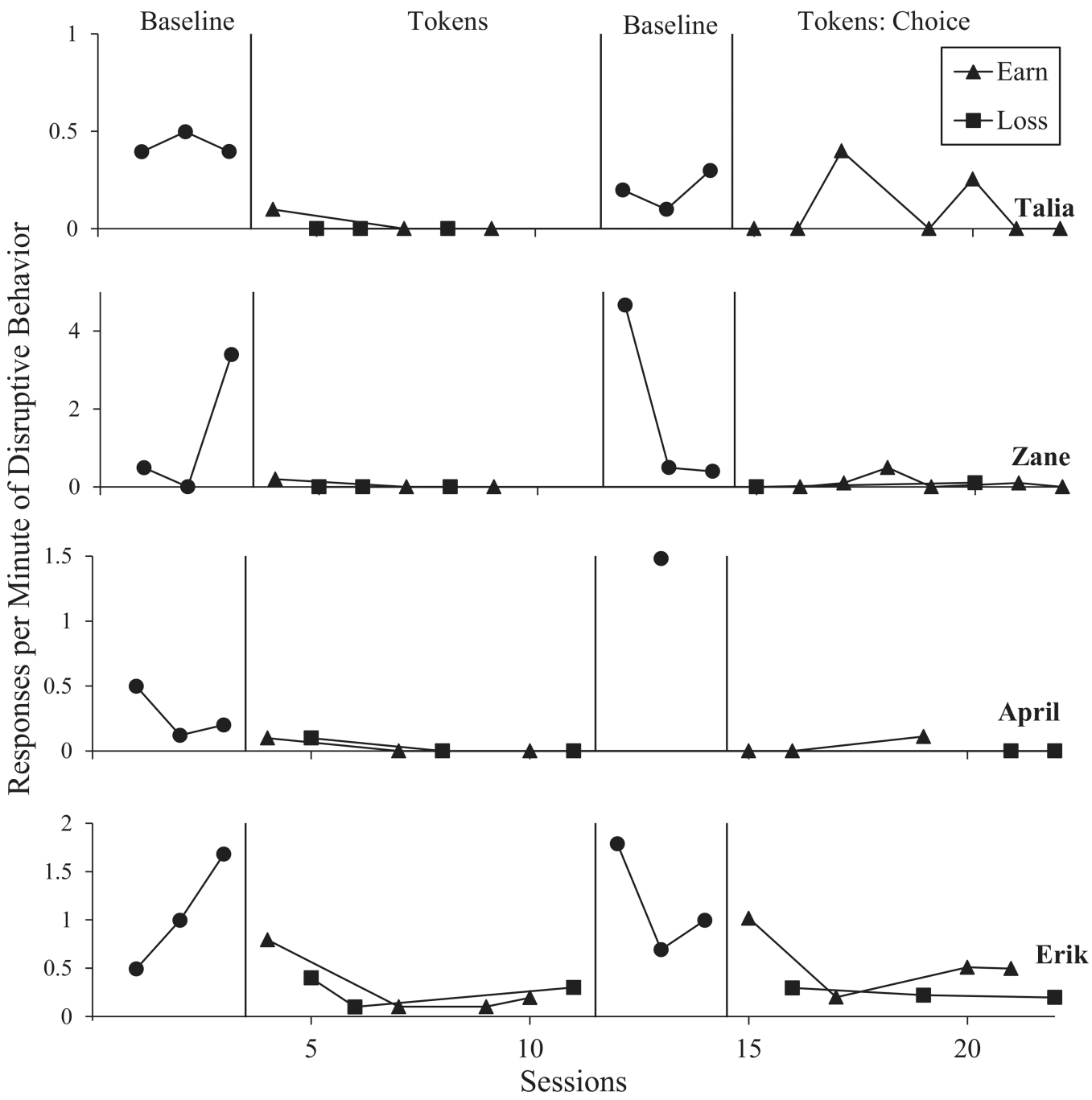

Figure 1.

Responses per minute of disruptive behavior across sessions for Talia, Zane, April, and Erik. Earn sessions are denoted by the triangles, and loss sessions are denoted by the squares.

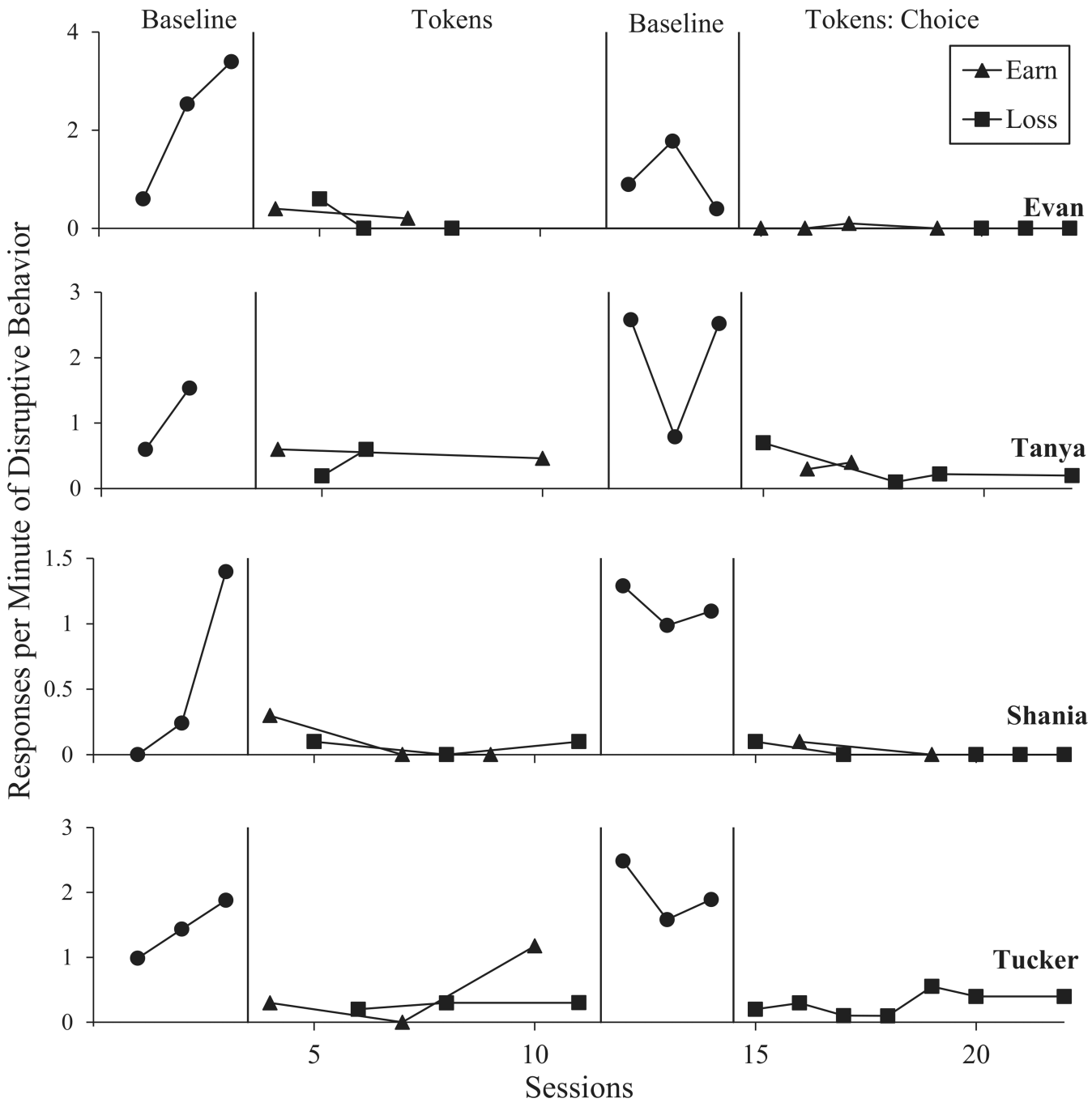

Figure 2.
Responses per minute of disruptive behavior across sessions for Evan, Tanya, Shania, and Tucker. Earn sessions are denoted by triangles, and loss sessions are denoted by squares.

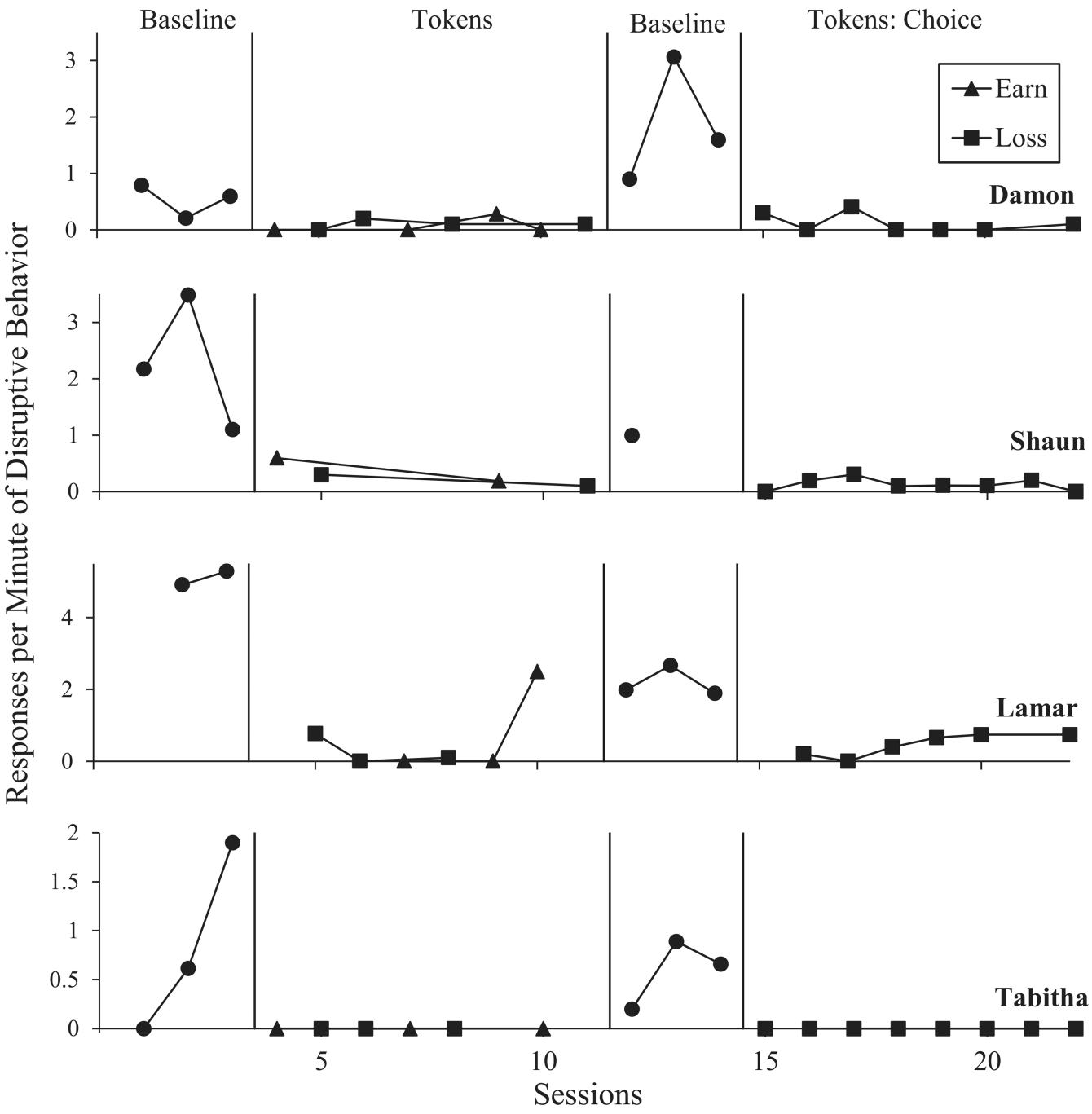

Figure 3.
Responses per minute of disruptive behavior across sessions for Damon, Shaun, Lamar, and Tabitha. Earn sessions are denoted by triangles, and loss sessions are denoted by squares.

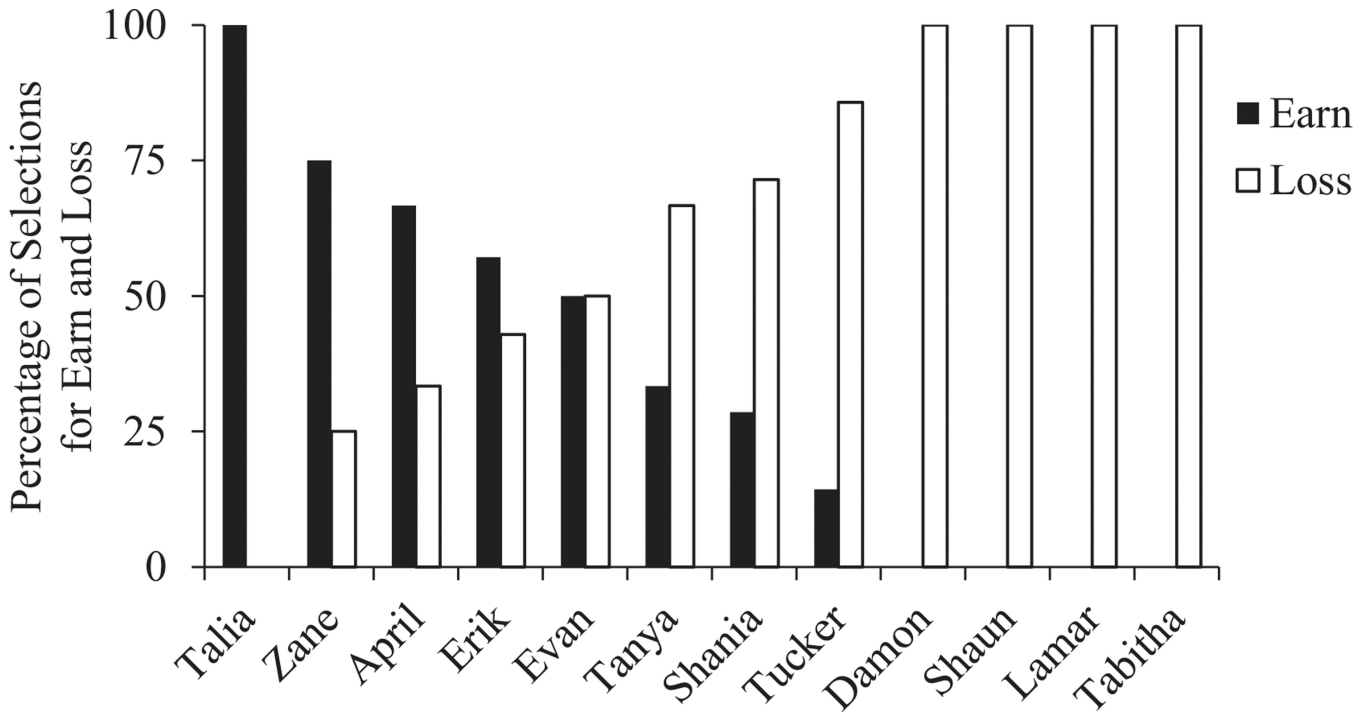

Figure 4.
Percentage of selections for earn and loss conditions for each participant during the tokens: choice phase.

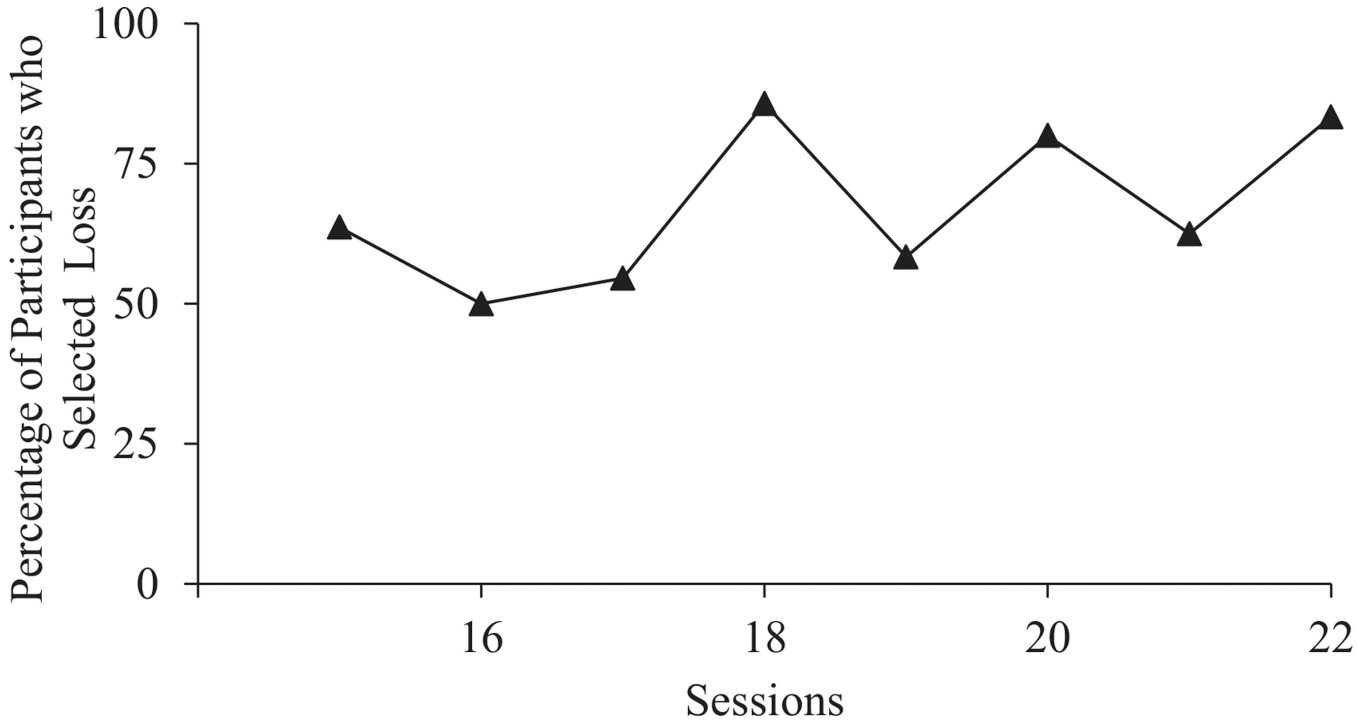

Figure 5.
The percentage of participants who selected the loss condition across tokens: choice sessions.

Table 1

Average Number of Tokens Earned or Kept

	Tokens		Tokens: Choice	
	Earn	**Loss**	**Earn**	**Loss**
Talia	9.3	10	10	
Zane	10	10	9.5	9.5
April	10	10	9.8	__[a]
Erik	10	9.7	8.3	10
Evan	10	10	10	9.7
Tanya	9	10	9	10
Shania	9.7	10	9.5	10
Tucker	8.7	9.7	9	9.5
Damon	9.3	9.8		9.9
Shaun	9.5	10		9.5
Lamar	10	10		9.8
Tabitha	10	10		10

[a] April was pulled from the classroom for special instruction before the end of the sessions both times she selected loss in the tokens: choice phase.

Table 2

Duration (in Minutes) of Intervention Implementation

	Small group	Whole class
Earn	4.52	7.68
Loss	1.18	0.42