Variables that Influence Preference for Response Cost

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VARIABLES THAT INFLUENCE PREFERENCE FOR RESPONSE COST

by

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Submitted in Partial Fulfillment of the Requirements for the degree of
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By

Isaac Nzuki

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of
Master of Science
in the field of Behavior Analysis and Therapy

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TITLE: VARIABLES THAT INFLUENCE PREFERENCES FOR RESPONSE COST

MAJOR PROFESSOR: Dr. Erica Jowett Hirst

Few researchers have compared preference for reinforcement and response cost within a token economy, and the results have shown that preference varies among individuals (e.g., Donaldson et al., 2014; Iwata & Bailey, 1974; Jowett Hirst et al., 2016). Preference for response cost is an interesting phenomenon because response cost is a punishment procedure and is often considered aversive. Therefore, identifying the variables that influence preference for response cost is an important area of research. Some authors have suggested that the immediate delivery or presence of tokens might influence preference for response cost, but these variables have yet to be experimentally evaluated. The current study evaluated whether the presence of tokens influences selection of response cost over reinforcement in three typically developing preschool children by systematically varying the presence of tokens across both the reinforcement and response cost procedures. Results suggest that the presence of tokens influenced selection for one out of three participants. Implications of the results are discussed in terms of clinical application and directions for future research.
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CHAPTER 1
INTRODUCTION

Problematic behavior exhibited by children can lead to social isolation (Walker, Ramsey & Gresham, 2003), injury to self (e.g., Carr, 1977; Horner & Day, 1991, Iwata, Dorsey, Slifer, Bauman, & Richman, 1982; Taylor & Carr, 1992), injury to others (e.g., Carr & Durand, 1985a; Carr & Durand, 1985b; Horner & Day, 1991), and decreased opportunities for learning for the children engaging in the responses and their peers (Carr, 1991). Consequently, a significant portion of the technology developed in the field of applied behavior analysis is geared towards treating problematic behaviors in children (Carr & Durand, 1985). Specifically, a number of strategies based upon the principles of operant conditioning (reinforcement and punishment) have been developed to effectively increase appropriate behavior and decrease inappropriate behavior (e.g., Ayllon & Haughton, 1962; Fuller, 1949; Harris, Wolf, & Baer, 1964; Wolf, Risley, & Mees, 1964).

The most important variable for changing behavior is manipulation of consequences. The term *operant conditioning* refers to the controlling influence consequences have on behavior (Skinner, 1938). Consequences that increase the future probability of a behavior occurring are called reinforcers, in a process called reinforcement (Catania, 1992). Reinforcement that involves the presentation of a stimulus is known as *positive reinforcement* and reinforcement that involves the removal of a stimulus is known as *negative reinforcement* (Michael, 1975). In a seminal application of positive reinforcement in a clinical setting, Fuller (1949) shaped the arm movements of a severely intellectually disabled man who was deemed unable to learn with contingent presentation of a warm sugar–milk solution. At the time, operant conditioning had only been tested and demonstrated in animals. Before the experiment began, the man was
deprived of food for 15 hrs, and then a syringe with a warm sugar–milk solution was squirted into the man’s mouth whenever he raised his right arm. Afterwards, the man raised his arm 19 times after being food deprived and even opened his mouth while raising his hand simultaneously.

As previously mentioned, reinforcement can also involve removal of a stimulus, in addition to reduction, postponement, or prevention of a stimulus (Hineline, 1977; Michael, 1975). For example, Greene and Hoats (1969) increased the work rate of an intellectually disabled man on a simulated card sorting tasks through the use of television distortion as a negative reinforcer. If a task was not completed by a certain interval, auditory and visual distortions of the television occurred and continued to occur until the task was completed. During the procedure, work rate increased from 5.7 responses per minute to a peak of 8.8.

A procedure that is commonly used with reinforcement is extinction, which involves withholding reinforcement for a behavior, leading to a subsequent decrease in the behavior (Premack, 1965). When reinforcement is provided for one behavior while withheld for another, or is provided in one condition but not another, the process is known as differential reinforcement (Bailey & Wolery, 1992). Differential reinforcement procedures have been the most effective and widely used procedures for reducing problem behaviors (Vollmer & Iwata, 1992). The procedures have been most effective when used in function-based treatments where identification of the reinforcers that maintain problem behaviors have allowed for the development of functionally equivalent appropriate behavior and extinction of the problem behavior (Vollmer & Iwata, 1992).

There are several types of differential reinforcement, but the most commonly used variation is differential reinforcement of alternative behavior (DRA) in which reinforcement is
delivered for appropriate behavior and withheld for inappropriate behavior (e.g., Deitz & Repp, 1983; Vollmer, Roane, Ringdahl, & Marcus, 1999). For example, Vollmer et al. (1999) evaluated the use of a differential negative and positive reinforcement procedure in increasing compliance and reducing escape-maintained self-injurious behavior (SIB) in three children. Before the treatment evaluation, functional analyses were conducted to determine the maintaining variables of the problem behavior, which were found to be escape for two children and access to tangible items for one child. SIB was placed on extinction (i.e., did not result in a break from tasks or access to tangible items) while compliance was reinforced with a 30-s break for the children whose SIB was maintained by escape and access to tangible items for the child whose SIB was maintained by access to tangible items. The authors found that SIB was reduced and compliance increased in all three children.

Another commonly used variation of differential reinforcement is differential reinforcement of other behavior (DRO) where reinforcement is delivered after a specified period of time during which no problem behavior occurs (Deitz, 1985). Baker and Thyer (2000) evaluated the use of a DRO procedure to reduce the aggressive and inappropriate behavior of a 26-year-old man with moderate intellectual disability. The treatment consisted of earning stickers for every 15-min interval during which he did not display problem behavior. Before every session, the man was given the rules regarding his behavior, and the contingency was explained to him. A timer was placed at his desk to allow him to keep track of how much time passed. The authors found that the mean number of inappropriate behaviors reduced from 16 occurrences per day during baseline to three per day during the DRO condition. In addition, some secondary positive results were seen including remaining in seat for longer periods of time and increased work production and compliance.
Although function-based treatments that include differential reinforcement and extinction have proven to be useful and effective, they do not always result in desired decreases in problematic behaviors (e.g., Fisher, Piazza, Cataldo, Harrell, Jefferson, & Conner, 1993; Grace, Kahg, & Fisher, 1994; Hagopian, Fischer, Sullivan, Acquisto, & LeBlanc, 1998; Wacker et al., 1990). In addition, there are also cases when reinforcement and extinction may not be feasible or practical, such as when the variables maintaining problem behavior cannot be identified (e.g., Iwata, Vollmer, & Zarcone, 1990) or when the behavior has to be rapidly decreased (e.g., Dura, 1991). As a result, a variety of punishment procedures have been developed for clinical application. Punishment is defined as a change in the environment contingent upon a behavior that leads to a decrease in the future probability of that behavior occurring (Michael, 1993). Punishment procedures have been frequently used to augment reinforcement and extinction procedures. For example, Hagopian et al. (1998) assessed the efficacy of using functional commination training (FCT) (a DRA procedure) with and without extinction and with punishment to treat severe problem behavior. The authors found that FCT with extinction was effective in reducing problem behavior for the majority of clients; however, significant decreases were observed in only half of the applications, whereas FCT with punishment resulted in at least a 90% reduction in problem behavior for every case in which it was applied.

Punishment procedures, like reinforcement, may involve the delivery or removal of a stimulus contingent on behavior (Holland & Skinner, 1961). When a punishment procedure involves the presentation of a stimulus, it is known as positive punishment (Lerman & Vorndran, 2002). A few of the positive punishers that have been evaluated in literature to decrease problematic behaviors include electrical stimulation (e.g., Linscheid, Iwata, Ricketts, Williams, & Griffin, 1990) and lemon juice presentation (e.g., Glasscock, Friman, O’Brien, &
Christopher森, 1986). Linscheid et al. (1990) clinically evaluated the use of brief contingent electric stimulation on reducing the intractable and severe head-directed SIB of five individuals with developmental disabilities. The electric stimulation was delivered through a helmet that could detect head hits and thus would deliver immediate and brief contingent stimulation. The authors found that the system produced immediate and complete elimination of the SIB across all five individuals. In addition, follow-up data indicated continued effectiveness and lack of detrimental side effects. In another example, Glasscock et al. (1986) used citrus juice variations to reduce chronic ruminant gagging of a 13-year-old girl with Batten's disease and an intellectual disability. The authors presented citrus juice, alternating between lemon and lime variations to prevent habituation, contingent upon ruminant gagging and found that the intervention was effective, practical, and acceptable.

When a punishment procedure involves withdrawal of a stimulus, it is known as negative punishment (Lerman & Vorndran, 2002). One example of a common negative punishment procedure is time out, which involves a brief withdrawal of the individual from opportunities to earn or engage with positive reinforcers (Hewett, 1965). Donaldson, Vollmer, Yakich, and Camp (2013) evaluated the use of time-out to reduce problem behavior in preschool-aged boys. During the treatment condition, the participants were first reminded of playground or house rules. Afterwards, any violation of the rules by the participants resulted in a teacher delivering a verbal instruction for the participant to go to time-out or with the use of physical prompts if necessary. A timer was used to signal the start and end of time-out, and all problem behaviors were blocked or ignored during timeout. The authors found that the time-out procedure effectively reduced the problem behavior of all participants.
Another commonly used negative punishment procedure is response cost (RC), which involves the withdrawal of a specific reinforcer contingent upon emission of a problem behavior (Sulzer-Azaroff & Mayer, 1972). RC may be more desirable than time-out as it does not require removing access to all reinforcers or disruption of ongoing activities (Axelrod, 2013). Falcomata, Roane, Hovanetz, Kettering, and Keeney (2004) evaluated the use of a response cost procedure in reducing the inappropriate vocalizations of an 18-year-old man diagnosed with autism. During the RC condition, the man was given continuous access to a radio (a preferred item identified through a preference assessment) and lost access to the radio for 5 s contingent on inappropriate vocalizations. The authors found that contingent loss of the radio reduced the inappropriate vocalizations to near zero levels.

A significant number of reinforcement and punishment procedures have involved the use of unconditioned stimuli (i.e., a reinforcing or punishing stimulus that does not require a history of pairing with other reinforcers or punishers to gain its reinforcing or punishing properties) (Hull, 1943; Skinner, 1938). For example, food is an unconditioned reinforcer because it does not require a history of conditioning with other reinforcers in order to gain reinforcing properties, and an electric shock is an unconditioned punisher because does not require a history of pairing with other punishers to gain punishing properties. The use of unconditioned reinforcers and punishers, however, can be impractical, expensive (Cooper, Heron, & Heward, 2007), or lead to habituation (Macy & Flache, 2002; Rankin et al., 2009). Consequently, many procedures utilizing conditioned reinforcers and punishers have been developed. Conditioned reinforcers (e.g., money) gain their reinforcing properties through being paired with unconditioned reinforcers, and conditioned punishers (e.g. a frown, reprimands) gain their punishing properties through being paired with unconditioned reinforcers.
The token economy, which typically involves earning, losing, or both earning and losing tokens simultaneously, is an example of an application that utilizes both conditioned reinforcement and punishment, depending on the application. In the token economy, an individual earns tokens (e.g., poker chips and points) for engaging in a target appropriate behavior (DRA) or for not engaging in inappropriate behavior (DRO) and loses tokens for an inappropriate behavior (RC) or for not engaging in appropriate behavior (response cost of other behavior; RCO). After a specified period of time, the individual can exchange tokens for backup reinforcers. Due to pairing with backup reinforcers, the tokens become conditioned reinforcers, thus making them valuable to the individuals earning them (e.g., Carr, Frazier, & Roland, 2005). Tokens can have several backup reinforcers, in which case they become generalized conditioned reinforcers, allowing them to be effective despite the effects of various motivating operations (Miltenberger, 2008). Token economies have proven to be effective in reducing a variety of problematic behaviors such as food refusal (e.g., Kahng, Boscoe, & Byrne, 2003), aggression (e.g., Hobbs & Holt, 1976), antisocial behaviors (e.g. Besalel-Azrin, Azrin, & Armstrong, 1977; Rickard, Melvin, Creel, & Creel, 1973), repetitive speech (e.g., Handen, Apolito, & Seltzer, 1984), and non-compliance (e.g., Hegel, 1988). Some of the settings where token economies have been implemented include classrooms (e.g., Bushell, Wrobel, & Michaelis, 1968; Oleary and Becker, 1967), hospitals (e.g., Park & Lee, 2012), and institutions for the intellectually disabled (e.g., Lent, LéBlanc, & Spradlin, 1970). In addition, the effectiveness of token economies has been shown across different populations including typically developing children (e.g., Barrish, Saunders, & Wolf, 1969), atypically developing children (e.g., Hung, Steeves, Martin, & Pear, 1970; Tarbox, Ghezzi & Wilson, 2006), delinquents (e.g., Hobbs & Holt, 1976), and psychiatric patients (e.g., Ayllon & Azrin, 1965; Schaefer & Martin, 1966).
In addition, the effectiveness of token earning and losing have been compared by a number of researchers and have most often been found to be equally effective (e.g., Conyers et al., 2004; Iwata & Bailey, 1974; Sullivan & O’Leary, 1990). For example, Sullivan and O’Leary (1990) compared the effectiveness of both response cost (RC) and response-gain (DRA) token economy procedures in reducing the amount of off-task behavior of 10 children with academic and behavioral problems. During the DRA procedure, tokens and praise were delivered for on-task behavior and during the RC procedure, tokens were removed and a reprimand was delivered for off-task behavior. The DRA and RC procedures were assigned to one 20-min class each (math or reading) during the first evaluation and then switched between the classes during the subsequent evaluation. The authors found that both procedures were equally effective in reducing off task behavior of the children in both classes with the percent on-task behavior increasing from 60% during baseline to 85% for both procedures.

Given that both reinforcement and response cost-based procedures are symmetrically effective, it is important to evaluate preference in order to ensure that interventions are not only individualized and effective, but also preferred by the stakeholders in question (Hanley, 2010). In addition, evaluating preference is important because use of preferred interventions may increase the effectiveness of the procedure, the participant’s enthusiasm for learning opportunities, and the likelihood of caregivers implementing the intervention (Dozier et al., 2007). A few studies have anecdotally evaluated preference for and acceptability of these two procedures and overall have found that both RC and DR procedures are viewed as acceptable and favorable (e.g., Elliot, Witt, Galvin, & Peterson, 1984; Frentz & Kelley, 1986; Heffer & Kelley, 1987; Little & Kelley, 1989; McGoey & DuPaul, 2000; Reynolds & Kelley, 1997). For example, McGoey and DuPaul (2000) evaluated the effects of a reinforcement and response cost procedure
in reducing disruptive behavior of four preschool children with attention deficit hyperactivity disorder (ADHD). During the reinforcement procedure, the participants earned small buttons that were displayed on a chart for following classroom rules. Before the experiment, teachers were trained to “catch” participants behaving well and then deliver the button. The children could earn up to five small buttons per each 15-min activity period. Three small buttons would earn them one big button, and three big buttons would earn them a prize. At the end of the day, the children could exchange their big buttons for back-up reinforcers such as stickers and hand stamps. In the response cost condition, the same button chart and criteria for obtaining the large buttons and prizes were used. At the beginning of the class, the teacher reminded the children of the classroom rules and introduced the rules about losing buttons for breaking rules. If any child broke one of the classroom rules, the teacher removed one of the buttons from the chart. At the end of the study, the teachers completed an acceptability rating. Although the teachers rated both procedures as acceptable, they rated the response cost procedure as slightly more acceptable than the reinforcement. Specifically, the teachers agreed that they would be willing to use the RC intervention again in the future and that the intervention was fair and reasonable.

In another study, Little and Kelley (1989) evaluated whether parents would view response cost as acceptable. The authors taught mothers how to implement response cost procedures at home and observed them during baseline, treatment, and follow-up. The children had free points at the beginning of several time periods during the day and lost points contingent on misbehavior (e.g., non-compliance). Children with points remaining were allowed access to daily and weekly privileges (e.g., television). The procedure reduced misbehavior in the children and aversive parent behavior (e.g., spanking). In addition, all mothers rated the procedure as highly acceptable and satisfactory. In addition, Reynolds and Kelley (1997) used a multiple baseline design to
evaluate the effectiveness of a response cost treatment package for improving the classroom behavior of four preschoolers. In the study, teachers implemented the response cost system during the treatment phases, which consisted of teachers removing smiley faces contingent upon aggressive behavior. In addition, each removal of a sticker was accompanied by a reprimand. If a child retained at least one smiley face at the end of an observation period, he or she would be allowed to choose an easily administered reward. The authors found that the response cost procedure substantially decreased aggressive behavior and was a highly acceptable treatment to teachers and parents.

Although anecdotal evaluations can sometimes provide useful information, they are not always accurate and reliable (Hanley, 2010). Hanley, Piazza, Fisher, and Maglieri (2005) also note that even though questionnaires or rating scales may be appropriate for evaluating preference of a procedure with consumers of an intervention such as caregivers, teachers, or community members, these methods are not appropriate for individuals who may not be able to express their preferences verbally. Although it may be reasonable for individuals who know the client well to take part in selecting behavioral interventions, relying on the preferences of others may not be in the best interest of the client. In place of this, preference for behavioral interventions can be assessed by presenting multiple treatment alternatives in a choice arrangement to the person receiving the treatment.

Sattler, Betz, and Zellner, (1978) empirically evaluated the preference for reinforcement and response cost in 80 children. The children played a lever-pulling game once under conditions of reinforcement and once under conditions of response cost. Each game consisted of 44 trials. During reinforcement, children earned one penny for every correct response (up to 40 pennies), and during the response cost condition, the children started with 40 pennies in their
possession and lost one for every incorrect response. After having been exposed to each of the conditions, the children were allowed to pick and then experience one of the chosen conditions. The authors found that 62 of the 80 children selected the reinforcement condition when given the choice. Two limitations to this study, however, are that the authors only exposed the participants to the contingencies once before the preference evaluation and did not use a repeated measure when determining preference for a condition. That is, the children had only one opportunity to select a procedure. Other authors, however, have used repeated measure in order to show a stable pattern of responding (e.g., Donaldson, DeLeon, Fisher, & Kahng, 2014; Iwata & Bailey, 1974; Jowett Hirst, Dozier, & Payne, 2016).

Iwata and Bailey (1974) compared the effects of a reward and cost token procedures on the social and academic behavior of two groups of elementary special-education students. Each student in the reinforcement group had tokens placed into a cup when there were no classroom rule violations during a 3-to 5-min interval and could earn up to 10 tokens, and each student in the response cost group started with 10 tokens and lost a token for each instance of a classroom violation during the same interval duration. After a reversal to baseline, the contingencies were switched between the groups. Following 10 sessions of experiencing the new contingency, the children were given a daily choice between the two. The authors found that there were no differential patterns of selection between the two; that is, four children consistently picked the reinforcement condition, five consistently picked the response cost condition, and six switched their preference at least once. In addition, the procedures were equally effective in reducing rule violations and off-task behavior of target subjects in each group.

Donaldson et al. (2014) evaluated the effects of earning and losing tokens on disruptive behavior of high school students under symmetrical contingencies of earn and loss. At the start
of each 10 min session, each student was given a laminated piece of paper with 10 circles. Tokens were in the form of checkmarks placed in the circles with an erasable marker. During the earn condition, participants would start with zero tokens and earn tokens if they were on task each time they heard a click. During the loss condition, participants would start with 10 tokens and lost tokens whenever they were off task when they heard a click. These two conditions were alternated in a multielement comparison. In the choice condition, the experimenter showed each participant a board with no tokens and a board with 10 tokens and then asked each student individually if he or she wanted to start with no tokens or 10 tokens. The authors found that both contingencies produced decreases in disruptive behavior, but for some participants, there were greater decreases in the loss contingency than in the earn contingency. When the authors offered the participants to pick a contingency, more than half of the participants (67.3%) selected the loss contingency more than the earn contingency.

One limitation to the Donaldson et al. (2014) and Iwata & Bailey (1974) studies, however, is that the effects of and preferences for DR and RC had been evaluated in the context of a group (i.e. other peers were present), which may have influenced target responding (Jowett Hirst et al., 2016). Therefore, Jowett Hirst et al. (2016) extended these studies by determining the individual effects of DR and RC under both group and individual conditions and evaluating preference between the procedures in the absence of peers. In the first study, three groups of three typically developing children were exposed to RC, DR, and control conditions after a token training and baseline phase. Only one group was run each 5 min session. On-task behavior was defined as staying on the mat, keeping hands to self, and raising a hand to talk during a small group activity. In the RC condition, the experimenter placed a red poster board on the wall and red token board with 10 tokens attached in front of each participant. The experimenter then
provided continuous instructions to name letters and numbers and removed tokens from participants who were not on task during a given observation. In the DR condition, the experimenter placed a green poster board on the wall and placed empty green token boards in front of each participant. The experimenter then provided continuous instructions to name letters and numbers and placed a token on the token boards of participants who were on task during a given observation. After a stable pattern of responding was observed, the experimenters evaluated preference between the procedures by placing the three token boards associated with each type of condition (i.e., baseline, RC, and DR) on the floor and calling each participant one at a time to select the board he or she preferred individually. Once a participant had made a selection, the experimenter instructed him or her to go play in another area of the classroom until all the participants made a selection and then placed a colored strip of paper associated with the selected condition in a canvas bag. After all participants had made their selections, the experimenter gathered the group and selected a strip from the bag and implemented the session. The authors found that a majority of the participants preferred RC over DR: one participant chose DR more than RC, and the other five participants chose RC more than DR.

In the second study, 14 preschool-aged children were exposed to similar RC, DRA, and control conditions, individually. In the RC condition, the experimenter stated the session rules and placed a red board with 10 tokens affixed in front of the participant. If the participant was not on task (i.e., not tracing) during a given observation, the experimenter removed a token from the token board. In the DRA condition, the experimenter stated session rules and placed an empty green board in front of the participant. If the participant was on task (i.e., tracing) during a given observation, the experimenter placed a token on the token board. During the preference evaluation, the experimenter placed all three boards (DRA, RC, and control) in front of the
participant and then reminded him or her of the rules associated with each condition. The participant was then allowed to pick a board, and then the experimenter implemented the chosen condition. All sessions were 5 min in length. The authors found that of the 10 children who were evaluated for preference, five participants chose DRA more than RC and five chose RC more than DRA. It should be noted that one of the participants who preferred DRA in the second study also participated in the first study, during which he selected DR.

The finding that some individuals prefer RC over differential reinforcement is not only interesting given that RC is a punishment procedure, but also important because reinforcement procedures are considered best practice (Bailey & Burch, 2011; LaVigna & Donnellan, 1986). In addition, the findings are encouraging because RC is easier to implement and more practical (e.g., Donaldson et al., 2014; McGoe & DuPaul, 2000; O’Leary & Becker, 1967). For example, Donaldson et al. (2014) found that RC took less time to implement than differential reinforcement; because nearly all students earned all of their tokens in the differential reinforcement sessions, the experimenter spent most of the time delivering tokens. In contrast, because nearly all students kept their tokens in the RC sessions, the experimenter spent little time removing tokens. RC might also be an attractive procedure because it provides caregivers a way to respond to problem behavior, which can replace other responses that might reinforce the problem behavior (e.g., attention, escape). For example, Little and Kelly (1989) showed that mothers’ negative attention towards their children’s misbehavior was reduced when they were taught to implement RC procedures. In addition, some researchers have found RC to be more effective than other interventions (e.g., Pfiffner, O’Leary, Rosen, & Sanderson, 1985; Rapport, Murphy, and Bailey, 1982; Sullivan and O’Leary, 1990). Rapport et al. (1982) compared the effects of response cost versus a stimulant medication on task-related behavior in hyperactive
boys. The authors found that the response cost procedure led to significant increases in on-task behavior and academic performance while the stimulant medication was not as effective. In another study examining on-task behavior, Pfiffner et al. (1985) found that a response cost procedure in the form of lost recess was more effective than reprimands for children with behavior problems in maintaining on-task behavior. Additionally, Sullivan and O'Leary (1990) found that treatment gains were maintained better during fading and withdrawal of response cost than they did in response to traditional rewards.

Despite the effectiveness of response cost and that it is preferred by some children, parents, and teachers, the variables that influence preference are unknown and yet to be experimentally explored. A few authors have discussed variables that may influence preference (e.g., Donaldson et al., 2014; Iwata & Bailey, 1974; Jowett Hirst et al., 2016; Pietras, Brandt & Searcy, 2010). First, the characteristics of a procedure may influence preference. Pietras et al. (2010) found that when net tokens were the same for both procedures, participants selected the procedure that did not involve token loss. Thus, the authors argued that token loss may be an aversive characteristic of response cost procedures. Second, peer influence could affect selection. Iwata and Bailey (1974) and Donaldson et al. (2014) conducted a preference evaluation in the classroom where each student made a selection in the presence of other students, thus it is possible that selections could have been influence by the choices of others (Jowett et al., 2016). However, Jowett Hirst et al. conducted their preference evaluation in the absence of peers and obtained similar results. Third, net tokens could also influence preference for one procedure. To investigate this, Donaldson et al. and Jowett Hirst et al. calculated average net tokens for each individual across conditions, and Iwata & Bailey calculated average net tokens for each group across conditions. All the authors found that net-token averages were
similar across procedures. Therefore, this may not be an influential variable; however, slight differences may have contributed to preference, but this has yet to be experimentally evaluated.

Fourth, in cases where RC is more effective, it also could be that response cost is preferred because it results in a higher probability of reinforcement per response (Hanley et al., 2005). That is, because punishment procedures effectively suppress problem behavior, the majority of behavior leads to reinforcement (e.g., if a child is not engaging in disruptive behavior, he or she is likely contacting reinforcement for engaging in appropriate behavior). Fifth, the endowment effect may also influence preference for response cost procedures (Donaldson et al., 2014). That is, items that are already in one’s possession may hold greater value than items that are yet to be earned (Thaler, 1980).

Finally, the presence of tokens, as well as immediate access to tokens, may influence preference for RC (Jowett Hirst et al., 2016). Jowett Hirst et al. (2016) and Donaldson et al. (2014) evaluated preference for a response cost and reinforcement procedures by placing token boards associated with the DR and RC conditions in front of the participants. However, tokens were present with RC, but were not present with DR, thus, students may have preferred RC because of the presence of tokens on the board. That is, perhaps the procedure may have been viewed as less effortful in that the participants perceived they did not have to work to gain tokens (Jowett Hirst et al., 2016). Although the variables that may influence preference for RC are many, the purpose of the current study is to determine whether the presence of tokens may be an influential variable by systematically varying the presence of tokens across DRA and RC procedures during a preference evaluation.
CHAPTER 2

METHOD

Participants and Setting

Three typically developing preschool-aged children (4 years 11 months to 5 years 7 months) participated in the study. All participants were enrolled in one of two child development centers affiliated with a large mid-western university. Experimenters conducted sessions on the floor of or at a table in the staff break rooms that contained one or more tables and several chairs. During some sessions, staff members were present; however, they did not interact with the participants at any time during the session.

Materials

During each session, the experimenter placed letter and shape tracing worksheets and a marker on one side of the floor or table, and toys, blank pieces of paper, and assorted colored markers on the other side of the floor or table approximately 12 inches apart. The toys were items typically found in preschool classrooms (e.g., puzzles, books, plastic dinosaurs, and figurines of people). The experimenter placed token boards in between the session materials and in sight of the participants. The tokens were pennies, and the token boards consisted of laminated strips of colored paper (approximately 4 in x 10 in.) with 10 square pieces of Velcro®. The experimenter placed a prize bin containing tangible items (e.g., stickers, toy cars, spin tops, sticky hands, etc.) and edibles (e.g., chocolate, Smarties®, Skittles®, M&M’s®) (for some children) in each location and presented it to the participants during exchange following all token sessions (DRA and RC). Participants were required to trade all tokens following each session.
**Response Measurement**

Trained graduate students collected data using a pencil and data sheets. The primary dependent variable was cumulative number of selections; however, the experimenter also collected data for on-task behavior and frequency of token delivery and removal. I defined selection as pointing to a board or vocally stating the name or color of a board. I defined on-task behavior as moving the marker within an untraced grey boundary of a letter/shape or transitioning from a fully traced letter/shape to an untraced one or from a fully traced worksheet to an untraced one. Observers collected data on on-task behavior every 30 s throughout a 5-min session. I converted data for on-task behavior to a percentage by dividing the number of observations during which the child was on task by the total number of observations in the session (10). I defined token delivery as the experimenter placing a token on the board and token removal as the experimenter removing a token from the board. Observers collected data on token delivery and removal every 30 s throughout a 5-min session.

**Interobserver Agreement**

A second independent observer collected data during at least 25% of all sessions for each participant. I calculated interobserver agreement (IOA) for choice by assigning a score of 1 for an agreement (the two observers agreed on the selected procedure) and a score of 0 for a disagreement (the two observers disagreed on the selection), summing all scores, and then dividing the score by 10 (total number of opportunities for agreement) and multiplying by 100%. I calculated IOA for on-task behavior in the same way as choice. That is, I assigned a score of 1 for agreements and 0 for disagreements, summed the scores, divided by 10, and multiplied by 100%. I defined agreement for on-task behavior as both observers scoring the occurrence or nonoccurrence of on-task behavior in a given interval. I scored IOA for token delivery or
removal similarly. I summed the interval scores, divided by the total number of observation intervals, and multiplied by 100%. The participants had a mean IOA of 100% for choice, 97% (range: 80%-100%) for on-task behavior, and 99% (range: 80%-100%) for token delivery or removal. IOA for Hugo was 100% for choice, 96% (range: 80% to 100%) for on-task behavior, and 99% (range: 90% to 100%) for token delivery or removal. IOA for Ajax was 100% for choice, 98% (range: 80% to 100%) for on-task behavior, and 100% for token delivery or removal. IOA for Clarissa was 100% for choice, 97% (range: 80% to 100%) for on-task behavior, and 99% (range: 80% to 100%) for token delivery or removal.

**Treatment Integrity**

Experimenters collected treatment (TX) integrity for 100% of all exposure sessions (to ensure that the participants experienced the contingencies correctly prior to evaluating preference) and at least 25% of all preference evaluation sessions. During the DRA condition, if the observer scored *on task* and *T+* (token delivery), I assigned a value of 1 to that trial; if the observer scored *on task* and *n/a* (no consequence) or *T-* (token removal), I assigned a value of 0 to that trial. During the RCO condition, if the observer scored *on task* and *n/a*, I assigned a value of 1 to that trial; if the observer scored *on task* and *T+* or *T-*, I assigned a value of 0 to that trial. I then summed the values, divided by 10 (number of opportunities for correct treatment implementation), and multiplied by 100%. The participants had a mean TX integrity of 97% (range: 80%-100%). Sessions with Hugo had 96% TX integrity (range: 90% to 100%). Sessions with Ajax had 98% TX integrity (range: 80% to 100%). Sessions with Clarissa had 97% TX integrity (range: 80% to 100%).
**Color Preference Assessment**

Prior to the start of the evaluation, experimenters conducted a paired stimulus preference assessment as described by Fisher et al. (1992) in order to determine each participant’s least preferred colors. An experimenter then randomly assigned the two lowest preferred colors to each procedure (DRA and RCO; described below) in order to minimize the effects of preference for color influencing selection of a given procedure.

**Experimental Design**

I used a reversal design for experimental control. The reversal design involved a replication of conditions after which we observed a change in any participant’s pattern of selection. For Hugo, I used an A/B/C/A+C/C design. For Ajax, I used an A/C/A design. For Clarissa, I used an A/C/A’ design.

**Procedures**

Prior to the start of each 5-min session, the experimenter placed tracing worksheets and a marker on the table or floor and approximately five to eight toys or activities on the floor (e.g., figurines, coloring book, puzzles). In order to ensure the participant could engage in tracing behavior and understood token economies, prior to the start of the first session of each condition, the experimenter described the session contingencies and prompted the participants to engage in tracing and toy playing in order to experience the contingencies associated with each. After the participant practiced tracing, the experimenter provided the consequence for the condition (e.g., for RC, the experimenter showed the participant that she kept the token and said, “Look, you kept your token because you were tracing”). Afterwards, the experimenter presented the prize bin in order to practice exchanging the token(s) he or she earned or kept during training. The experimenter showed the participants the items in the prize bin and then stated the different
values of each prize. Next, the experimenter had the participant count the number of tokens he or she had and then showed the participant which items he or she could choose. After the participant selected an item, the experimenter asked the participant to give him or her the number of tokens required and then gave the participant the item he or she had selected. This training procedure was only conducted prior to the first implementation of a token procedure. Prior to the beginning of each subsequent session, the experimenter reminded the participant of session rules and then signaled the start of the session by saying, “Ready, set, go!” During all sessions, the experimenter avoided interactions with the participant. When the participants attempted to interact with the experimenter, the experimenter either did not respond at all or respond briefly and neutrally (e.g., “Ok”) with minimal eye contact. The experimenter delivered the same neutral response regardless of what the participant said or whether the participant was playing with toys or engaging in the target task.

Following each session during which tokens were used, the experimenter gave the participant the opportunity to exchange tokens for edibles (i.e., small pieces of candy or other snacks), trinkets (e.g., small toys and stickers), or engagement with a toy or leisure activity (e.g., iPad). The prices of edibles, trinkets, and engagement with a toy or leisure activity varied from one to five tokens. In general, the number of tokens required for a given item corresponded to the actual monetary price (i.e., higher priced items required more tokens for exchange). The participant could spend the number of tokens he or she had for any combination of the above, but was required to spend all tokens prior to the next session.

**Exposure.** In this phase, the experimenter implemented three sessions of each condition (DRA, RCO, and control; described in detail below) in a semi-random, alternating fashion (i.e., first, randomly select one condition from the three options; second, randomly select one
condition from the remaining two options; third, run the final remaining procedure). The experimenters determined the order of sessions by shuffling three notecards with the name of each procedure and then laying them on the table. In addition, if any session resulted in a treatment integrity score below 90%, the experimenter implemented the procedure in that session again until it resulted in a treatment integrity score of 90%.

**Control.** Prior to the start of the control condition, the experimenter placed a white token board in front of the participant and described the rules as follows: “Look! It’s the white board. There are no tokens. When it’s white, you can either work on tracing or play with toys. If you work on tracing or play with the toys, nothing will happen because there are no tokens.” In addition, the experimenter asked the participant questions regarding the contingencies as previously mentioned (e.g., “What happens if you are working?” and “What happens if you are playing?”). The experimenter prompted the participant to respond correctly if an incorrect or no response occurred. The experimenter then set a timer for 5 min and said to the participant, “When I say go, you can either trace or play. Ready, set, go” and started the session. The experimenter observed the participant every 30 s. During the session, the experimenter did not provide any programmed consequences.

**DRA.** Prior to the start of the DRA condition, the experimenter held a cup with 10 tokens and placed an empty token board in front of the participant. The experimenter then described the rules as follows: “Now you get the [color] board, and it doesn’t have any tokens on it. When we start, you can either work on tracing or play with toys. If you are tracing you will get a token. If you are not tracing, you will not get a token. At the end, you can trade your tokens for prizes and snacks. If you don’t have any tokens, you don’t get anything.” In addition, the experimenter asked the participant questions regarding the contingency as previously mentioned (e.g., “What
happens if you are working?” and “What happens if you are not working?”). The experimenter prompted the participant to respond correctly if an incorrect or no response occurred. The experimenter then set a timer for 5 min and said to the participant, “When I say go, you can either trace or play. Ready, set, go” and started the session. The experimenter observed the participant every 30 s and delivered a token if the child was on task or did nothing if the child was not on task.

**RCO.** Prior to the start of the RCO condition, the experimenter placed a token board with 10 tokens attached in front of the participant. The experimenter described the rules as follows: “Now you get the [color] board, and it has 10 tokens on it. When we start, you can either work on tracing or play with toys. If you are working on tracing, you will keep your tokens. If you are not tracing, you will lose a token. At the end, you can trade your tokens for prizes and snacks. If you don’t have any tokens, you don’t get anything.” In addition, the experimenter asked the participant questions regarding the contingency as previously mentioned (e.g., “What happens if you are working?” and “What happens if you are not working?”). The experimenter prompted the participant to respond correctly if an incorrect or no response occurs. The experimenter then set a timer for 5 min and said to the participant, “When I say go, you can either trace or play. Ready, set, go” and start the session. The experimenter observed the participant every 30 s and did nothing if tracing or removed a token if not tracing.

**Choice.** I used a concurrent-chains arrangement (e.g., Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997) to evaluate preference for the procedures by presenting the token boards associated with each type of procedure (i.e., baseline, RCO, and DRA) (initial link), allowing the participants to select a procedure, then implementing the chosen procedure (terminal link). In addition, when presenting the token boards, I reminded the participants of the contingencies
associated with each set of materials and asked the participants questions regarding the
contingencies. Participants selected a procedure by verbally stating, pointing to, or touching a set
of materials. Experimenters conducted sessions until participant’s pattern of choice responding
was stable and determined preference by counting the cumulative number of selections of each
procedure. The layout of the different boards was switched each session, and the presence and
absence of tokens varied according to the conditions described below.

**RCO tokens.** The experimenter laid out all three token boards: control, DRA, and RCO.
The DRA token board was empty (no tokens affixed) and the cup of tokens was not present.
Additionally, the RCO token board had all tokens affixed. This procedure replicates those of
Jowett Hirst et al. (2016), was similar to Donaldson et al. (2014), and was used to identify
children who preferred response cost. Children who preferred RCO under these conditions then
experienced two or more of the conditions described below.

**No tokens.** The experimenter laid out all three token boards: control, DRA, and RCO.
However, there were no tokens present with any procedure, and the token boards did not have
Velcro® (i.e., we used colored pieces of paper in the same shape as the original token boards)

**DRA & RCO tokens.** The experimenter laid out all three boards (control, DRA, and
RCO) with tokens present for DRA and RCO. The DRA token board was empty (no tokens
affixed), and the cup of tokens was present with the board. Additionally, the RCO token board
had all tokens affixed.

**DRA tokens.** The experimenter laid out all three boards (control, DRA, and RCO) with
tokens present only for DRA. The DRA token board was empty (no tokens affixed) and the cup
of tokens was present. Additionally, an RCO token board with no Velcro® was used, and thus,
had no tokens affixed.
Color reversal. For one participant for whom we did not observe a change in preference based on the presence of tokens, we switched the colors of the DRA and RCO token board (i.e., the token board previously assigned to DRA was now RCO and vice versa) in order to determine if the participant was choosing a procedure based on preference for color.
CHAPTER 3

RESULTS

Figure 1 displays the cumulative number of selections for a procedure for Hugo, Ajax, and Clarissa. Results for Hugo are on the top panel. During the initial RCO tokens phase, Hugo selected RCO a total of 5 times and did not select the DRA or control. During the no tokens phase, Hugo selected RCO a total of 5 times, DRA a total of 2 times, and did not select control. During the DRA tokens phase, Hugo selected DRA a total of 5 times and did not select RCO or control. During the DRA and RCO tokens phase, Hugo selected RCO a total of 4 times and did not select DRA or control. During the reversal to the DRA tokens phase, Hugo selected DRA a total of 4 times and did not select RCO or control. These results suggest the presence of tokens influenced his preference.

Results for Ajax are on the middle panel. During the initial RCO tokens phase, Ajax selected RCO a total of 4 times and did not select DRA or control. During the DRA tokens phase, Ajax selected RCO a total of 5 times, DRA a total of 6 times, and did not select control. During reversal to the RCO tokens phase, Ajax selected RCO a total of 3 times, DRA a total of 2 times, and did not select control. These results suggest the presence of tokens may have influenced his selection; however, we were unable to replicate preference for RCO under conditions of tokens present during RCO.

Results for Clarissa are on the bottom panel. During the initial RCO tokens phase, Clarissa selected RCO a total of 8 times, DRA a total of 2 times, and did not select control. During the DRA tokens phase, Clarissa selected RCO a total of 5 times, control once, and did not select DRA. During RCO tokens color-reversal phase, Clarissa selected RCO a total of 7 times,
DRA a total of 3 times, and did not select control. These results suggest the presence of tokens did not influence her selection nor did the color associated with the procedures.

Tables 1-2 display the average percent of on-task for the participants in all phases. All three participants had higher average levels of on-task behavior during the DRA and RCO phases as compared to the control phases.
CHAPTER 4
DISCUSSION

Previous researchers have suggested that variables such as the aversive characteristics of a procedure, presence of peers, net tokens, a higher probability of reinforcement, and the presence of and/or immediate access to tokens might influence preference for response cost (Donaldson et al., 2014; Iwata & Bailey, 1974; Jowett Hirst et al., 2016; Pietras, Brandt & Searcy, 2010). The current study evaluated whether the presence of tokens influenced preference for response cost. Previous researchers that have evaluated preference for RC and DR did not have tokens next to the DR board and thus could not rule out the effects of the presence of tokens influencing selection (e.g., Donaldson et al., 2014; Jowett Hirst et al., 2016). The current study manipulated the presence and absence of tokens during choice of DRA and RCO procedures. The DRA-tokens and RCO-tokens manipulations tested whether the presence of tokens influenced preference, and the no-tokens and DRA-\&-RCO-tokens manipulations provided information regarding whether immediate access to the tokens influenced preference.

The results of one out of three participants suggest that the presence of tokens influences preference. Hugo selected RCO when RCO had tokens and DRA did not have tokens, and selected DRA when DRA had tokens and RCO did not have tokens. In addition, Ajax initially selected RCO when RCO had tokens and alternated his selections of RCO and DRA when DRA had tokens and RCO did not have tokens. Thus, for these two participants, the results suggest that the presence of the tokens affected their choice of a procedure. However, due to Ajax’s inconsistent preference during the second RCO tokens evaluation, only data for Hugo provide a strong demonstration of the influence of tokens on preference.
With respect to the results obtained for Clarissa, because she continued to select RCO regardless of the presence of tokens (i.e., when RCO had tokens and DRA did not have tokens and also when DRA had tokens and RCO did not have tokens), these data suggest that the presence of tokens did not influence preference. Because her preference did not change when experimenters manipulated the presence of tokens, I hypothesized that her preference may have been influenced by the color assigned to the procedures. Although I tried to control for color bias by assigning the two lowest preferred colors, because the results of her paired stimulus preference assessment showed that she preferred the color that had been assigned to the RCO board, we switched the colors of the procedures to test whether she was selecting RCO based on color preference. During the color reversal phase, she continued to select RCO more than DRA, indicating that the color of the board did not influence her selection, but rather, a characteristic of the RCO procedure, such as immediate access to tokens.

Several researchers have suggested that the immediate access to tokens might influence the selection of RC over DR (Donaldson et al., 2014; Jowett Hirst et al., 2016). That is, children may view it as easier to keep the tokens that they already have, than to earn tokens. In addition, Donaldson et al. (2014) suggested that preference for RC might be explained by the endowment effect: items that one already has might be more valuable than items one has yet to earn. Thus, participants might have selected RCO because the tokens that were delivered in the beginning of a session during an RC procedure held a greater value than tokens that were yet to be delivered during the DRA procedure.

The results for Hugo and Ajax also suggest that the immediate access to tokens may have influenced their selection in some phases. Hugo mostly selected RCO when there were no tokens present for all boards, and only selected RCO when tokens were present for the RCO and
DRA boards. Under these conditions, because the presence and absence of tokens was the same for both procedures, what remained constant was immediate access to tokens following selection of RCO.

The results for Hugo and Ajax can be examined in light of some limitations. Because there was no presession exposure before each new choice phase (i.e., any condition that followed RCO tokens), it could be that Hugo selected DRA in the DRA tokens phase because he did not know that he would get tokens if the selected the RCO board with no tokens present. However, this is unlikely for several reasons. First, the experimenter verbally explained the contingencies before each preference session. Second, Hugo was able to answer questions regarding the contingencies. Finally, Hugo selected RCO in the no tokens phase; therefore, he had experienced the contingencies associated with the RCO board under conditions of no tokens present. Another limitation to consider is that the color of the boards may have also influenced Hugo’s selection for RCO in the no tokens and all tokens phases. Previous research has shown that children may prefer a procedure due to the color associated with the procedure rather than the characteristics of the procedure (Heal, Hanley, & Layer, 2009). This conclusion might be supported by the fact that he preferred the color associated with the RCO board more than the one associated with the DRA board according to the paired stimulus preference assessment conducted. Finally, the evidence that the presence of tokens influenced responding for Ajax is weaker than for Hugo, as we did not replicate preference during the second evaluation of RCO tokens.

The results of this study show that for at least one participant, preference for a procedure may be changed by manipulating the presence of tokens. Jowett Hirst et al. (2016) notes that this would be potentially advantageous in situations where the child prefers a procedure that does not match that of the teachers or parents; by matching the preference of a procedure, all individuals
can be satisfied and the likelihood that the child and caregivers will participate in the intervention may increase (Dozier et al., 2007). In addition, as previously mentioned, RC is easier to implement and can be more practical than DR (e.g., Donaldson et al., 2014). These results can also inform researchers who are examining the effects of the characteristics of both procedures on how to present choices; that is, it may be prudent for them to make sure that no tokens are present on all boards, or that all boards have tokens, given that the presence of tokens may influence selection of a procedure.

Given the promising results of this study, there are future directions that can further extend them. Although the results of this study suggest that immediate access to tokens during RCO may have influence preference for some participants, we cannot conclude this definitively as we did not experimentally manipulate access to tokens. That is, regardless of the condition, selection of RCO resulted in immediate delivery of a token board with all tokens affixed. Future researchers could experimentally evaluate the influence of immediate access by not delivering the RCO board upon selection (i.e., keeping it hidden and providing verbal feedback when a token is lost). Another potential variable that could be evaluated is the location of the tokens. It could be that for some children, the presence of tokens in the DRA tokens condition does not influence their preference because the tokens are in a cup, which for some, might be less salient than if the tokens are displayed on the token board as in RC. Thus, future researchers could manipulate how the tokens are displayed when next to DRA board (e.g., placed in the experimenter’s hand vs. laid out on the token board next to the Velcro®). Future researchers could also evaluate whether the presence of tokens influences the preferences of older children; perhaps the presence of tokens is more likely to influence young children as compared to older children. Finally, researchers could evaluate variables that affect preference for DR procedures
as some participants showed a preference for DR in this and other studies (Donaldson et al., 2014; Iwata & Bailey, 1974; Jowett Hirst et al., 2016). Donaldson et al. (2014) suggested that some participants might prefer DR to RC due to loss aversion because when the participants were asked why they preferred DR to RC, some reported that they found token loss aversive. It is also important to note that in Donaldson et al., the participants had a laminated piece of white paper with 10 open circles with checkmarks made by an erasable marker, and during the RC condition, the experimenter would erase checkmarks from the circle for participants engaging in disruptive behavior when the clicker sounded. Perhaps RC could be less aversive if instead, the experimenter verbally gave notice of token loss instead of erasing a checkmark or removing a token.
Table 1

This table depicts the percentage on-task behavior for Hugo, Ajax, and Clarissa in each phase.

<table>
<thead>
<tr>
<th>Phase</th>
<th>DRA</th>
<th>RCO</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hugo</td>
<td>57.8%</td>
<td>32.3%</td>
<td>26.7%</td>
</tr>
<tr>
<td>Ajax</td>
<td>80.2%</td>
<td>75.7%</td>
<td>0%</td>
</tr>
<tr>
<td>Hugo</td>
<td>77.1%</td>
<td>80.1%</td>
<td>45%</td>
</tr>
</tbody>
</table>
FIGURES

Figure 1. Cumulative number of selections of a procedure for Hugo, Ajax, and Clarissa. The triangles denote DRA, the circles denote RCO, and the squares denote Control.
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