EVALUATION OF THE VALUE OF ACTIVITY-BASED TOKEN REINFORCEMENT

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Abstract

In ABA, tokens are a conditioned stimulus that can be used to reinforce behavior when delivered following the response (Hackenberg, 2009). Traditional tokens can take many different forms, including pennies, stickers, or check marks. However, for some learners, these tokens may have no reinforcing effect, and the resulting token economy may have a weak reinforcing effect. Very little research has been done examining the different types of tokens that are used in a token economy. The present study sought to determine if items from a learner’s preferred activities could be used as tokens and if they are more reinforcing than the traditional token. Study 1 replicated Fiske et al.’s (2020) use of a multiple-schedule reinforcer assessment to assess the value of traditional and activity-based tokens. Study 2 replicated Charlop-Christy and Haymes (1998) method to evaluate whether the use of activity tokens led to more accurate responding in an academic task than the traditional tokens. One student participated in both studies. The results of Study 1 indicate that the student engaged in more responses when an activity token with backup reinforcement was delivered as a consequence, compared to when the traditional token with backup reinforcement was used. However, no difference in responding was observed when the tokens were presented as a consequence without backup reinforcement. In Study 2, the learner engaged in more accurate responding on an academic task when activity tokens were delivered than when traditional tokens were delivered. Overall, the results of this study demonstrate that the type of token being used for a learner can affect performance and activity-based token economies can be an effective system of reinforcement.
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Introduction

Learners with autism spectrum disorder (ASD) require specialized teaching programs and individualized reinforcement. Under the teaching method of applied behavior analysis (ABA) learners will be reinforced when they emit a correct response for a given task. This reinforcement is crucial to their success in learning new skills. There has been a plethora of research done in the area of best practices for providing reinforcement and the different ways to deliver reinforcement. The token economy has been demonstrated to be a widely used and effective method for delivering reinforcement on a delayed schedule (Hackenberg, 2009). The tokens become conditioned reinforcers in order to delay the delivery of a primary or back-up reinforcer. While token reinforcement can work for many learners, there are some learners for which this is an ineffective system of reinforcement. Until now, little research has been done on the learners for whom token systems do not work.

In this literature review, I will first describe ASD and the importance of reinforcement in ABA. I will then discuss reinforcement, the current limitations of reinforcement, and evaluate methods of more effective reinforcement. I will introduce the components of token reinforcement and assessments for determining potential reinforcers. I will then discuss the current variations of tokens that have been done as well as provide a possible alternative to the traditional token by using a learner’s highly preferred activity as a token variation.

ABA and Reinforcement

ASD is a neurodevelopmental disability that affects approximately 1 in 54 children worldwide (CDC, 2020). Individuals diagnosed with ASD tend to have difficulties with social interaction, an inability to read body language, and abnormalities with eye contact. Additionally, about 31% of individuals with autism also have an intellectual disability, which is characterized
by an intelligence quotient (IQ) below 70 (CDC, 2020). Due to such a low IQ, it can be hard for these individuals to learn in the same way that typical students learn. According to Anderson and Romanczyk (1999), children with ASD can be expected to make significant progress when diagnosed early and when exposed to structured and consistent evidence-based intervention programs and educational methods. The best known of these effective strategies are those based in ABA. ABA is commonly used when teaching skills and behavior change in students with ASD. The goal of ABA is to produce effective and generalizable changes in behavior by reinforcing desirable behaviors and not reinforcing undesirable behaviors (Fisher & Piazza, 2015).

Reinforcement is a key feature of ABA especially when teaching children on the autism spectrum. Reinforcement is used when teaching because it keeps the learner motivated. Early work showed that operant learning strategies that taught behavior by providing reinforcement following its occurrence could be used to increase social behaviors such as communication and social interaction, imitation, instruction following, and object naming in children with ASD (Schuetze et al., 2017). To specify a stimulus or an event as a reinforcer, one must observe a subsequent increase in the behavior on which it was contingent. Reinforcement can then be used to explain the increase in behavior.

Reinforcement takes two forms, positive and negative reinforcement. Positive reinforcement is the presentation of a stimulus contingent upon behavior. In turn, this is followed by an increase in the desired behavior. Positive reinforcement is very similar to earning rewards, except that the preferences of the earner are taken into account when choosing what stimulus to present to the participant as a reward. This allows positive reinforcement to be more specifically tailored for the individual. In contrast, negative reinforcement is the removal of an aversive
stimulus contingent upon behavior, also leading to an increase in the behavior of the learner. An example of this would be waking up in the morning and hitting snooze on an alarm (behavior) to stop the noise of the alarm (aversive stimulus). Therefore, negative reinforcement is taking something away to increase a behavior.

The type of reinforcer used, particularly when delivering positive reinforcement, is also important. According to Rincover and Newsome, (1985), children with autism can be less responsive to environmental stimuli than typical children. That lack of responsiveness significantly interferes with educational efforts, so educators must assess various methods that might influence motivation. Most teachers rely on edible reinforcers due to the ease of availability and delivery (Lovaas, et al, 1966, Rincover & Newsome, 1985), however the use of edibles can quickly lead to satiation when the learner is either no longer hungry, or no longer wants the preferred edible, which is a big limitation of this type of reinforcement. Rincover and Newsom (1985), also stated children quickly satiate on edible reinforcers which can cause responding to become inconsistent and therefore, hinder learning. Roll et al., (1995) define satiation as “reinforcers losing their ability to increase, or maintain, behavior when too many have been consumed” (p. 324). Alternative reinforcers or reinforcers that are not edible, such as toys, sensory activities, or self-stimulation can help to remedy satiation in learners.

The schedule of reinforcement, especially during early learning, is crucial to consider and plan when designing an intervention. The schedule of reinforcement refers to how often and when the reinforcement is delivered. When teaching new behaviors, the schedule of reinforcement tends to be as high as one to one or Fixed Ratio 1 (FR1) (Barton, Lawrence, & Deurloo, 2012). This means that every time the learner engages in the target response, they get reinforced. However, when a teacher is constantly providing reinforcement to a learner, the
exchange of items and time spent engaging with the item/edible takes away from valuable instructional time. Austin et al., (in preparation) conducted a pilot study examining this exact problem. The authors found that a large portion of the instructional time they observed in classrooms was not being used effectively as it should be. Their study determined that across three preschool and elementary classrooms, the percentage of time students spent on academic tasks during baseline averaged between 33% and 38% due to high levels of engagement in reinforcement and other activities. In a classroom, there should be many opportunities for learning, but instead more time is being spent preparing instructions, socializing, offering extended leisure time to students, and frequently providing reinforcement (Austin et al., in preparation).

**Addressing Limitations of Reinforcement Systems**

While providing reinforcement is essential to the learning of students with autism, there are some problems with delivering reinforcement without a set schedule. As per Rincover and Newsome (1985), children satiate on reinforcement rather quickly therefore, a continuous schedule of reinforcement such as a fixed-ratio (FR) 1 schedule in which a learner is reinforced after every single correct response may not be the best method of reinforcement in a classroom. Delaying reinforcement by using a different or intermittent reinforcement schedule is a way to combat satiation and loss of instructional time. This means that instead of providing reinforcement after every correct response, an instructor can provide reinforcement on a set schedule. For example, if the reinforcement is being delivered after every five or so responses then the instructor is using an FR5 schedule. Unlike the FR1 schedule, the FR5 schedule requires the learner to produce five correct responses to obtain the reinforcer.
Delayed schedules of reinforcement can also be an effective procedure for preventing satiation and maintaining behavior change. Applied researchers have shown that when the delay of reinforcement is mediated by measures that outline the contingencies (e.g., contingency contracts that state which behaviors will be reinforced and when), young learners are able to maintain many different behaviors or skills under those delayed schedules (Israel, 1973; Israel & O’Leary, 1973). Programs using delayed reinforcement have specified the behaviors that will be reinforced, as well as the settings and times in which the behaviors were to be performed (Fowler & Baer, 1981). Reinforcement delays can be considered for teaching programs, both for maintaining appropriate social behavior and for maintaining academic performance, such as on-task behavior and correct responding (Fowler & Baer, 1981).

Another common recommendation to reduce satiation when teaching skills to children with autism is to apply differential reinforcement. Differential reinforcement is the withholding of reinforcers for one behavior and delivering them for another (Petscher, Rey, & Bailey, 2009). Differential reinforcement is also a way to increase instructional time and help learners to acquire skills more rapidly. In some circumstances, such as school, it may not be practical to provide reinforcement contingent on each response (FR1), especially if the programmed reinforcer requires time and effort to engage with (e.g., puzzle, coloring, blocks; Tarbox, Ghezzi, & Wilson, 2006). Instead, practitioners can save higher quality or high frequency reinforcement for high-quality responses, such as responses that are produced independently without prompts (Sundberg & Partington, 1998). For example, the use of differential reinforcement is recommended in early intervention (EI) programs because children in EI often do not acquire skills in the absence of motivational procedures (Karsten & Carr, 2009; Leaf & McEachin, 1999; Lovaas, 2003). Differential reinforcement has been shown to promote skill acquisition better
than other types of reinforcement, so children in EI may have better learning outcomes when
differential reinforcement is used (Vlădescu & Kodak, 2010).

Reduction of satiation through differential reinforcement can be done through both
schedules and magnitude of the reinforcement, where reinforcers are delivered more frequently
or at a greater quantity for higher quality responses. In early research of differential
reinforcement the focus was mainly on schedules or quality of the reinforcement instead of the
magnitude of reinforcement (Fiske et al., 2014). A few studies have examined variations in
differential reinforcement schedules for prompted and independent responding to identify
schedules that increase the efficiency of learning (i.e., quickly increase independent responding).
This technique has been shown to be a useful tool in promoting fast skill acquisition and
decreasing the occurrence of prompt dependence that can result from imprecise prompt fading.
Olenick and Pear (1980) evaluated this differential reinforcement procedure with three children
with severe intellectual disabilities who were taught to tact pictures over a progressive sequence
of prompt and probe trials. Unprompted correct responses were reinforced on a continuous
reinforcement (CRF) schedule, and prompted responses were reinforced on a fixed-ratio 6 or 8
schedule (providing reinforcement after 6 or 8 responses). The authors demonstrated that the
combination of the differentially rich schedule for unprompted responses and the lean schedule
for prompted responses was more effective than the use of nondifferential reinforcement with all
participants.

Magnitude-based differential reinforcement is another way to reduce satiation in learners.
Reinforcement magnitude refers to the intensity of the reinforcer, which can be measured in
terms of concentration, amount, or duration of the reinforcer (Trosclair-Lasserre et al., 2008).
Magnitude-based differential reinforcement may depend on how a learner responds to both large
and small amounts of reinforcement. If the learner responds differently in that they demonstrate preference for the large amount of reinforcement over the smaller amount then they should engage in higher levels of responding and engagement to produce the larger magnitude of reinforcement (Fiske et al., 2014).

The methods describe above reduce satiation by decreasing the frequency or amount of reinforcement that is delivered for each correct response. A final method of reducing satiation that shares similarities with these approaches is through the use of token reinforcement.

**Token Reinforcement**

A token is an object or a symbol that can be exchanged for goods or services (Hackenberg, 2009). Token systems, in one form or another, have provided the basic economic framework for all monetary transactions. Tokens themselves have no intrinsic reinforcing value, therefore whatever value a token has is established through relations with other reinforcers, both unconditioned (e.g., food) and conditioned (e.g., money). In ABA, tokens are a conditioned stimulus that can be used to reinforce behavior when delivered following the response (Hackenberg, 2009). Essentially, the token is conditioned to be a reinforcing stimulus so that when a learner responds, they are reinforced without acquiring the terminal reinforcer.

Using tokens as reinforcement indicates that there is an accumulation of tokens before the exchange. The exchange response is what occurs once the learner has received all of their tokens and exchanges those tokens for the preferred reinforcement. For example, if a student earns a total of five tokens, one for each response, the student will exchange the group of five tokens one time instead of exchanging each token five times. Accumulating groups of tokens before exchange means that the exchange response only has to be executed once rather than repeatedly, decreasing satiation and potentially increasing the overall reinforcing value of the back-up
reinforcer (Hackenberg, 2009). Initially, tokens are introduced with frequent exchange periods and a highly preferred item throughout most token-reinforcement contingencies, ensuring repeated preferred item-token pairings or reinforcement-token pairings (Hackenberg, 2009). This allows the learner to recognize the value of the token and what that token represents before the number of responses (and therefore tokens) required to access back-up reinforcer is increased.

Token reinforcers bridge the gap between the behavior and the delay of a back-up, often primary, reinforcer. As the learner engages in the target behaviors, they will receive the conditioned reinforcer immediately, and the primary reinforcer is delayed. Practitioners and teachers depend on the token’s reinforcing value to delay reinforcement and to aid in skill acquisition or lead to decreases in maladaptive responses (Bonfonte, Bourret, & Lloveras, 2020). Research suggests that the token economy may promote greater delay tolerance compared to behavioral programs that involve primary reinforcers alone (Leon, Borrero, & DeLeon, 2016).

The goal in clinical practice is to have these tokens become generalized in the sense that they can easily be associated with a variety of back-up reinforcers. Essentially, when tokens are paired with multiple backup reinforcers (e.g., food) they are said to be generalized; for example, going into a store in which tokens can be exchanged for a wide array of preferred items and activities. Generalizing the tokens, would enhance their durability making them less dependent on specific motivational conditions. Tokens will not become effective reinforcers if they are paired with stimuli that are not of sufficient quality or that have not been established as effective reinforcers themselves (Hine, Ardoin, & Call, 2017).

The conditioned tokens can then be used in a token economy. The token economy is a behavior modification technique that is based on the principles of operant conditioning that utilizes the systematic reinforcement of a target behavior (Matson, Estabillo, & Matheis, 2016).
Token economies are highly structured; therefore, desirable target behaviors may be reinforced more consistently and they are easy to dispense for the learner to accumulate (Tarbox, Ghezzi, & Wilson, 2006). The typical token economy consists of six components: 1) the target behavior, 2) a token that functions as a conditioned reinforcer, 3) backup reinforcers, 4) the token production schedule, 5) the exchange production schedule, and 6) the token-exchange schedule (Ivy, Meindl, Overley, and Robson, 2017 p. 710). These six components are inherent in any and all token economies.

Children and adults with disabilities were the first populations that received extensive focus in research regarding the use of token economies. Allyon and Azrin, (1965) conducted one of the first of these studies on mental patients in a psychiatric hospital. In their study, when the target response was performed, the attendant gave the token to the patient; that token could then be exchanged later during the day or even on later days or weeks for the reinforcing items. Credits, points, merits, money etc., could have served the same purpose (Allyon & Azrin, 1965). The primary function of the tokens in this study was to bridge the delay between response and reinforcement. Increases in the number of tokens or the value of backup events enhanced client responsiveness (e.g., Ayllon et al., 1979). Additionally, by sampling a portion of reinforcers on a non-contingent basis, the client is subsequently more likely to purchase the event with tokens and consequently engage in token earning behavior (e.g., Ayllon & Azrin, 1968a, 1968b; Curran, Lentz, & Paul, 1973).

More recently, Tarbox, Ghezzi, and Wilson, (2006) conducted a study to demonstrate how token reinforcement may be used to increase attending behavior in a young child with autism during discrete trial training (DTT). Token reinforcement increased the attending behavior of a young child with autism. The results also show that the tokens required for backup
reinforcement can be increased without sacrificing the strength or stability of attending. The results further show that token reinforcement is most effective in sustaining attention when backup reinforcement is available, and when tokens can be exchanged without delay.

Token economies can also be used in large groups such as in a classroom setting. A study done by Shakespeare, Peterkin, and Bourne, (2018) explored the use of a token economy as a behavior modifier in disruptive classrooms. They used a token economy as a reinforcement strategy to encourage students who exhibited positive behavior; so each time a student displayed appropriate behavior they were given a token. Prior to the intervention, disorderly conduct was the most disruptive of all of the inappropriate classroom behaviors with 100% of males engaging in the behavior and 67% of females. After the intervention, 47% of males and 33% of females engaged in disorderly conduct. Across all of the observed behaviors in the classroom, the token economy appeared effective in decreasing the presence of disruptive behaviors.

These studies demonstrate that the token economy can be very effective in delaying reinforcement and maintaining high responding in students. However, before implementing a token economy, we need to make sure that the token is going to be effective. If a learner does not see the token as having value, then the token will not be effective as a reinforcer. This is true for all types of reinforcers, not just tokens. Therefore, reinforcer assessments are used to evaluate different stimuli and the learner’s response to that stimuli.

Assessments of Reinforcers

Since reinforcement is a cornerstone of teaching students with autism, it is important for clinicians, parents, or teachers to be able to identify these potential reinforcers. Sometimes it can be very difficult to identify these reinforcers which led to the use of a formal preference assessment. Preference assessments aid clinicians in determining what a learner’s preferred and
non-preferred stimuli are (Leaf et al., 2018). There are multiple kinds of preference assessments such as single-stimulus from (Pace et al., 1985), paired choice, (DeLeon & Iwata, 1996), and multiple stimulus without replacement (MSWO). In these assessments, students are exposed to different stimuli and are free to choose which stimuli they prefer over others. The results of these assessments provide the practitioner with information about different items that a student may prefer or not prefer. These results were useful because the assessment demonstrated that it could predict what stimuli were likely to function as reinforcers in behavior-change programs (Green et al., 1991). For example, Hagopian et al., (2001), conducted a study comparing the predictive validity of the results of a single-stimulus preference assessment with the results of a paired-stimulus assessment. Ultimately, their study demonstrated that the relative ranking of high, middle, or low preference in the single stimulus assessment accurately predicted reinforcer effectiveness.

While the rankings may be able to predict the reinforcing effectiveness of certain preferred items, Green et al. (1991) reported that not all stimuli that are identified as preferred are equally effective as reinforcers. Reinforcer assessments are used following preference assessments to determine if the preferred items are reinforcing. Essentially, the reinforcer assessments are designed to determine if the learner will work for the preferred items. One method of assessing the value of a reinforcer is a progressive ratio (PR) reinforcer assessment developed by Roane, Lerman and Vordran, (2001). Under PR schedules, the schedule requirements for reinforcement increase until the learner stops responding. The last schedule requirement that the learner completes is referred to as the “break point.” Using these data, the researcher can determine the amount of work the learner will complete for a given reinforcer. When conducting this type of assessment, the reinforcing efficacy of two similarly ranked items
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from the participants’ preference assessments can be compared. Roane conceptualized this reinforcer assessment as a behavioral economic assessment because changes in response rate and reinforcer consumption were evaluated across increasing schedule requirements. The results of this study suggest that PR schedules allow a relatively quick examination of changes in a learners’ reinforcer preference or value under increasing schedule requirements. Criticism of the PR schedules indicate that they may be aversive as the schedule requirement increases and can take a very long time to complete (Dardano, 1973; Poling, 2010), which has the potential to lower levels of responding.

An alternative method of evaluating the value of a reinforcer is the multiple schedule reinforcer assessment (MSA) developed by Smaby et al., (2007). Their study looked at an assessment protocol designed specifically to rapidly identify reinforcing effects of social stimuli and gauge relative preferences for these social stimuli when they are used as consequences in young children with ASD. This system rapidly alternates between extinction (EXT) and reinforcement conditions. In the EXT conditions, the defined response produced no programmed consequence. EXT conditions were conducted so that participants began each social consequence condition with a consistent immediate history. In the social consequence/reinforcement condition the researcher would either tickle the learner, give the learner head rubs, or providing social praise (i.e., ‘Good job’) contingent upon the response. Comparisons of rates of behavior across the different contingencies could then be compared. Ultimately this method was able to quickly and effectively identify the reinforcing value of social consequences. The results of this study indicated that this procedure can identify social reinforcers and preference among social stimuli at the same time. Additionally, this method can identify reinforcing stimuli more rapidly than other assessment procedures (Smaby et al., 2007).
Evaluating Token Economy as Reinforcement

Fiske et al., (2015) conducted a study examining the reinforcing effects of a token economy. This study used PR schedules to evaluate the reinforcing value of an already established token economy when compared to primary reinforcement. Under PR schedules, requirements for reinforcement were increased systematically after each reinforcer delivery to identify the learner’s break point (Roane, Lerman, & Vorndran, 2001). The study consisted of four conditions: Baseline, Paired Token, Primary Reinforcement, and Unpaired Token. Both learners demonstrated low levels of responding in the baseline condition as well as in the token without backup reinforcement in the unpaired token condition. The learners responding in the primary reinforcement and paired token conditions was higher than in both the baseline and without backup conditions, but responding was variable. One of the learners responded similarly in both the primary reinforcement and paired token conditions. The results showed that token systems resulted in inconsistent responding in both students and that the effectiveness of a token economy may be based on the quality of the backup reinforcer (Fiske et al., 2015).

Bonfonte, Bourret, and Lloveras, (2020) expanded on the work done by Fiske et al. (2015) and compared the reinforcing efficacy of tokens to a high preference (HP) edible and a low-preference (LP). The study used a conditioned reinforcer test in which they compared token and tandem conditions. These conditions were used to assess the stimulus functions exerted by the tokens. They also conducted a PR condition that was made up of three parts: HP edible, LP edible, and token. The PR schedule in this study started with an FR2 for production and doubled after completion of each component (FR 2, 4, 8, 16, etc.). This study yielded different results from that of Fiske’s study in that the delivery of the HP edible produced the highest levels of
responding across participants when compared to the LP and token conditions. Responding in the HP series continued to increase across all PR-step sizes. Overall, HP edibles functioned as stronger reinforcers than tokens. This may suggest that, in situations where large reinforcement effects are necessary, it may be preferable to use strong primary reinforcers rather than conditioned reinforcers.

Fiske et al. (2020) conducted a follow-up study that sought to address limitations in the previous study and criticisms lodged against PR schedules by replicating Smaby et al.’s (2007) use of MSA to evaluate the reinforcing efficacy of the components of a token system. The study consisted of five different components: Extinction (EXT), token without backup, yoked fixed ratio (FR), token with backup, and primary reinforcer. The EXT component was run for up to 5 min or it was terminated after the learner stopped responding for 1 continuous min. The EXT component had no consequences following the target response and was conducted before each of the reinforcement components. The EXT condition was conducted to determine how many times the learner would respond with no reinforcement being delivered.

All of the reinforcement components gave the learners the opportunity to respond for 1-min. These different components allowed the experimenters compare the rates of responding in each component of the token economy to determine which one would lead to the highest rates of responding. For example, in the token without backup component, as in the classroom, pennies were used as tokens for the learners. In this token without backup component, the experimenter would put a penny on the learner’s token board following each target response, once the learner earned all of the tokens the experimenter would remove all of the tokens from the board and did not provide backup reinforcement. The token without backup condition was run to determine if the tokens themselves were reinforcing enough without the backup reinforcement being
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delivered. In the yoked-FR component, the tokens were not used and when the learner completed the number of responses equal to the number of tokens on their board then they received access to a bin of preferred items for 10-s. The yoked-FR component was run in order to assess the learner’s responding without a token board and just the reinforcer after a set number of responses. The token with backup component was nearly identical to the token without backup component except that once the learner filled the token board, they were able to exchange the tokens for a bin of preferred items for 10-s. This component was run to assess the learner’s frequency of responding when receiving a token for each response plus the backup reinforcer. Finally, in the primary reinforcement component, learners were provided the bin of preferred items for 10-s following each target response. This component was run to evaluate the effectiveness of the bin of preferred items as reinforcers without the use of any other elements of the token economy.

Similar to the study by Smaby et al. (2007), the MSA alternated between EXT and the various reinforcement components in a fixed order and each component was conducted twice. The results indicated that all of the learners emitted low rates of responding in the EXT condition, and token without backup yielded the lowest rates of any of the reinforcer components for all of the learners, indicating that tokens in and of themselves were not reinforcing. Additionally, for two of the four learners, token with backup reinforcement yielded response rates similar to that of the primary reinforcement condition, indicating strong effects of the token economy. For the other two learners, both emitted lower rates of responding in the token with backup reinforcement condition than the primary reinforcement condition indicating that the token economy was not as effective as primary reinforcement. In one case, the token economy was no more effective at increasing responding than the yoked-FR condition, indicating that the
provision of primary reinforcement on a fixed ratio schedule was just as effective. Finally, the yoked-FR component resulted in decreased responding rates among three of the four learners, the other learner had high rates of responding in this component in his second series.

Ultimately, this method of token assessment proved to be a good and fast alternative to a PR schedule for examining the reinforcing value of token economies and their various components (Fiske et al. 2020). The studies by Fiske et al. (2015) and Fiske et al. (2020) demonstrated that token systems can have similar effects to primary reinforcers for some learners, but that it may not be the case for all learners.

Variations of a Token

As was noted in the Fiske et al. (2015, 2020) studies, not all tokens have the same reinforcing effects for all the learners that use them. For some learners, the tokens may have no reinforcing effect, and the resulting token economy may have a weak reinforcing effect. Therefore, it may be important to examine possible variations of a token. A study done by Ford, McClure, and Haring-McClure (1979) compared two different types of tokens. The students from a regular education class performed a key-press task and received either generic round wooden tokens or pieces of a specific, highly preferred, jigsaw puzzle. The students in the one group received the generic tokens and the students in the other group received the puzzle pieces. Both types of tokens were traded in for food reinforcers. As the tokens were earned, the students were encouraged to put the jigsaw pieces in the puzzle and the round wooden tokens in a piggybank. When the jigsaw pieces were used as token reinforcers, the children increased responding. According to Ford et al. (1979), the jigsaw pieces were more valuable to the students. The results of this study leads one to hypothesize that the type of token used may indeed be important.
A different variation of a token comes from a study done by Charlop-Christy and Haymes in 1998 examined the use of a learner’s “obsessions” as tokens. This study was conducted to follow up on previous research about the use of aberrant behaviors such as self-stimulation and echolalia as reinforcers to increase task performance (Charlop et al., 1990). Charlop-Christy and Haymes stated, “In applied settings teachers and practitioners frequently use tokens that have deemed ‘reward’ value to children such as happy faces or Power Ranger stamps” (p. 189). Thus, in common practice, meaningless poker chips have been replaced with specific items of potential interest. In this study, Charlop-Christy and Haymes used a multiple-baseline design across children with a within-child reversal analysis to assess the differential effectiveness of two token programs: (a) typical tokens (e.g., stars) exchanged for food, and (b) object of obsession as tokens (e.g., beads, trains) exchanged for food. In order to assess the effects of these token programs on a learner’s task performance, each child participated in a 15-min work session with tasks that were selected based on their current programming. The traditional token condition served as a baseline of current task performance. The objects of obsession as tokens condition was then run to compare the effectiveness of tokens based on obsessions as reinforcers for correct task performance to the typical tokens.

The use of the obsessions as tokens was associated with the highest correct percentage on tasks and did not take any more time to deliver than food as a consequence. All of the children increased correct responding on tasks when objects of obsession were used as token reinforcers. Typical tokens resulted in decreased responding or no progress on tasks and seemed less effective than tokens based on the children’s obsessions, so the type of token did increase the child’s on task performance. These results indicate that tokens based on obsessions may serve as primary reinforcers rather than secondary reinforcers like typical tokens are. This means that the
Value of Activity-Based Token Reinforcement

token itself may be a reinforcer and not just a conditioned reinforcer and could therefore be more effective.

Carnett et al. (2014) then replicated the study done by Charlop-Christy and Haymes (1998) and expanded on it in which they investigated the use of a learner’s perseverative interests as tokens (e.g., a picture of a train). The study “compared the effects of a token economy intervention that either did or did not make use of tokens that reflected a child’s perseverative interest” (p. 369). The goal was to decrease challenging behavior and increase on-task behavior. The study compared two token economy interventions: one with perseverative interests and one without using an alternating treatments with and initial baseline design. During the baseline session, the instructors verbally prompted on-task behavior and provided praise for on-task behavior. Additionally, instructors ignored or delivered a reprimand for challenging behavior. In the token economy sessions, the non-perseverative interest tokens were pennies with a typical token board and the perseverative interest tokens were pieces of a jigsaw puzzle. Both sets of tokens could be exchanged for a small piece of food. In both token conditions, tokens were delivered contingent upon 20-s of continuous on task behavior. The results of the study demonstrated that using a learner’s perseverative interests as tokens was superior to using a token of no interest to the learner. Carnett et al. stated that the reinforcement from perseverative interest-based tokens may be more immediate, and thus more efficient than relying only on the reinforcing value of backup edibles that were only available after a number of tokens have been earned and exchanged.

These studies demonstrated that there may be a huge benefit to varying the type of token being used in a token economy. However, these studies had some limitations. In the Charlop-Christy and Haymes (1998) study, the items that were being used as objects of obsessions were
items that the learners typically did not receive in school. Therefore, the increase in correct task performance could have been due to the novelty of the items being provided in a classroom situation. Another potential limitation is that the learners were not given access to the obsessions as the backup reinforcer, they were given food instead. It may have been beneficial to examine the effects of the use of items of interest when the trade-in of these tokens results in the delivery of those items as the back-up reinforcer. These limitations make room for further research in the area of token variations.

**Current Study**

The purpose of the current study is to replicate and expand on Charlop-Christy and Haymes (1998) study on the use of obsessions as tokens. Additionally, the purpose of the study is to determine if components of current highly preferred items can be used as tokens. As seen in the study by Ford, McClure, and Haring-McClure, (1979), the value of a token or type of token matters. For example, for a learner whose current highly preferred or most reinforcing item is a puzzle, is it possible to use the pieces of the puzzle as tokens? In contrast to Ford et al.’s (1979) study, at the end of the teaching session, when all tokens (puzzle pieces) have been earned, the learner can then put the puzzle together as the token-exchange rather than earning an edible reinforcer. Using a current preferred item as a token may add more reinforcing value to the token than if a traditional token was used. This type of token is not a generalized conditioned reinforcer because it already has reinforcing value. Additionally, this may help to teach the students the concept of a token economy faster, through objects or stimuli that the student already has an established preference for. Overall, the current investigation addresses two research questions in two separate studies. Study 1 examines whether traditional tokens are themselves reinforcing and, if not, whether activities as tokens have more reinforcing value than traditional tokens.
Study 2 examines whether the use of the preferred activities as tokens leads to more accurate responding in an academic task than that observed when traditional tokens are used.

**Study 1**

**Method**

*Participants and Setting*

Two learners with autism were recruited to participate in this study. However, one of the learners exhibited an increase in challenging behavior that precluded his participation in sessions, and so was not included in the current study due to time constraints. The remaining participant was a 12-year-old male with significant developmental delays. He had minimal verbal language and some challenging behavior that included self-injury. The participant was chosen for this study based on his previous experiences with a token economy. He was nominated by his teacher who expressed concern that his existing token system was not effective. He received token training about 3 to 4 years prior to this study, though the method of token training is unknown. His classroom teachers discontinued the use of his token board about 9 months prior to this study due to concern that it was ineffective. When it was in use, he was using a traditional token board which was a small clipboard with five velcro spaces for five pennies (tokens). The participant was also chosen for this study because he had preferred items that could be used as activity-based tokens.

The participant attended a specialized school for children with developmental disabilities. Sessions were conducted in a therapy room connected to an observation room by a one-way mirror. The mirror was used to unobtrusively collect data. One experimental session was conducted a day, with 3 to 5 sessions per week. Sessions were videotaped to record additional behaviors as well as to gather additional reliability data.
**Preference Assessment**

The first part of this study assessed the reinforcing value of the learner’s current token system. The first step was to assess preferred activities that the learner could trade the tokens in for using a paired-choice preference assessment. Items in the preference assessment were chosen based on teacher and parent interview. The activities that were chosen for the assessment were: a box of stuffed animals, a box of jungle animal figures, a ball popper, a penguin racer, and a fabric dart board. The top three items from the paired-choice preference assessment were then used in a multiple stimulus without replacement (MSWO; Fisher et al., 1992) assessment to identify the most highly preferred activity prior to each of the multiple schedule reinforcer assessment (MSA) sessions. This was done in order to ensure that the learner was always earning the most highly preferred item for that session. That activity was then used as the backup reinforcer once all of the tokens were earned.

**Materials**

In traditional token board conditions, the student’s classroom token board was utilized. For this participant, as mentioned, his token board was a small clipboard with five velcro dots on it and five pennies that served as tokens. The velcro dots were for the traditional tokens to stick onto the board to indicate to the participant how many tokens he had earned and how many he had left to earn. For the activity tokens, the activities that could be chosen were based on the preference assessment which included a box of stuffed animals, a box of jungle animal figures and a ball popper. For the activity token “token board,” a clear plastic bin divided into five equal size compartments was used. For example, if the participant chose the stuffed animals, for each correct answer, one animal from the box was placed into one of the five bin compartments to indicate to the participant that he has earned one out of five tokens. Once each compartment had
a stuffed animal in it, the participant could access the whole box of stuffed animals. The activity was pre-prepared and delivered to the participant in a box to ensure that the participant had the maximum amount of time to engage with the activity.

**MSA: Traditional Tokens**

In the assessment of the traditional token system versus the activity-based token systems, the reinforcing value of tokens and the token system was evaluated using the method in the Fiske et al. (2020) study. The study used an MSA in which two or more alternating schedules were associated with a unique discriminative stimulus. The MSA quickly alternates between an extinction component and multiple different reinforcement components in order to identify the reinforcing efficacy of different reinforcers, such as tokens (Smaby et al., 2007). During this assessment, the participant was required to engage in a simple, repetitive task to gain access to various reinforcing stimuli.

The components that were assessed were (a) EXT, (b) token without backup, (c) yoked fixed ratio (FR), (d) token with backup, and (e) primary reinforcement. The EXT component was assessed in between each new reinforcement condition so that the participant began each new session with a consistent immediate history as described in Smaby et al. (2007). The different components of the multiple schedule, described below, were indicated by a different color of laminated paper, on which there are black stars (white = EXT; purple = token without backup; blue = yoked FR; orange = token with backup; pink = primary reinforcement). Prior to the prompted trials and the beginning of each component, the experimenter stated the color of the laminated paper that is associated with the given component and the instruction, “Touch stars.”

As in the Fiske et al. (2020) study, the task that was used required the participant to point to a black star (4 cm across) that is positioned on one end of a 23-cm x 36-cm laminated sheet of
paper and then to another black star at the other end of the sheet within 5 s. The participant used the same hand for a single response. This task was chosen because it minimized unintentional prompts for responding (e.g., a pile of items to be manipulated) as in Smaby et al. (2007). Component-specific reinforcement was given to the participant following each target response. The EXT component lasted for 5 min, or until the learner ceased responding for 1 min. In all of the reinforcement components, the participant was given the opportunity to respond for 1 min. Response time did not include the token delivery, exchange, or time spent engaging with the bin of preferred items; the timer was paused during these events and the sheet was covered to prevent responding. The 1 min of time during which the participant had the opportunity to engage in the target response was scored for response frequency.

Before the start of each component, described below, the experimenter ran forced exposures equivalent to the length of the participant’s token board. This allowed the participant to access to the contingency for that specific component. During the forced exposures, the experimenter presented controlling prompts and provided reinforcement that was consistent with the contingency for the next component.

**EXT.** There were no programmed consequences delivered to the participant following any target response. An EXT component was run before each of the reinforcement components.

**Traditional Token without Backup.** The experimenter used the participant’s current tokens (a penny) during this component in order to assess the traditional tokens reinforcing value. Upon completion of each target response, the experimenter placed one token on the board. Once the participant earned all of his tokens, the experimenter removed the tokens from the board without providing the backup reinforcement. When the experimenter removed the tokens, the token board was placed over the stimulus sheet to prevent the participant from responding;
the token board was moved to the side when it was time for the participant to respond again. The 1-min timer for the session was paused during token delivery (approximately 2s) or for the final token delivery, and reset of the token board (approximately 7s). The clock resumed once the experimenter presented an opportunity to respond again.

**Yoked FR.** The token board and tokens were not used, but when the participant completed the number of responses equivalent to the number of tokens on his token board, he was given 50 s to access the preferred activity. The 1-minute timer was paused while he engaged with the activity (for 50 seconds) and then began again when he was allowed to respond.

**Primary Reinforcement.** Upon the completion of the target response, the participant was provided 10 s of access to his preferred activity. The preferred activity was delivered on an FR1 schedule. The preferred activity was set up prior to the component and placed in front of the participant in order to allow the participant to have the full 10 s to engage with the activity (e.g., a puzzle with the pieces all laid out). The 1-min session timer was paused following each target response during 10-s access to the activity, and then restarted once the participant had the opportunity to begin responding again. It should be noted that while primary reinforcement refers to reinforcement that does not require conditioning (e.g., food, warmth), in this study it is used to differentiate the immediate delivery of the full activity from the delivery of conditioned tokens and backup reinforcement. This is consistent with how components were described in Fiske et al. (2020).

**Traditional Token with Backup.** Upon completion of the target response, the experimenter delivered one token to the participant to place on his token board. Once the participant had earned all of his tokens, the participant could exchange the tokens for his preferred activity. The 1-min timer was paused during token delivery, token exchange, and for
engagement with the activity. The amount of time allotted for engagement was based on the participant’s number of tokens. For example, the participant had a total of five tokens, therefore he received 10 s of engagement per token for a total of 50 s of engagement with the activity. The 1-min timer resumed when the participant had the opportunity to respond again.

**MSA: Activity-Based Token**

The next part of the study assessed the reinforcing value of the preferred activities as tokens. In this condition, everything was done in the same way as in the Traditional Token condition with the exception of the actual tokens. Once again, prior to the start of each session, an MSWO was run in order to assess activity preference. The components in this phase also remained the same, with the exception of replacing the traditional token component with the preferred activity token component. As in the traditional token condition, the components were indicated by a different colored laminated sheet of paper on which the black stars are pictured (e.g., blue = preferred activity token). The other three components remained the same including their assigned color. Once again, as in the traditional token condition, the experimenter stated the color associated with the given component before the prompted trials and again before the beginning of each component to signal the start of each session.

**EXT.** This component was run identically to how it was conducted in the Traditional Token Assessment condition.

**Activity Token without Backup.** Upon completion of each target response, the experimenter placed one token in a bin in front of the participant. The bin contained dividers equal to the number of tokens on the participant’s traditional token board (5 spots). Therefore, the participant had to earn one token to place in each compartment of the bin, when the compartments were filled, then the participant exchanged the tokens for the backup reinforcer.
Once the participant had earned all of his tokens, the experimenter removed the tokens from the bin without providing backup reinforcement. During token removal, the token bin was placed over the stimulus sheet to prevent the participant from responding; when it came time for the participant to respond again, the bin was moved to the side. The 1-min clock for the session was paused during token delivery (approximately 2 s) or for the final token delivery and reset of the token bin (approximately 7 s). The clock resumed after the experimenter presents an opportunity to respond again.

**Yoked FR.** Same as the Traditional Token condition. The reinforcer in this condition was yoked to the backup reinforcer used in the Traditional Token condition.

**Primary Reinforcement.** Same as the Traditional Token condition.

**Activity Token with Back-up.** Procedures in the activity token with back-up component are identical to the procedures in the Traditional Token condition, however for the Activity-Based Token condition, the token itself changes. During this component, upon completion of the target response, the experimenter provided the participant with one piece of the preferred activity (i.e., a small ball) as the token. These tokens were then placed in a bin that contained dividers for each item, in front of the participant. Once the participant had earned five of the pieces to the preferred activity, he could exchange the pieces for access to the preferred activity. The 1-min timer was paused during token delivery, token exchange, and for engagement with the activity. The amount of time allotted for engagement was based on the participant’s number of tokens. This participant had a total of five tokens therefore, he received 10 s of engagement per token for a total of 50 s of engagement with the activity. The clock resumed when the participant had the opportunity to respond again. The reinforcer in this condition was yoked to the backup reinforcer used in the Traditional Token condition.
Design

The overall design of this study is an alternating treatments design comparing the use of the traditional token to the activity token. The method of this assessment of traditional vs. activity-based token systems is based on the procedure in the Fiske et al. (2020) study. We evaluated the Traditional vs. Activity Token Systems by alternating the presentation of the full set of related components until the results became stable. The assessment of the reinforcing value of the tokens is based on the procedures described in Smaby et al. (2007) and Fiske et al., (2020). To further examine the different effects of the two token systems, an additional ABAB (traditional vs. activity tokens) reversal design was conducted for only the Token with Backup component using the same materials and procedures.

Reliability and Treatment Integrity

To ensure that data collection was reliable, interobserver agreement (IOA) was taken on 66.7% of sessions. Reliability on response frequency was calculated analyzing the total frequency count for two observers; the smaller observed frequency divided by the larger frequency and multiplied by 100. IOA on the frequency of responses during the assessments was an average of 98% (range, 96-100%). Additionally, to guarantee that the assessments were being run correctly and that tokens and reinforcement were being delivered as intended, experimenters were provided with a treatment integrity (TI) checklist. The TI checklist described the steps for conducting the assessment in detail and how and when to provide reinforcement. The TI checks were conducted for 17% of sessions and yielded 100% integrity.

Results

Preference Assessment
A paired-choice preference assessment was conducted with the participant prior to the reinforcer assessments. The five items that were used in this assessment were: animal figures, stuffed animals, a ball popper, a dart board, and a penguin racer. Figure 1 shows the results of the preference assessment. The preference assessment was run three separate times in order ensure that the learner chose the most preferred items consistently over time. After three sessions, the top three items were the animal figures, the stuffed animals, and the ball popper. The participant chose the animal figures an average of 6.67 times, he chose the stuffed animals and the ball popper an average of 4.33 times. The participant chose the penguin racer an average of 3 times and the dart board an average of 2 times. The top three items were used in subsequent MSWO preference assessments prior to running each reinforcer assessment to ensure that the participant was working for his most preferred reinforcer in each session. Throughout all of the MSWO preference assessments, the participant consistently chose to work for the ball popper toy, so that was used as the backup reinforcer during all conditions and the balls were used as the tokens in the activity token conditions.

Figure 1. Results of the paired-choice preference assessment for Participant 1. The average of each item is represented by the black bar with white dots.
**MSA: Traditional Tokens**

Figures 2 and 3 show the results of the reinforcer assessment for Participant 1. Figure 1 displays the data as depicted in Fiske et al. (2020), and Figure 2 displays the data in a more traditional alternating treatment design presentation. As in Smaby et al.’s method (2007), only the last minute of the EXT component is depicted in each graph. The learner did not respond in any of the EXT components in the last minute across any phases.

*Figure 2. Results of the multiple-schedule reinforcer assessment for Participant 1. The reinforcement components are represented by the shaded bars.*
During the traditional token conditions, the participant engaged in the highest rate of responding during the primary reinforcement component with an average of 19.3 responses per min. The participant responded 32 times in the first primary reinforcement component, 2 times in the second and 25 times in the third. This component was always run last in the sequence and it should be noted that the participant fell asleep during the second traditional token condition which is why the rate of responding is so much lower than the other two conditions.

During the traditional token phase, the participant engaged in the lowest rate of responding on average during the Yoked FR component. In this condition, the participant had to engage in 5 correct responses before he would gain access to the preferred reinforcer. The learner responded an average of 0.67 responses per minute. During the first Yoked FR component of the traditional token condition, the learner did not respond at all, and during the second and third conditions he responded one time in each. Aside from the reinforcement delivered during
prompted trials, the learner did not access reinforcement during these sessions because he produced fewer than five responses. These results indicate that the participant was not motivated to engage in the response on a highly delayed schedule of reinforcement (FR5). Additionally, the token system does not appear to be beneficial just because it delivers the backup reinforcer on an FR5 schedule; it is really the tokens that have the additive value.

The participant displayed variable rates of responding during Token without Backup component. During this component, the learner did not receive a backup reinforcer and only received the tokens. Overall, the participant responded an average of 5 times per minute during this component. During the first traditional token condition, the participant did not respond. In the second condition, he responded 10 times, and in the third condition he responded 6 times. These results indicate that the traditional tokens did not hold enough value for the participant to engage in the response for just the tokens on their own.

The participant again engaged in lower rates of responding, relative to primary reinforcement, during the Token with Backup component. During this component, the learner gained access to the backup reinforcer after earning five tokens. In this condition, the participant engaged in an average rate of 1 response per minute. During the first Token with Backup component of the traditional token condition, the participant responded three times. In the second and third conditions, the participant did not respond. This suggests that, even when tokens and a backup reinforcer are in place there is still not enough value in the token economy for the learner to be motivated to engage in the response to access the backup reinforcer.

**MSA: Activity Token Condition**

Similar to the traditional token condition, the participant again engaged in the highest rate of responding during the Primary reinforcement component with an average of 36 responses per
minute. The participant responded 32 times in both the first and third Primary components of the activity token conditions and 44 times in the second activity token condition. The participant’s rate of responding during this component in the activity token condition was even higher than that observed during the traditional token condition.

Once again, this participant produced the lowest rates of responding during the Yoked FR component. The average rate of responding during the Yoked FR component of the activity token condition was approximately 3 per min. During the first and second Yoked FR components, the participant responded one time in each. During the third condition, the participant engaged in 7 responses. Aside from the prompted trials, this third component is the only condition in which the participant met criteria to earn reinforcement. Overall, and similar to that observed in the traditional token phase, this component has demonstrated that the participant was not motivated to engage in a response for the backup reinforcer on a delayed schedule (FR5) when no tokens were provided.

As in the traditional token condition, the participant again had variable rates of responding during the Token Without Backup component. The participant’s average rate of responding during this component was slightly higher than the traditional tokens with approximately 6.7 responses per min. During the first Token Without Backup component of the activity token condition, the participant engaged in one response. In the second and third conditions, the participant produced higher rates of responding of with 15 responses in the second condition and 5 responses in the third condition. While the rates of responding in this condition were still variable, they were also higher than were observed in the traditional token condition. This indicates that the activity tokens, on their own, may hold more reinforcing value than the traditional tokens, though performance under this condition was inconsistent.
In comparison to the traditional token conditions, the participant displayed much higher rates of responding during the Token with Backup component in the activity token conditions, with an average of 17 responses per minute. During the first and second Token with Backup components of the activity token condition, the participant responded 20 times in each component. In the third component, the participant responded 11 times.

**MSA: Traditional vs. Activity Token Pairwise**

To further demonstrate the difference in the rate of responding between the traditional token and the activity token, an ABAB reversal was conducted utilizing only the EXT and Token with Backup reinforcement components. Figure 4 shows the results of a reversal design comparing the rates of responding under traditional token and activity token conditions, specifically when the backup reinforcer was provided for the completion of the token board. Similar to the previous MSA sessions, the participant did not respond during the last minute of the EXT component.

Across both traditional token conditions, the learner averaged approximately 3 responses per minute with a range of 1 to 5 responses. In the activity token conditions, the learner emitted higher rates of responding. The first activity token condition averaged approximately 19 responses per minute, with a range of 15-21 responses and the second activity token condition averaged approximately 15 responses per minute, with a range of 0-25 responses. During the second activity token condition, the learner did not respond at all during the first session. This could have been due to carryover from the previous token without backup session which was run right before this session.
Discussion

In sum, the traditional tokens led to low rates of responding across all conditions, regardless of backup reinforcement. The primary reinforcement components demonstrated that the backup reinforcer was a highly preferred and reinforcing item, though only on an FR1 schedule and not on an FR5 schedule. The tokens, however, were not motivating on their own or in combination with backup reinforcement in the full token economy. This indicates that for this learner, the traditional tokens hold little value and do not appear to function as a generalized conditioned reinforcer.

Overall, the rate of responding for each component in the activity token condition was consistently higher than in the traditional token conditions. These results demonstrate that the activity tokens, paired with the backup reinforcer, led to much higher rates of responding than
that observed in other components, which indicates that the activity tokens (when paired with a backup reinforcer) hold significant reinforcing value. The value of the token economy exceeds that of merely delivering the backup reinforcement on an FR5 schedule, indicating that—unlike traditional tokens—activity-based tokens have additive value within the token economy for this learner.

The pairwise assessment comparing the traditional tokens with backup and the activity tokens with backup helped to further demonstrate the difference between the traditional tokens and activity tokens. During the activity tokens with backup condition, the learner consistently responded at a much higher rate than in the traditional tokens with backup condition, indicating that the activity tokens with backup held more reinforcing value. In order to determine if the effects of the activity tokens would persist with more difficult tasks and how they would affect skill acquisition, a second study was conducted.

**Study 2**

**Method**

**Participants and Setting**

One learner with autism participated in this study. The participant for Study 2 was the participant who completed Study 1 for whom it was determined that a) traditional tokens were not effective reinforcers and b) activity reinforcers were effective reinforcers. All sessions were run in the same therapy room as Study 1, which was connected to an observation room by a one-way mirror. The mirror was used to unobtrusively collect data. One to two experimental sessions were presented a day, with 3 to 5 sessions per week. As in Study 1, sessions were videotaped to record additional behaviors as well as to gather additional reliability data.

**Preference Assessment**
As in study one, the first step of Study 2 was to assess preferred activities that the learner could trade the tokens in for. Items in the preference assessment were the top three items that were chosen in the original preference assessment. The most highly preferred activity for the participant was determined using a MSWO preference assessment conducted before reinforcement sessions. That preferred activity was then used as the back-up reinforcer once all of the tokens were earned. An MSWO was also run prior to each session in order to ensure that the activity was still highly preferred by the participant.

Task and Dependent Variable

The selected task was dependent upon the participant’s programming. The task that was selected had been discontinued due to the learner performing at an average of 50% independence in the classroom. The task was a counting task in which the learner was given a number line and red and yellow counters with the instruction, “Count [insert specified number].” The numbers 1 through 10 were randomized for the learner to count. Sessions were run in blocks of 10 trials so that each number was presented at least once in each session. Task performance was recorded by marking a plus (+) for a correct response or a minus (-) for an incorrect response. A correct response was defined as the learner accurately counting out the specified number of counters by placing them on the number line. An incorrect response was defined as the learner providing no response within 5 s of the instruction or inaccurately counting out the specified number of counters. Correct independent performance was then converted to a percentage by dividing the number of correct, independent responses by the total number of trials and multiplying by 100. This program was run identically to how it was conducted in the classroom, with the exception of a change to the error correction. In this study, an error correction was only used following
three consecutive errors, while the original program provided an error correction after each incorrect response.

Interobserver agreement (IOA) was taken on 60% of sessions. Reliability on task performance was calculated by dividing the number of agreements for both incorrect and correct responses by the total number of agreements plus disagreements, then multiplying by 100. Average interobserver reliability for correct and incorrect responses was 100%. Treatment integrity (TI) was based on the participant’s program and assigned task. TI checks were done to ensure that the participant’s program was being run as it was supposed to be, data were being recorded correctly, and reinforcement (a token) is being given appropriately. TI checks were conducted on 20% of sessions and yielded 100% integrity.

**Procedure**

The participant was presented with the counting task with the numbers in a random order of across sessions. Throughout all trials, the experimenter provided praise ("That's right!" "Good job.") and a token for each independent correct response. After an incorrect response or failure to respond within 5 s, the experimenter stated "Let's try again" or "No, that's not correct." After three consecutive incorrect responses, the experimenter provided a correction trial (e.g., count to 5, with a gesture to each counter), praise, and a token reinforcer contingent upon correct responding. Ten trials were run per session. Correction trials were not included in the data analysis.

Once the participant earned the number of tokens on his token board (5), they were traded in for the backup reinforcer (i.e., ball popper). Criterion for success in this program was at least 80% independent correct responding on two consecutive sessions.
**Traditional Token.** The first step in this procedure was to determine the preferred activities (e.g., ball popper, stuffed animals) through a preference assessment. The participant participated in an MSWO preference assessment with the top three items from the previous study. The item that the participant selected most often was used as the participant’s backup reinforcer activity. The participant then participated in work session as described above. For each correct response, the participant was given his typical token. The token board was placed next to him so when he responded correctly, the token could easily and quickly be placed on the board. Incorrect responses were addressed as previously described with a “No” or “Try again” and no token was provided. After earning all five tokens the participant could trade those tokens in for the backup reinforcer. The backup reinforcer the highly preferred activity from the MSWO. The participant was then able to engage with the item for 10-s for each token earned (e.g., 50 s for a 5-token board).

**Activity as Tokens.** This condition examined the relative effectiveness of pieces of a preferred activity as a token as a reinforcer for correct task performance. Components of the preferred activity that was identified in the preference assessment described above were used as the tokens in this procedure. Activity Token sessions were conducted as in the Traditional Token condition. During this condition, contingent upon the correct response, the participant was given a component of his preferred activity as a token. The token board—a bin with five partitioned compartments—was placed next to the participant so that when he responded correctly, the token was easily and quickly placed on the board. Incorrect responses were addressed as previously described with a “No” or “Try again” and no token was provided. After earning all five tokens the participant was provided access to the entire preferred activity. The participant was then able to engage with the item for 10-s for each token earned (e.g., 50 s for a 5-token board).
**Design**

The design of this second study replicated the Charlop-Christy and Haymes (1998) study in which the use of the pieces of a preferred activity as tokens was compared with the use of the typical tokens. An ABAB reversal design was used to assess the differential effectiveness of two token systems: (a) traditional tokens (e.g., pennies) traded in for the preferred activity, and (b) preferred activity pieces as tokens (e.g., balls) traded in for access to the activity.

**Results**

Figure 5 shows the results of the participant’s performance when using the traditional tokens versus the activity tokens. When using the traditional tokens, the learner responded correctly on an average of 50% of trials. During the first traditional token condition, the participant’s accuracy of responses was on an increasing trend until it peaked at approximately 70% correct and then declined again to 50%. His overall performance in the first condition was variable, with a moderate level of performance.

When the activity tokens were introduced, the participant’s level of performance immediately increased and he responded correctly on approximately 85% of trials, followed by an increase to 90% correct across two consecutive sessions. During the reversal to traditional tokens, the participant’s accuracy dropped back to 70% before evidencing a decreasing trend to 50% correct in the third session of the phase. When the activity tokens were reintroduced, the learner’s accuracy immediately increased again to 96% correct responding, followed with 100% correct responding during the final two sessions.
Figure 5. Results of the ABAB reversal design comparing the accuracy of responses at independent when using the traditional tokens versus the activity tokens.

Discussion

In Study 2, the learner’s accuracy of responses greatly increased when the activity tokens were introduced. Additionally, the learner clearly had a decrease in performance when the activity tokens were removed and replaced with the traditional tokens. It should also be noted that in the two activity token conditions, the participant was able to reach mastery criterion for the program, which was defined as at least 80% correct across three consecutive trials. In contrast, mastery criterion was not met in the traditional token condition. Overall, the activity tokens lead to a better performance on the task than did the traditional tokens.

General Discussion
Study 1 replicated and expanded upon the use of the MSA to evaluate the reinforcing effects of tokens, by evaluating the effects of a traditional token and an activity token. Similar to Smaby et al. (2007), this study determined that the MSA was a sufficient and convenient method to identify items that function as reinforcers for learners with ASD. As mentioned in the Fiske et al. (2020) study, the use of this method allowed rapid alternation between extinction components and multiple reinforcement components to analyze the potency of each supposed reinforcer in comparison to an extinction control. The results of this study also expanded on the Fiske et al. (2020) study by comparing two different types of tokens. This study demonstrated that when the activity tokens were used and paired with the backup reinforcer, they had more reinforcing value than did the traditional tokens when paired with the backup reinforcer. However, without the backup reinforcer, the reinforcing value of both types of tokens, especially the traditional tokens, greatly decreased.

The primary reinforcement component in both conditions allowed a comparison with the token system, which suggested that the full token system, when activity tokens were used, was nearly as effective as the item alone in increasing response rates. As mentioned previously, primary reinforcement, in this study, is referring to the whole activity chosen by the learner and not some type of unconditioned reinforcement. The primary reinforcement in both conditions demonstrated that the learner will engage in a high number of responses for the preferred item delivered on an FR1 schedule. The results of the MSA show that the learner engaged in similarly high levels of responding in the activity token with backup component to that of the primary reinforcement component, indicating that the delivery of the balls (when paired with the backup reinforcer of the ball popper) were nearly as reinforcing as the ball popper itself.
This study also replicated and expanded on the Charlop-Christy and Haymes (1998) study by comparing the effectiveness of the traditional tokens and the activity tokens when used as reinforcers in the participant’s current programming. The Charlop-Christy and Haymes (1998) study found that when objects of obsession were used as tokens, all of the participants had increased levels of responding and met criterion for success quicker than they did with traditional tokens. Similar to the Charlop-Christy and Haymes (1998) study, the activity tokens produced more accurate responding from the participant than did the traditional tokens. The participant was also able to meet mastery criterion on the task when using the activity tokens as opposed to the traditional tokens. Again, for this study, mastery level was defined as an average of 80% correct or higher across three consecutive sessions. In this study, the participant was able to surpass mastery criterion in both activity token phases. Additionally, when using the traditional tokens during the reversal condition, the learner’s responding rapidly decreased to levels below mastery. Importantly, the token system operated in the same way in both conditions, in that the backup reinforcer of the ball popper was delivered contingent upon the delivery of five tokens. The difference in accuracy of responding across the two conditions indicates that the type of token used in the token system significantly impacted the participant’s performance.

**Value of Tokens**

Previous research has explained that tokens are conditioned stimuli that can be used to reinforce behavior when delivered following the response (Hackenberg, 2009). Tokens are established as conditioned reinforcers through their relationship to other reinforcers. The traditional tokens used in this study also had to be conditioned at one point, essentially teaching the learner that the token itself will eventually lead to the backup reinforcer. While little is known about this specific learner’s token training history, his teachers reported that the tokens
had been repeatedly paired with his iPad and other highly reinforcing items. For example, every
time the learner engaged in the desired behavior, he would obtain a token that could be
exchanged for the highly preferred item. His teachers then reported that over time, the learner
had to earn more and more tokens to eventually gain access to the highly preferred item.
However, for this participant, his teachers were concerned that the traditional tokens never fully
functioned as a conditioned reinforcer and primary reinforcement always led to more accurate
and frequent responding. This is demonstrated in this study by the learner’s performance during
the traditional token conditions, in that when using the traditional tokens with the backup
reinforcer, his frequency of responding was much lower than that observed in the primary
reinforcement condition (backup reinforcer provided for every response) and even lower, in
some sessions, than that observed under the Yoked FR condition (backup reinforcer provided
every five responses). As demonstrated in the Fiske et al. (2015, 2020) studies, token systems are
not always effective and the token economy may have little additive value beyond that of the
backup reinforcer. This means that a traditional token economy will only work when the tokens
can be exchanged for a highly preferred or valuable backup reinforcer. For this learner, his
traditional token economy did not appear to have any reinforcing value for him as he was not
responding as often during the MSA and his accuracy was below mastery during Study 2. This
lack of value could be because the tokens were not trained well originally or because they had
not been used recently.

In contrast to traditional tokens, in this study, the activity tokens may already be
conditioned reinforcer because they are a component of a larger, highly preferred activity. In
Study 1, the learner responded to the activity tokens with backup right away, without any
training. The only exposure the learner had to the activity tokens was during the prompted trials
prior to beginning the session. Aside from those trials, the learner did not receive any token training with the activity tokens. The activity tokens with backup then led to much higher levels of responding than did the traditional tokens. This is also demonstrated during the second study when comparing the effects of the traditional tokens versus the activity tokens on the accuracy of the participant’s responding. The activity tokens led to the highest level of performance and helped the participant to reach mastery criteria while the traditional tokens did not. The naturally conditioned value of the activity token could have been the reason for the sharp increase in the accuracy of the learner’s responding during the assessment of the effects on task performance.

One note of caution, however. In the MSA, the activity tokens did not hold value on their own when backup reinforcement was used. As a result, clinicians must not assume that they are reinforcing each response when they deliver activity tokens. They should monitor acquisition closely and consider alternative forms of reinforcement if progress is not observed.

An additional consideration from the Charlop-Christy and Haymes (1998) study implies that previous research on stimulus novelty may have something to do with the efficacy or value of the activity tokens. Those studies reported that learners tend to visually orient toward stimuli more frequently and for longer periods of time when those stimuli are more novel or more meaningful (O'Connor & Hermelin, 1967; Young, 1969). Additionally, another study by Trabasso and Bower (1968) determined that learning is more likely to be enhanced when stimuli are salient or novel. In this study, and in the Charlop-Christy and Haymes study, activity tokens or tokens based on obsessions were both novel because they were not typically provided in the learning environment. Similar to the Charlop-Christy and Haymes (1998) study, it’s possible that the learner attended more to the activity tokens just because they were novel to that setting. However, the results of this study, along with the results of the studies done by Charlop-Christy
and Haymes (1998) and Carnett et al. (2014) suggest that while the token may be novel, it most likely also holds a higher reinforcing value than that of a traditional token and more effectively reinforces behavior in skill acquisition.

**Conditioning Tokens**

The schedule of reinforcement, especially during early learning with young children, is crucial to consider and plan when designing an intervention. When teaching new behaviors, the schedule of reinforcement tends to be a FR1, to establish a clear contingency of reinforcement and strengthen the response by reinforcing each correct response (Barton, Lawrence, & Deurloo, 2012). Once the behavior is learned, the schedule can be faded out to provide reinforcement less frequently. However, providing reinforcement on this dense of a schedule can lead to satiation (Rincover & Newsome, 1985) and a loss of instructional time (Austin et al., in preparation). Tokens can help to delay that reinforcement and combat satiation or the loss of instructional time once they are conditioned, but conditioning the tokens can take time (Hackenberg, 2009).

Leaf, McEachin, and Taubmann (2012) developed one method for training tokens. Leaf and colleagues’ recommendation for token training is to start with delivering tokens for a simple behavior (e.g., the learner placing his or her hands in the lap) and gradually expanding response requirement complexity. Additionally, they recommended starting with the learner initially only earning one token and then expanding to more tokens before an exchange occurs. Essentially, the tokens are given immediately after the target behavior occurs and gradually become associated with later delivery of reinforcement. Therefore, token economies act as a bridge between the occurrence of a target behavior and the delivery of the reinforcer as well as between the setting of the target behavior and delivery of the reinforcer (Matson, Estabillo, & Matheis, 2016). As previously mentioned though, the tokens themselves have no intrinsic reinforcing value,
therefore whatever value a token has is established through relations with other reinforcers, both unconditioned (e.g., food) and conditioned (e.g., money; Hackenberg, 2009). Hackenberg goes on to explain that initially, tokens are introduced with frequent exchange periods and a highly preferred item throughout most token-reinforcement contingencies, ensuring repeated preferred item-token pairings or reinforcement-token pairings. These pairings allow the learner to recognize the value of the token and what that token represents before the number of responses (and therefore tokens) required to access back-up reinforcer is increased.

For the learner in this study, the traditional tokens held little reinforcing value, which is problematic as they offer little to no reinforcement when delivered contingent upon skills. As an FR1 is frequently desirable for establishing new skills, the ineffectiveness of the traditional tokens in this study indicates the need for the tokens to be re-trained by pairing them repeatedly with other known reinforcers. This would have required a process such as that described above, implemented across days or even weeks.

In contrast, very little training was needed in order to initiate the use and effectiveness of the activity based token. The learner had one exposure session that consisted of five prompted trials in which he was taught the contingency that responding to the task five times would earn him five balls, and then once he had all 5 balls, he would get the backup reinforcer. The tokens may have held value without conditioning because of their history of pairing with the activity reinforcer. Relatedly, the activity tokens may have more effectively signaled to the learner what was going to be earned (i.e., the activity they come from) whereas generalized tokens do not provide a visual cue of what is to be earned.

Due to the fact that so little training was needed, the activity tokens may help to eliminate the need for the high frequency of token-reinforcement pairings. The present study demonstrated
that the activity tokens have reinforcing value without any prior training, and may have promised a more dense schedule of reinforcement than did traditional tokens. Therefore, using these activity tokens can allow the instructor to provide frequent reinforcement without the fear of satiation or the loss of instructional time while also ensuring that the learner continues to engage in frequent and accurate responding. This schedule of reinforcement also may be ideal for those young learners who require denser schedules of reinforcement in order to learn a novel skill because they are still being reinforced on an FR1 schedule.

**Generalized Conditioned Reinforcers**

Previous research has also indicated that token reinforcers bridge the gap between the behavior and the delay of a back-up reinforcer, because the token has become a generalized conditioned reinforcer (Bonfonte, Bourret, & Lloveras, 2020). “Generalized” means that the tokens can be exchanged for any item of the learner’s choosing. Kazdin and Bootzin (1972) cite many different advantages to using tokens or other generalized conditioned reinforcers mainly being that they can (a) bridge the delay between target response and backup reinforcer delivery, (b) be delivered at any time, (c) maintain responding over extended periods of time until backup reinforcers are available, (d) be delivered without interrupting sequences of responses, (e) may be less sensitive to the effects of satiation, and (f) can be associated with a variety of backup reinforcers.

In this study, the traditional tokens could be conceptualized as putative generalized token reinforcers. Previously, the participant in this study was earning traditional tokens to exchange them for an iPad or an edible reinforcer. However, activity tokens do not act as generalized conditioned reinforcers, as they can only be exchanged for the one activity of which they are components. Therefore, while the activity token does not need to be conditioned in order to
signal reinforcement, it can also only be used for the one activity. The tokens will not translate to other activities. This presents some challenges to implementation. In the current study, the type of activity that was used in this study was easy to deliver in terms of both the tokens and the activity. The toy that was used was one piece that could be slid back and forth across the table when the learner earned it. Some learners may enjoy more extensive activities that are not so easily delivered and cleaned up. Additionally, not all activities have clear components that can be used as tokens, such as a single item like an iPad, which can make it challenging to come up with highly preferred activities to use with activity tokens. Further, because the learner may not want to work for the same item all day, every day, multiple activities that can be used as tokens would need to be available for the learner to choose from. While these constraints can be seen as a limitation of this reinforcement system, the fact that the activity tokens do not need to be conditioned may be a benefit that outweighs its limitations.

As a potential future direction, the activity tokens may aid in the process of training generalized conditioned reinforcers in the traditional token training process. Perhaps a learner who has first been introduced to activity tokens can then transition to traditional tokens by pairing the traditional token (e.g. a penny) with an activity token (e.g. a ball) and then fading the activity tokens out to create more effective generalized tokens over time.

**Clinical Implications**

Ultimately, activity tokens can and should be utilized for a number of reasons. As with the participant in this study and participants in the Fiske et al. (2015, 2020) studies, some learners do not respond well to the traditional token system. In this study, the task that was used to examine the effects of the token systems on accuracy was initially discontinued in the classroom because of the learner’s poor performance. However, when it was tested during this
study, his performance greatly improved when the activity token was used. For learners that are struggling with programs, it may be the case that their reinforcers are ineffective, and might benefit from a different system. In this case, the participant’s teacher made the decision to discontinue his program when just altering the reinforcement system was effective in helping the student reach mastery. Activity tokens could prove to be a viable alternative to the traditional token as they are just as easy to deliver, but seem to hold more reinforcing value and therefore lead to better overall performance on tasks.

Additionally, in the Charlop-Christy and Haymes (1998) study, they found that when using the traditional tokens, it led to an increase in challenging behavior as compared to when objects of obsession were used as tokens. This could be because when the participants were earning the obsessions as tokens, the novel stimuli were distracting from challenging behavior. In the present study, challenging behavior was not measured, but future research should examine and compare the effects of the traditional token system versus the activity token system on challenging behavior during instructional time.

Another reason to utilize the activity tokens is as previously mentioned, the activity tokens can also aid in the token training process and bridge the gap between reinforcement and conditioning a traditional token. The learner in this study did not need to be taught that the activity token was going to be traded in for backup reinforcement because the token itself may have already had value to the participant, because of its association with the activity. This could be especially helpful for the young learners who require dense schedules of reinforcements in order to learn new skills. Young learners are often reinforced on an FR1 schedule which takes away from instructional time and can lead to satiation. Tokens could be used to help in delaying reinforcement for those learners, but as it has been shown, tokens have to be conditioned via
frequent token-reinforcement pairings. Additionally, token training for young learners may not be ideal because the skills they are learning such as sitting and attending need to be taught before token training can begin. Therefore, utilizing the activity tokens in this training process will help to provide frequent reinforcement and eliminate the need for formal token training.

**Limitations and Future Directions**

The results of this study should be considered in light of a few limitations. First, there was only one participant involved in the study. Only having one participant, with his own unique history with token economies, makes it difficult to compare and generalize the effects the tokens may produce for another student. Therefore, while the activity token system worked for this participant in particular, there is no guarantee that it will work for other learners. Future research should examine the effects of the activity tokens with learners of different ages, different levels of ability and different histories with tokens.

As mentioned previously, little is known about this learner’s history with tokens and his training with tokens. The information that was gathered about this learner’s history with tokens was from his current classroom teachers, who were not his teachers when his token training began. It is not clear that if when his tokens were trained, they were more potent and their value decreased over time. There is also no information on how exactly the tokens were originally trained and if that training was sufficient for the learner or not. Obtaining this information may have aided in understanding why exactly the traditional tokens were not as effective for this learner.

Another limitation is that when testing the effects of the two token systems on the participant’s accuracy, the study did not examine the effects of primary reinforcement. During the MSA, the primary reinforcement component led to the highest rates of responding across
both the traditional tokens and the activity tokens. For Study 2, the effects of primary reinforcement were not tested. While it was not necessarily possible for the participant to do any better than he did with the activity tokens, as he met mastery criteria, we do not know what acquisition would look like under a known dense schedule of reinforcement.

There are a few areas of this study that future research could focus on. While this study sought out participants with token systems that were ineffective, future studies could examine the effects of the activity tokens with a more successful traditional token economy. This may help to further demonstrate the difference of the effects of both systems. Additionally, as mentioned earlier, future studies could test the use of activity tokens as a first step in the token training procedure to determine if the activity tokens will lead to quicker training to the subsequent use of traditional tokens alone.

**Conclusion**

This study replicated and expanded upon the use of the MSA to evaluate the reinforcing effects of tokens (Fiske et al., 2020), by evaluating the effects of a traditional token and an activity token. Additionally, this study also replicated and expanded on the Charlop-Christy and Haymes (1998) study by comparing the effects of traditional tokens versus activity tokens with the participant’s current programming. While previous research demonstrates the utility and efficacy of a traditional token system, they are not always the best option for a learner with ASD (Charlop-Christy & Haymes 1998; Fiske et al., 2015, 2020). As shown in this study, it is important to evaluate the type of reinforcement system that is being used for a learner because it can change the way a learner performs and learns. Overall, unlike traditional tokens, the activity tokens did not require any training and significantly increased the learner’s performance on tasks.
Value of Activity-Based Token Reinforcement

References


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Doi:10.1002/bin.242


Appendix A

PARENTAL PERMISSION TO PERMIT CHILD
TO TAKE PART IN RESEARCH

TITLE OF STUDY: An Evaluation of an Activity-Based Token Economy for Learners with Autism Spectrum Disorder

Principal Investigator: Isabella Massaro, B.A.
The information in this consent form will provide more details about the research study and what will be asked of your child if you permit him/her to take part in it. If you have any questions now or during the study, you should feel free to ask them and should expect to be given answers you completely understand. After all of your questions have been answered and you wish your child to take part in the research study, you will be asked to provide oral consent. You are not giving up any of your child’s legal rights by permitting him/her to take part in this research or by providing oral consent.

Who is conducting this research study?
Isabella Massaro is the Principal Investigator of this research study. A Principal Investigator has the overall responsibility for the conduct of the research. However, there are often other individuals who are part of the research team.
Isabella may be reached at 848-932-4500 or irm17@gsapp.rutgers.edu.
The Principal investigator or another member of the study team will also be asked to complete this informed consent. You will be given a copy of the completed consent form to keep.

Why is this study being done?
The Douglass Developmental Disabilities Center provides intensive behavior analytic instruction to learners on the autism spectrum. Part of this instruction includes providing learners with reinforcement when they complete a task. Sometimes, this reinforcement is given in the form of a token economy. While traditional token economies work for many students, some students do not benefit from them. Using pieces of a student’s highly preferred activity, such as puzzle pieces or Legos, as tokens may be more effective for some students. This study will evaluate the benefit of using the pieces of a preferred activity in a token economy as an alternative to the traditional token economy.

Who may take part in this study and who may not?
School-aged children who attend the Douglass Developmental Disabilities Center with autism between the ages of 5 and 21 years may take part in this study. The study will be open to learners who have an existing token economy in place.

Why has my child been asked to take part in this study?
Your child is being invited to take part in this study because they are a student at the Douglass Developmental Disabilities Center aged between 5 to 21 years old, have a diagnosis of autism spectrum disorder, and use a token economy system in the classroom. Your child’s classroom
teacher and board certified behavior analyst are interested in learning whether an activity-based token economy system may be effective for your child.

**How long will the study take and how many subjects will take part?**
Approximately 2-3 students will take part in this study. The assessments of the different components of a token economy should take approximately 8-12 sessions per child, and take approximately 30-60 minutes per session with 2-minute breaks in between sessions. The comparison sessions between the two different token economies will be approximately twenty 15-minute work sessions, run 3-5 days per week scheduled in coordination with each student’s teacher. Overall, each student’s participation should last about 3 months.

**What will my child be asked to do if s/he takes part in this study?**
During a normal school day, your child will be asked to do preference assessments in which they will choose their most preferred activity to engage with. They will also be asked to participate in reinforcer assessments in which they will do a simple task in order to gain access to tokens and/or their preferred activity. When the reinforcer assessments are complete, your child will be asked to do previously mastered tasks to access tokens.

**Are there any benefits to my child if s/he takes part in this study?**
The benefits of your child taking part in this study may be the identification of a token economy system that maximizes your child’s responses during work sessions.

**What are my alternatives if I do not want my child to take part in this study?**
Your alternative to taking part in the research study is not have your child take part in it. If you choose to not participate in the study, there will be no consequences and no impact on your child’s learning at the DDDC.

**How will I know if new information is learned that may affect whether I am willing to allow my child to stay in the study?**
During the study, you will be updated about any new information that may affect whether you are willing to allow your child to continue taking part in the study. If new information is learned that may affect your child after the study is completed, you will be contacted.

**Will I receive the results of the research?**
The Principal investigator will share the results of the assessments with you after your child has completed the full token economy evaluation.

**Will there be any cost for my child to take part in this study?**
There is no monetary cost for your child to take part in this study. Your child may encounter minimal stress during instructional sessions, but this is not expected to exceed the stress experienced during typical daily instructional sessions in the classroom.

**Will my child be paid to take part in this study?**
Your child will not be paid to take part in this study.

**How will information about my child be kept private or confidential?**
All efforts will be made to keep your child’s personal information in the research record confidential, but total confidentiality cannot be guaranteed. The primary researcher will only use
your child’s initials on data sheets to track of their individual responses. All data collected during
your child’s sessions will be de-identified and entered to an Excel file without any personal
identifiers. All data sheets or computer files that contain identifying information will be kept in a
locked filing cabinet or in a password-protected computer accessible only by the research team.
Recordings of sessions will be stored on Rutgers’ HIPAA-compliant Microsoft Teams and made
available only to those involved in the study. The recordings will be deleted when the study has
been concluded.

What will happen to my child’s information collected for this research after the study is
over? The results of the study may be shared at conferences or in a publication. If the results of
the study are shared, pseudonyms will be used. The identity of your child will not be shared.

What will happen if I do not wish my child to take part in the study or if I later decide that
I do not wish my child to stay in the study?

It is your choice whether your child takes part in the research. You
may choose to have your child take part, not to take part or you may change your mind and
withdraw your child from the study at any time. If you do not want your child to enter the study
or decide to stop taking part, their relationship with the study staff will not change, and s/he may
do so without penalty and without loss of benefits to which your child is otherwise entitled.

Who can I call if I have questions?

If you have questions, concerns, problems, information or input about your child taking part in
the research or if you feel your child may have suffered a research related injury, you can contact
the Principal Investigator, Isabella Massaro, at 848-932-4500 or irm17@gsapp.rutgers.edu. You
may also contact my advisor, Dr. Kate Fiske, at 848-932-4500 or kfiske@rutgers.edu.

If you have questions, concerns, problems, information or input about the research or would like
to know more about your child’s rights as a research subject, you can contact the Rutgers IRB
Director at: Arts and Sciences IRB, 335 George St., Liberty Plaza Ste. 3200, New Brunswick, NJ
08901 (732) 235-2866 or the Rutgers Human Subjects Protection Program at (973) 972-1149,
email us at human-subjects@ored.rutgers.edu or write us at 65 Bergen Street, Suite 507, Newark,
NJ 07107.

Will I be able to review my child’s research record while the research is ongoing?

Because the information gathered in individual sessions is not meaningful until the full
assessments are completed, we are not able to share information in the research records with you
until the study is over.

Do I have to give my permission?

No. You do not have to permit use of your child’s information. But, if you do not give
permission, you and your child cannot take part in this study.

If I say yes now, can I change my mind and take away my permission later?

Yes. You may change your mind and not allow the continued use of your child’s information and
to stop taking part in the study at any time. If you take away permission, your child’s information
will no longer be used or shared in the study, but we will not be able to take back information
that has already been used or shared with others. You may also withdraw your consent for the
use of data already collected about your child, but you must do this by writing to Isabella Massaro, Douglass Developmental Disabilities Center, 151 Ryders Lane, New Brunswick, NJ 08901. Your relationship with the study staff will not change, and you may do so without penalty and without loss of benefits to which you are otherwise entitled at the DDDC.

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**PARENTAL PERMISSION FOR CHILD**

**Oral Consent Questions**
Do you understand what has been discussed?
Have all of your questions about this form and study been answered?
Do you agree to have your child take part in this study?

Child Name:
Parent Name:
Date of Consent:
Time of Consent:
Name of Person Obtaining Oral Parental Consent:

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**ADDENDUM: CONSENT TO AUDIO-VISUALLY RECORD SUBJECTS**

You have already agreed to have your child take part in a research study entitled, An Evaluation of an Activity-Based Token Economy for Learners with Autism Spectrum Disorder, conducted by Isabella Massaro. We are asking your oral consent to allow us to both audio and videotape your child as part of the research. Participation in the study requires consent to be recorded.

The recordings will be used for analysis by the research team and for educational purposes.

The recorded remote sessions will be conducted using a video camera, and uploaded to Rutgers’ HIPAA-compliant platform, Microsoft Teams. Only those involved in the study will have access to the Microsoft Teams channel. Although we will be unable to modify recordings, all recordings will be deleted when the study has been completed.

The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written consent.
PARENTAL PERMISSION FOR CHILD

Oral Consent Questions
Do you understand what has been discussed and agree for your child to be recorded?
Child Name:
Parent Name:
Date of Consent:
Time of Consent:
Name of Person Obtaining Oral Parental Consent: