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The token economy for children with intellectual disability and/or autism: A review

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ABSTRACT

One of the most important technologies of behavior modifiers and applied behavior analysts over the last 40 years has been the token economy. These procedures are useful in that they help provide a structured therapeutic environment, and mimic other naturally occurring reinforcement systems such as the use of money. Token economies, at least from a research standpoint, appeared to have crested in popularity during the 1980's. However, for children with intellectual disability (ID) and/or autism, such methods continue to hold considerable therapeutic promise. An overview of past developments, current status, and potential future trends and applications with respect to this special population are discussed.

The token economy plays a historic and important part in the history of behavior modification and analysis. Money is one of the first token systems, with these reinforcers being obtained through good behavior. However, the first therapeutic application of the token system has been credited to Avendano y Carderera (1859) who described a "ticket" or token that could be used to reward good behavior of children (Rodriguez, Montesinos, & Preciado, 2005). The modern day version of the token system as a systematized therapeutic tool has been credited to Wolf by his colleague Risley (1997). Staats however, claimed he was the first to employ the token economy (Staats, Minke, & Butts, 1970). He antidotally described a token reinforcer system he employed for children's reading problems in 1959. He goes on to note that Jack Michael at the University of Houston used the same procedures soon afterwards for children with ID and reading problems. What these events confirms is that the token system has been in play as a viable therapeutic method for some time.

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One of the most important early works which helped popularize the technique was a book by Ayllon and Azrin (1968) called *The Token Economy*. This book dealt with persons evincing ID and other developmental delays, setting a strong precedent for the application of this methodology to the developmentally delayed population. And, the methods have proven to be effective for typically developing children who display various challenging and antisocial behaviors (e.g. Besalel-Azrin, Azrin, & Armstrong, 1977; Rickard, Melvin, Creel, & Creel, 1973). However, for the present review we will limit ourselves to children with ID or autism; these are two groups where the token economy may have particular promise.

1. Overview

Developmental disabilities (DD), particularly ID and autism, have a history of broad applications of behavioral technology (Chung et al., 2007; Lancioni et al., 2007; Matson, 2007; Plant & Sanders, 2007; Vedora & Stromer, 2007). Similarly, the token system has a long lineage where learning based applications are concerned (Kazdin, 1982). In fact, children and adults with ID were the first populations which received extensive study using the token economy (Ayllon & Azrin, 1965; O'Leary & Drabman, 1971). These studies and others like them were of considerable importance because at the time major limitations on these persons for even minimal learning was considered debatable. Furthermore, children with DD were prone to display comorbid psychopathology and/or challenging behaviors which further complicated the treatment picture (Matson & Nebel-Schwalm, 2007a,b). The token economy was particularly applicable since is could be readily administered in school or inpatient settings. Furthermore, it could be used as a base program, with other tailored interventions for communication, independent living skills, and other important areas added on to the token economy (Greenberg, Scott, Pisa, & Friesen, 1975; McCreadie, Main, & Dunlop, 1978). Thus, token economies have proven to be flexible and effective interventions for children with DD, and worthy of the current day practitioner and researcher attention for further evaluation and focus.

2. ID research

A substantially larger number of token economy studies have been conducted with children who have ID than who evince autism and are certainly warranted given the frequent problems with communication (Li-Tsang, Lee, Yeung, Siu, & Lam, 2007), psychopathology and other nonfunctional behaviors (Davis, Kurtz, Gardner, & Carman, 2007; Morad, Nelson, Merrick, Davidson, & Carmeli, 2007). However, given the very high overlap between the two developmental disorders, a great deal of generalizability in techniques across groups is likely. Furthermore, token economy procedures for people with ID, has considerable tradition, compared to other behaviorally oriented techniques.

We have noted that such methods can be traced back at least 50 years, with an early data based study published by Birnbrauer, Wolf, Kidder, and Tague (1965). They treated 17 children with mild ID who were 4–8 years of age using an ABAB single case design. Treatment was in the school setting and focused on increasing study skills. The goal of the program was to increase the amount of work accomplished per day. Completing specific tasks resulted in social praise and token reinforcement from the teacher. These procedures were paired with time-out for offensive and disruptive behavior which involved going to a time-out area in the hall for 10 min with 30 s of quite time required to terminate the contingency. These data were partially replicated and extended by Pruneti, Cantini, and Baracchini-Muratorio (1989) who used a token system with 20 children averaging 11 years of age. These children had serious head injuries with coma. Target behaviors were maladaptive problem behaviors which were markedly reduced by giving tokens for adaptive behaviors. Gains were monitored for a 1-year follow-up.

Wolf, Giles, and Hall (1968) extended this earlier study with children of borderline ID to children with normal IQ who were all at least 2 years below grade level. Correct completion of work resulted in the teacher giving the child points by marking their achievements in a folder. Total points could later be redeemed for various items including field trips or snacks (e.g. sandwiches, milk, fruit, cookies). The student also has the option to save points over an extended period of time and then trade them in on larger ticket items such as clothes, inexpensive watches, or a used bicycle. Interestingly, contingencies

were also used for the instructors who could earn monetary bonuses for each child whose 6 weeks report card improved from one period to the next. The program, which was run on Saturday mornings over the summer vacation, resulted in academic gains of 1.5 years in just a few months. Similarly, Staats et al. (1970) worked to enhance academic achievement. Training was for culturally disadvantaged children and occurred in the classroom. Their program however was carried out for an entire school year. As with Wolf et al. (1968) they report very positive results with their program.

Cotler, Applegate, King, and Kristal (1972) took on a different type of challenge, by working with conduct disorder problems among the most problematic children in a state hospital school program. The token system was implemented for 4 days a week over a 15 weeks period of time. This study is particularly noteworthy in that the children engaged in fighting, swearing, throwing objects, and running around the classroom, but treatment focused on strengthening positive behaviors incompatible with these problem behaviors. Thus, appropriate class participation, being quiet except when being called on, and completing homework assignments were the focus of the token economy. This emphasis on pro-social skill building is particularly noteworthy in these early token economy programs since at the time almost all learning based studies focused on suppression of maladaptive behavior only.

Jones and Kazdin (1975) in a well-controlled single case study described another interesting treatment twist by paired praise with tokens. At this point in the development of behavioral methods, psychodynamically oriented practitioners were asserting that these reinforcement methods were "mechanistic", did not deal with the "core problems" and would not result in maintenance and generalization. This study was one of the first with the token economy to address these issues empirically. They provided praise as a means of enhancing the "value" of social compliments and thus enhance generalization. Furthermore, they addressed the maintenance issue with their follow-up data. Nay and Legum (1976) partially replicated these data by also targeting pro-social behaviors incompatible with acting out in the classroom and by demonstrating that gains in appropriate behavior could be maintained. A somewhat different approach was taken by Johnson, Bradley-Johnson, McCarthy, and Jamie (1984). They provided tokens for specific correct responses on a test, the WISC-R.

One particularly novel token economy study we included in our selective review was by Fox and Roseen (1977). We would like to emphasize this paper because the 3.5-year-old boy who was the focus of the study did not have an ID, but had Phenylketonuria (PKU). This disorder results in severe ID unless the person adheres to a strict nutrition routine, however. The tokens were used to reinforce routine skills such as getting up, going to bed without a fuss, and brushing his teeth. Additionally, a primary task was drinking his Lofenelac at each meal, a milk substitute with no protein, which is a key dietary element for PKU treatment. The program was not only successful but was maintained over 52 weeks of follow-up. Using a token economy to teach self-help skills has also been demonstrated with children with moderate to profound ID, in providing a partial replication of the Fox and Roseen (1977) paper.

3. Autism research

The research demonstrating the efficacy of token economies for children with ID preceded most of the research using these procedures for persons with autism. The effectiveness of these treatment methods with people with ID resulted in the logical extension to autism, where a very substantial portion of the children have comorbid ID. Furthermore, children with high functioning autism, also have a substantial number of overlapping target behaviors with ID such as problems with attention, communication, and stereotypies.

Steeves, Martin, and Pear (1970) in an early study of the token economy, used these reinforcers for verbal and pointing tasks. The two boys who received treatment were 12 and 15 years old, respectively. Verbal behaviors included poor pronunciation and answering questions. Printing tasks included printing letters of the alphabet and later, simple words. Correct responses were followed by presentation of a token. Along these same lines, Tarbox, Ghezzi, and Wilson (2006) used tokens to increase attending of a child with autism during discreet trial instruction. They also reported very positive findings.

Hung (1977) in another early study also focused on communication. The emphasis was on reinforcing spontaneous questioning, as long as the questions were not repetitive or ritualistic. Tokens could be exchanged for various summer camp privileges. An interesting twist to the study was the reinforcement of questions in novel settings as a way of generalizing these appropriate efforts at communication. Another, similarly by Handen, Apolito, and Seltzer (1984), described the use of tokens to help maintain low rates of repetitive speech. The procedure was in effect an application of differential reinforcement of other behavior (DRO), and proved to be very effective.

From a technical perspective, an interesting twist on the token system was to target preschoolers who served as confederates to the teacher. These 2–4 year olds initiated or prompted 3 children with autism to initiate social interactions. If they did so, tokens were provided to the confederate. This approach has unique benefits; one is to promote generalization to real life interactions. Gains for the intervention proved to be impressive. In another approach, reciprocal social interactions were enhanced by reinforcing the target child with tokens. McDonald and Hemmes (2003) did this in the context of interactions between the child and three adults. As with the other studies reported here, good effects were achieved.

The flexibility of the token system as a teaching approach is further underscored by an innovative and interesting study published by Kahng, Boscoe, and Byrne (2003). They used the earning of tokens, predicated on consuming bites of food as a criterion for terminating the meal. This procedure was effective in increasing a 4-year-old girl with pervasive developmental disorder food consumption. Furthermore, the variety of foods she would consume was markedly increased since tokens were also predicated not only on quantity but also on number of different types of foods consumed.

4. What are the target behaviors?

Children with ID and/or autism have largely been administered token economies to promote social behaviors. For children with ID, skills most frequently targeted have dealt with school conduct and performance. Thus, behaviors such as remaining in seat, appropriate comments, completing homework correctly, completing tasks on time, enhancing attention during test administration, and enhancing self-help skills have been the basis for most of the studies represented in the literature.

For children who have autism, intervention targets have been somewhat different that what has been reported for the population with ID, and have focused to a large degree on core symptoms of autism. The focus has largely been on social skills, enhancing speech, learning to initiate verbal/social interactions and other similar interpersonal skills. Thus, type of DD does effect applications of behavioral programs, at least within the context of token economies.

5. Who is treated?

Some distinct and specific parameters exist with respect to what children receive treatment. These factors are pragmatic and are due to the fact that we are talking about secondary reinforcers where the child must understand that the token stands for something other than its tangible form. The child must be able to forgo immediate receipt of the primary reinforcer and must have some computational skills since they need to understand that several tokens can be used to buy large, more prized primary reinforcers. As a result of this required skill set, children tend to be of school age and evince mild ID versus more severe intellectual deficits. Given the focus on developing early intervention programs for these developmentally disabled children, token economies would seem to be a useful maintenance model that could be used to follow-up on these early intensive treatment methods.

6. Who provides the treatment?

Much of the intervention research with children who have ID or who have autism is conducted by psychologists or certified applied behavior analysts. While there certainly is nothing wrong with this model, there is much to recommend teachers, parents, and other primary caregivers who engaged in the intervention as trainers. Such a model promotes generalization and adds relevance to the treatment. One of the principle positive aspects of the token economy research we reviewed is that

primary caregivers are the predominate therapists. This factor in conjunction with the fact that treatment is typically done in groups and using positive replacement behaviors also makes the token system cost effective relative to other behavioral procedures as well as ecological validity.

7. The decline of the token economy

Token systems have been employed primarily in two broad clinical domains; inpatient psychiatric settings (Dickerson, Tenhula, & Green-Paden, 2005), and in school programs. The dates of published treatment studies show a flurry of activity in the 1970–1980's. Research on the topic appears to have peaked toward the end of this latter decade. Several factors appear to have contributed to the dramatic decline in token economy research in general and token economies for children with ID and/or autism in particular. First, however let us point out that this decline does not appear to be due to a lack of effectiveness of the procedures, nor to direct tests of other methods that show them to be superior. Furthermore, these token methods have proven to be flexible to the extent that they can be applied to include children or entire classrooms (Filcheck, McNeil, Greco, & Bernard, 2004). And, interestingly, in direct comparisons of group to individual contingencies, both proved to be equally effective, and both methods were superior to no treatment (Reitman, Murphy, Hupp, & O'Callaghan, 2003). Furthermore, children with ID and/or autism evince a heterogeneous range of problems from anxieties and fears, to academic problems, to communication difficulties (Cihak, Kessler, & Alberto, 2007; Goodson, Sigafoos, O'Reilly, Cannella & Lancioni, 2007; Li & Morris, 2007; Zimbleman, Pascal, Hawley, Molgard, & St. Romain, 2007). Token systems have addressed these and other issues such as class disruptions and severe food refusal (Boniecki & Moore, 2003; Filcheck, McNeil, Greco, & Bernard, 2004; Kahng, Boscoe, & Byrne, 2003; Musser, Bray, Kehle, & Jensen, 2001). Therefore, the token system has proven to be a robust and adaptable method for treating a range of skills in major ''needs'' areas for children with DD. Thus, social norms and trends in treatment research appear to be primary culprits for the decrease in clinical use and research activity (Table 1).

The decline of token systems has not been directly addressed in the child DD literature. However, the topic has received some attention with respect to the adult psychiatric population. Liberman (2000) describes the peak for token systems in this group as the 1960's and 1970's, and he notes that at one point 110 large-scale patient programs were in operation in the U.S. and Western Europe. Liberman (2000) notes that with the widespread deinstitutionalization movement, token programs were not begun in the community, thus the method waned in popularity. Furthermore, he attributes cost constraints and bureaucratic inflexibility as further contributing to the demise of token systems. Interestingly, these developments have occurred despite recommendations of expert groups in the area that long-term care programs should include behavioral learning techniques based on social learning principles (Lehman et al., 2004). Furthermore, at least with respect to the argument regarding expense, Kehle, Bray, Theodore, Jenson, and Clark (2000), describe their application of a token economy in a special education classroom as substantially effective, easy to implement, and required low investment of teacher time. We would interpret this latter point to mean relatively inexpensive. Finally, these authors note that their token economy was consistently selected by teachers as a treatment for classroom management.

Dickerson et al. (2005) point out however, that while the token economy is effective, most of the studies are 20 years old or more and may or may not have applicability to residential and modern day patient programs. We are not so skeptical. The laws of learning have not changed, and while some modifications may be desirable, the basic premise of token systems appear to us to be as sound as they ever were. Thus, this criticism seems to be much less significant than other issues that have resulted in the token systems decline. Dickerson et al. (2005) also point out that maintenance and generalization issues have been noted by critics. We consider this issue as a straw man since all treatments require continued application at some intensity level to remain effective. For example, discontinuing an antipsychotic drug resulting in the person with schizophrenia reverting to higher rates of symptomatology would be viewed as lack of maintenance of the drug if this same set of rules were applied. Practically speaking however, as long as the person evinces the disorder they will likely require treatment.

Table 1
Representative token economy studies for children with autism or ID

ID studies in chronological order	Children treated	Setting	Tokens	Target behaviors	Follow-up
Birnbrauer et al. (1965)	17 children with mild ID; 4–8 years of age	School	Checkmarks exchangeable for toys	Rates of studying	No
Wolf et al. (1968)	16 "borderline" to average IQ children; 12 years of age	School	Point system exchangeable for activities, food, or personal items	Academic achievement and report card grades	No
Staats et al. (1970)	24 children with mild ID; Average age 14 years	School	3 levels of tokens that could be exchanged for tangibles or activities	Improved attention and work behavior	No
Cotler et al. (1972)	14 boys with borderline to normal IQ	State hospital classroom	Mix of token, points, and tangible rewards	Proper class participation, being quiet, working on assignments	No
Jones and Kazdin (1975)	4 children with mild to borderline ID, 6–7 years of age	School	Tokens paired with praise; tokens exchangeable for activities or food	Attentive, in seat	Yes
Nay and Legum (1976)	11 children with mild ID; average age 14 years	School	Tokens for desirable activities and privileges	Out of seat, inappropriate verbalizations	Yes
Fox and Roseen (1977)	Boy with PKU and normal IQ; 3.5 years of age	Home	Tokens and pictures of activities and tangibles that serve as back-up reinforcers	Dressing in morning, picking up toys, drinking Lafenalac, brushing teeth, going to bed without fussing	Yes
Johnson et al. (1984)	42 children with mild ID; 6–14 years of age	School	Token for correct answer	On task while taking the WISC-R	NO
Pruneti et al. (1989)	20 children with head injuries/ coma; average age 11 years		Tokens for not engaging in maladaptive behaviors	Maladaptive behaviors	Yes

ASD studies in chronological order	Children treated	Setting	Tokens	Target behaviors	Follow-up
Steeves et al. (1970)	2 boys with autism; 12 and 15 years of age	Developmental center	Tokens for responding	Verbal and printing tasks	No
Hung (1977)	4 children with autism; 8–11 years of age	Summer camp	Tokens for correct responding; exchanged for privileges	Spontaneous questions; but not if it was repetitive	Yes
Handen et al. (1984)	Boy with autism and ID; 16 years of age	Group home	Token as differential reinforcement of low rate behavior (DRL)	Low levels of repetitive speech	Yes
Odom, Hoyson, Jamieson and Strain (1985)	3 children with autism; 2–4 years of age	School	Tokens for children interacting with the target children	Social initiation	No
McDonald and Hemmes (2003)	1 child with autism; 18 years of age		Pennies as tokens exchangeable for magazines, candy, and soda	Interactions with adults	No
Boscoe and Byrne (2003)	1 child with pervasive developmental disorder; 4 years of age		Token based differential reinforcement of alternative behavior	Food refusal	No
Tarbox et al. (2006)	1 young child with autism		Tokens during discrete trial instruction	Attending to task	No

The notion that the token economy results in excessive control and therefore can be degrading and coercive has also been made (Bilken, 1976; Corrigan, 1995; Hagan, 1975). To be sure, the potential for these conditions exist, and are particularly at play with children, who may be the most vulnerable of populations. Furthermore courts have been involved in regulating contingencies, again, framed as a "rights" issue (Greenberg & Meagher, 1977). However, safeguards versus the procedure per say appears to us to be the more relevant issue. No matter what psychological or drug treatment selected, sensitivity to possible issues of control and coercion must be considered. Thus, from our perspective this argument is not compelling. In fact we would argue that more structured programming allows for more oversight and staff training, and in fact would decrease the likelihood of the potential concerns noted above. Additionally, Roane, Call, and Falcomata (2005) in testing two adolescents with mild ID found that favorable response rates were higher when the reinforcers were contingent (e.g. token economy) as opposed to when they were noncontingent. Furthermore, Greenberg and Meagher (1977) make the important point that the client should be provided as much decision-making responsibility as is prudent with respect to token systems which of course would help in minimizing issues of coercion.

Another argument is a bit more philosophical, but nonetheless worth addressing. The notion is that children should engage in activities due to intrinsic motivation versus external reinforcers. Davidson and Bucher (1978) directly addressed this issue. They tested 4 children 4–5 years of age. Their basic conclusion was that token reinforcement did not decrease intrinsic interest. Thus, an alternate explanation is that pairing reinforcement with tasks that children enjoy or are only acquainted with may actually increase their intrinsic value through positive exposure to the activity.

The decline in the token economy may also be linked to the view that is held by some that token systems give a negative message. People can lose points for negative behaviors. Hogan and Johnson (1985) demonstrated increased effectiveness when the response cost component was dropped from the token system and target behaviors were reformulated in positive terms for socially "maladjusted" inpatient children between 8 and 17 years of age. A review of papers on token economy research for the present paper support this "negative message" only partially. The majority of the programs appear to target pro-social skills such as homework completion. Very few token economies use a response cost component. The detractors of token economies then, have some useful points to consider. However, the technology is powerful, efficient, and largely has been able to deal with critical comments. Thus, we see no substantial clinical justification for the decreased use of token economies.

The primary factor in the movement away from token economy research then appears to be two-fold. First because the methods have been around for a much longer period of time than most behavioral procedures, there has been ample time for the downside of the procedure to be identified. Initial research on new treatments whether applied behavioral analysis or medication is typically met with a great deal of enthusiasm by researchers and clinicians alike. Often the euphoria is replaced over time be an overly negative view of treatment and the enthusiasm is then placed on the next new intervention to appear. We would argue that at least with token economies, it is unfortunate that they appear to have lost so much with respect to their popularity. While this treatment method certainly has shortcomings, on the whole it is still one of the more effective forms of behavior modification. It does appear that at least for individual children token systems are still in favor, although not as popular as they were several decades ago. Beginning with Head Start for at-risk and children with ID, and moving to intensive behavioral interventions for very young children with autism and related pervasive developmental disabilities, there has been a traditional focus on children at an age where token systems may have limited utility. However, as children get older, classroom and home-based token economies that are combined with newer procedures such as functional assessment should be considered. We say this since many children with developmental disabilities will not receive intensive early intervention, some who do receive treatment will be partial or non-responders and even for those who respond extremely well, some sort of less intense structured intervention is likely to be in order. The token economy appears to be one of the primary intervention models with good research to support it that can achieve this goal. Therefore, renewed efforts to use these methods with children with ID and/or autism will hopefully be a focus of researchers and clinicians in the near future.

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