The Token Economy

26

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26.1 Introduction

We begin this chapter where papers on the token economy often end, with ethics. The decision to implement a token economy, as we shall emphasize, is always informed by the relevant coursework, training, and supervised experience in the applied analysis of behavior (ABA). If this appears obvious, it is because of the agonizing lessons learned in the early days of "behavior modification." We open a window on those days in order to comment on ethical matters pertaining to ABA in general and to the token economy in particular.

We turn next to a list of nine key elements in a token economy. We emphasize "key elements" for good reason. The trove of scientific research and systematic replication on the token economy today is sufficiently rich and informative to say with confidence that certain elements had better be in place in order for the intervention to qualify as ABA as here conceived. Putting these keys elements in motion does not guarantee a successful outcome, but it does increase the chances of one when the elements are in place. Successful behavioral interventions with high scores on measures of intervention integrity (a.k.a. procedural fidelity) consistently produce the best outcomes, as expected (Reed & Codding, 2011).

Our chapter is written for credentialed applied behavior analysts who work in the field with youthful clients and professional co-workers and who supervise aspiring applied behavior analysts. We take for granted a working knowledge of functional behavior assessment and interventions, and we naturally assume an unwavering commitment to manage the token economy according to the principles of behavior and the best practices of ABA.

The bulk of our own applied experience is early intensive behavior intervention (EIBI) and early childhood autism (e.g., Lovaas, 1987; Lewon & Ghezzi, 2020). This background does not commit us to writing a chapter on autism and early intervention per se, and besides, it would be a mistake to assume that a token economy is restricted to a particular person, age, setting, or circumstance. We take this opportunity instead to discuss broader matters, beginning with events over 50 years ago that shaped the future of ABA.

26.2 Ethics and the Token Economy

Workers in the field of applied behavior analysis might recall reading about the scandal at Sunland Miami Training Center in Jon Bailey and Mary Burch's book, *Ethics for Behavior Analysts*

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(2016; see also Curry, 2013; McAllister, 1972: NARC, 1972). Following an investigation of the residential treatment facility by Florida state officials in 1972, the superintendent and several senior staff members faced civil and criminal charges of cruel and unusual treatment of several youngsters with developmental disabilities living there at the time. The incident shocked the nation.

To make matters worse, the superintendent characterized the Sunland Miami facility as a "superb behavior modification program" (Bailey & Burch, 2016, p. 7). Florida state officials strongly disagreed, writing that the program, which included random beatings, public nudity and humiliation, physical restraint, and solitary confinement, was a "bizarre, abusive, and ineffective system of punishment (p. 2)."

The Sunland Miami program had no credible basis in ABA, concluded the authorities, and yet reports began to surface from prisons, psychiatric hospitals, and residential care and treatment facilities across the nation accusing "behavior modifiers" of exploiting convicts, demeaning psychiatric patients, mistreating elderly persons, and abusing people with disabilities (Moya & Achtenberg, 1974). Lawyers were prosecuting federal and state governments for civil rights violations, and the courts began scrutinizing therapeutic practices in prisons, psychiatric hospitals, and other "total" institutions (Wexler, 1973).

On top of that, the mainstream media was vilifying behavior modification as dystopic (Skinner's Utopia, 1971), and the motion picture industry was animating the script with a deeply disturbing parody of classical conditioning in Stanley Kubrick's *A Clockwork Orange*. To top it all off, Vice President Agnew warned in a speech in 1972 that behavior modification "poses a dire threat to traditional American values." For a young science striving to gain a toehold in human services, things could get no worse.

Against this backdrop, the American Psychological Association (APA), led by Albert Bandura, intervened by forming a Commission on Behavior Modification in 1974. "The Commission will focus on the area of applied behavior analysis in research and practice," read the mission statement, "in order to recommend effective courses of action to deal with the legal, ethical, and professional issues raised by these behavior-influencing procedures" (Stolz, 1978, p. xiv). As luck would have it, the most prominent "behavior-influencing procedure" at the time was the token economy, the ugly centerpiece of the "superb behavior modification program" at the Sunland Miami Training Center.

The APA Commission, chaired by Sidney Bijou, published a final report in 1978 that paid special attention to the ethics of large-scale applications of the token economy (Stolz, 1978). The authors of the report referred to "thousands" of undocumented token economies that surfaced in the wake of Ayllon and Azrin's legendary token economy at Anna State Hospital in the 1960s and feared that most of the programs were operating in state hospitals, nursing homes, detention centers, prisons, and schools for students with disabilities. The committee understood that the most vulnerable people in society populate these places, many too young or too old or weak to speak for themselves, many silenced by virtue of their incarceration or involuntary commitment, and each one unable to exert counter-control over a powerful and potentially coercive and oppressive system such as a token economy.

Fortunately, a token economy is like a magnet for exposing this type of trouble. As with most monetary economic systems, a token economy limits or restricts a person's access to the things and events the tokens can buy. Known technically as a "motivational operation," it is possible to take matters to extreme and even inhumane and deadly lengths, for example, by restricting an inmate's access to food, water, shelter, sleep, hygiene, social contact, and so on. The effects are conspicuous.

This, however, is not the only source of trouble that a token economy attracts. The inmate earns tokens for performing certain tasks in the prison and exchanges the tokens for the things and events the inmate can afford to buy. The relationship between tasks and tokens is laden with potential for gross inequities in workload and earnings, and the relationship between earnings and the price of the things and events that tokens

can buy is equally susceptible to gross inequities.

Suppose the price for a hot dinner in the prison commissary is 30 tokens. The inmate works in the prison laundromat 8 hours a day for a maximum of 10 tokens a day, 5 days a week. The inmate might earn less than 10 tokens a day and might even lose tokens already earned during the day, for instance, for failing to meet the standards set for properly folded clothes. A guard inspects the inmate's work periodically in this scenario and dispenses tokens based ostensibly on the quality of the inmate's performance. It is safe to say that under these conditions, the inmate would be eating many cold dinners.

It is easy to imagine far greater injustices than a cold dinner. A token economy is actually susceptible to unspeakable abuse; to inconsistent, haphazard, and arbitrary use; and for use as a cudgel for punishment, retribution, and revenge. A token economy, under these circumstances, not only spells trouble but can also breed cruelty, contempt, and corruption.

It is reasonable to suppose, then, that a large number of early token economies failed on moral and legal grounds, as in the Sunland Miami case. It is also reasonable, furthermore, to suppose that many of them failed on technical and conceptual grounds, which was also the case at Sunland Miami. It turns out that Florida state officials found that the token economy at Sunland was in disarray, that staff training was nonexistent, and that the people in charge of the facility simply did not know how to manage behavior within the confines of token economy (McAllister, 1972). It seems safe to conclude that the abusive practices at Sunland grew from this inadequacy.

Fortunately, a token economy is like a magnet for this type of trouble, too. An inherent feature of the token economy is that it has many "moving parts" that require constant attention to keep the system running smoothly and in tune with the objectives set for a given individual. When the parts fail, the intervention fails, and when it fails, it is likely that the demands of the token economy exceeded the behavioral skills and abilities of the people responsible for managing the intervention. "Winging it" seems to capture these moments concisely.

Design flaws, technical errors, conceptual shortcomings, and so forth are clear sources of trouble for a token economy. Less apparent but just as troublesome is the potential for harm created by making the mistake to introduce a token economy in the first place.

We suspect that many token economies in the 1970s were adopted prematurely and probably unnecessarily, given the success of Ayllon and Azrin's token economy at Anna State Hospital in the 1960s. The trouble with introducing a token economy needlessly or too soon is that it departs from the common practice in ABA to manage an individual's behavior as naturally and unobtrusively as possible. A token economy receives poor marks on these two dimensions, bringing it closer to a "last resort" than to a "first resort" intervention on the continuum of behavior management interventions (BACB, 2020)

The upshot of poor marks on the natural and unobtrusive dimensions is another common practice in ABA; if a less contrived and less intrusive intervention fails to change behavior, then move up to an intervention with a comparably higher level of contrivance and intrusiveness. A decision to move up this scale sets the occasion for yet another common practice in ABA, which is to choose a course of action in the presence of data showing little or no change in a target behavior over the course of a deliberate and systematic progression from the least-to-most intrusive and contrived interventions.

In hindsight, it seems inevitable that many token economies would fail for technical and conceptual reasons. There were, after all, very few colleges and universities with graduate training programs in behavior analysis at the time and in the era of the Sunland Miami scandal. There was no code of ethics, no regulatory controls, and no professional organizations in behavior analysts to support the education and training of future applied behavior analysts.

In an effort to protect highly vulnerable people from harm by behavioral interventions such as a token economy, the APA Commission

strongly recommended that behavior analysts adhere to the 1977 edition of APA's *Ethical Standards of Psychologists*. The recommendation provided protections not only for the civil rights of persons subject to behavioral interventions and research, but it also gave the ABA community the cover it needed to begin solving the legal, ethical, and professional problems that scandals such as the Sunland Miami affair exposed and that the commission brought to light in its report. These problems, in a nutshell, boiled down to poor academic preparation in the principles of behavior, poor training in applying the principles of behavior, poor supervision over the practice of applying the principles of behavior, and poor regulatory control over the behavior of applied behavior analysts (Johnstone et al., 2017).

How the behavior analysis community responded to these problems is beyond the scope of this chapter. It suffices to say that the group came together in the 1970s and began building the culture and infrastructure necessary for behavior analysis to succeed as a scientific discipline, as a legitimate profession, and as a leader in the human services community. The permanent products of this continuing pursuit include the Association for Behavior Analysis International (ABAI) and the Behavior Analyst Certification Board (BACB). ABAI has been accrediting graduate training programs in behavior analysis since 1993, and the BACB has been credentialing behavior analysts since 1998. A license to practice ABA, furthermore, is now required in most states and provinces, and many licensed behavior analysts working today maintain Professional Liability (Malpractice) Insurance for protection against complaints, claims, and lawsuits (BACB, 2021).

Our motive in beginning this chapter with ethical matters is to be clear from the start that implementing a token economy, or for that matter, *any* ABA intervention without the proper education, training, supervised experience, commitment, and in most states and providences, a license to practice as an applied behavior analyst, is plainly unethical and rightly so.

26.2.1 Star Charts, Point Systems, and the Token Economy

Star charts and point systems can be confused with a token economy and mistaken for ABA. The confusion over these types of systems and a token economy is understandable, given the similarities they share. Mistaking star charts and point systems for ABA is a different matter, and understanding the difference both clarifies the meaning of a token economy in the context of ABA and underlines the importance of maintaining a distinction between a token economy and systems that resemble a token economy.

A token economy is a behavior management intervention based on decades of experimental research and field studies in the analysis of behavior. A properly credentialed behavior analyst (1) selects the intervention for a given individual based on a comprehensive functional analytic assessment of the individual's behavior and current circumstances, (2) manages the intervention with the competence and commitment to follow the basic principles and best practices of ABA for the duration of the intervention, and (3) monitors and evaluates the effects of the intervention regularly according to directly measurable changes in personally and socially meaningful target behavior(s) in the intervention setting(s) and, to the maximum extent appropriate, in the individual's natural environment. A star chart or point system has none of these characteristics, obviously.

While this clearly disqualifies these systems as a token economy or ABA, it does not diminish the experience shared by millions of parents and teachers that a star chart or point system can be an effective way to promote desirable behavior at home and in the classroom with children and youth. The key to this success is the same key to a successful token economy: Maintain a contingent relation between responses and reinforcements.

Consider the child who earns points for feeding the family dog. The youngster enjoys a family picnic at the neighborhood park and feeds the dog regularly to earn enough points to exchange for the activity. The points by themselves are ini-

tially neutral, but they acquire and maintain a reinforcing function by virtue of their contingent relation to the things and events they buy, in this instance, a picnic with the family at the park.

Assuming the youngster's parents invest in the success of the system, they must commit themselves to maintaining the contingency they created for their child. This means that feeding the dog earns the child points toward a family picnic at the park, but only so long as the child earns enough points to exchange for the activity. It means that the child does not go to the park for a family picnic noncontingently, that is, without earning the correct number of points, and it also means that the points themselves are not given away freely or noncontingently, but are awarded instead just for feeding the dog in this scenario.

A token economy, as with star charts and point systems, takes advantage of a basic learning process in nature, operant reinforcement. The similarity ends there, however. The parent who awards a point on a ledger contingent on their child feeding the family dog is taking advantage of operant reinforcement, but is not thereby practicing ABA or implementing a token economy per se. For the same reason, the parent who puts a bandage over a small cut on their child's finger is taking advantage of the healing process but is neither practicing medicine nor implementing a medical procedure per se.

We hasten to add that we have absolutely no antipathy toward star charts and point systems, only toward mistaking these systems as ABA and confusing them with a token economy. Indeed, we agree with the legions of pediatricians, educators, and child psychologists that star charts and point systems can promote good behavior at home, in the classroom, and in the community.

In our work with young children and families, we sometimes encourage parents to implement a simple star or sticker chart at home. We exercise considerable caution in these cases, however. We understand that parents tend to want to introduce these systems needlessly, that the systems are susceptible to inconsistent and haphazard use, and that they are vulnerable to abuse by strict disciplinarians as an instrument of punishment. We view these as warnings and urge practitioners to keep the early history of ABA and the token economy in mind when it comes not only to selecting a token economy as a behavior management intervention but also to encouraging parents to adopt a star or sticker chart.

We turn next to a discussion of nine key elements in a token economy. Our purpose is not to review or critique the vast literature on the token economy, but instead to cite a few, mostly current studies in support of a key element, and add our own practical experience now and then to augment the scientific support. Keep in mind that we discourage people from implementing a token economy on any scale, large or small, without the proper coursework, training, experience, and credential(s) in ABA and that we encourage a functional analytic assessment of the person(s) involved in the token economy before deciding to build and manage one for them.

26.2.2 Key Elements in a Token Economy

A list of the key elements in a token economy appears in Table 26.1. We discuss each element in turn, offering suggestions along the way on how to develop, maintain, troubleshoot, and fade a token economy. To reiterate a previous point, we are more concerned with the token economy itself rather than with applications of the intervention to certain populations, ages, settings, and so on.

Table 26.1 Key elements in a token economy

Develop objectives and select relevant target responses with clarity and precision
Measure the target behavior repeatedly, accurately, and reliably
Choose when, where, and with whom the token economy will operate
Pick out tokens
Stockpile backup reinforcers
Establish tokens as generalized conditioned reinforcers
Specify the schedule of reinforcement
Token production schedule
Token exchange schedule
Exchange-production schedule
Decide when to exchange tokens
Phase out the token economy

26.2.3 Develop Objectives and Select Relevant Target Responses with Clarity and Precision

We distinguish between an intervention (or treatment) objective and the response(s) that will lead to achieving the objective for a given person. An objective for a youngster in a token economy, for example, is to be ready for school each morning. The responses that serve or accomplish this objective might include awaking earlier, grooming faster, or dressing quicker.

Developing objectives and selecting responses relevant to accomplishing the objective is an individualized, ongoing process guided by an overriding concern for a person's health, welfare, and happiness. This concern translates into objectives and responses that (1) maximize a person's access to contingencies of positive reinforcement and minimize exposure to aversive stimuli, (2) promote independence and autonomy over the course of the intervention, (3) open new and previously unavailable or restricted contingencies of positive reinforcement, and (4) establish appropriate replacements for dangerous and undesirable behaviors.

Engage the person from the start, if possible, in the process of developing objectives and selecting responses with developmentally (and culturally) appropriate methods and materials, as needed. Be mindful of the truism that learning goals linked to personally important and socially meaningful objectives keeps the "applied" and "analytic" dimensions of ABA in balance throughout the intervention (Baer et al., 1968; Common & Lane, 2017; Leaf et al., 2016).

An important first step in creating important and meaningful behavior change is to begin identifying instances of the responses that will accomplish an objective. Some or all of these responses will constitute the "targets" of the intervention. The challenge is to develop a class of target responses that is not only commensurate with a given objective but also populated with a sufficient number of instances to which positive reinforcement can be applied once the intervention begins in earnest.

A clear, concise, and easy-to-follow description of the target response(s) is essential to the success of any ABA intervention, including a token economy. A useful description includes verbs and phrases that depict a person's actions in real time. Given a learning goal to wake up in the morning at 6:30, actually waking up and getting out of bed at the appointed time is useful in that it describes the target behavior (awaking, getting out of bed) in clear and unmistakable action terms. Indeed, the whole point of describing behavior as action is to obtain an objective, unvarnished description of the behavior, one that anyone would be able to identify with perfect accuracy, at least in theory. Relying upon ambiguous or vague terms defeats this ideal and undermines the efficacy of the token economy (Moore et al., 2001).

Giving clear examples and non-examples of the response(s), describing the full range of topographies included in the class, and delineating strict rules for recording instances and/or non-instances of the response(s) in the class accomplish the task. Keep in mind that classes that are defined too broadly may fail to capture a fine-grained but clinically significant change over time and that classes that are defined too narrowly may fail to capture instances of behavior that relate to accomplishing an objective, thereby providing an incomplete picture of change over time (Johnston et al., 2020).

26.2.4 Measure the Target Behavior(s) Repeatedly, Accurately, and Reliably

It is one thing simply to observe a response and another thing to observe, record, and measure the response repeatedly with a high degree of accuracy and reliability over extended periods. The outcome of the process is a measurement system that both compliments an intervention objective and captures the responses essential to accomplishing the objective.

Obtaining a measure of inter-observer agreement (IOA) with respect to the occurrence and non-occurrence of a given target response is a

long-standing practice in ABA (e.g., Johnston et al., 2020; Page & Iwata, 1986). Bear in mind that the practice of working toward and obtaining a high degree of IOA is not limited to research in ABA, but it also provides practitioners with accurate and reliable information that is necessary to assessing the impact of an intervention over time. It serves as the basis for modifying the parameters of the token economy, it tracks maintenance and generalization of behavior change in different settings and circumstances, and it is indispensable when phasing-out a token economy and moving toward less contrived and intrusive contingencies. Measuring behavior often and monitoring progress frequently have an additional benefit of keeping the behavior analyst accountable to the stakeholders and clients they serve (Hawkins & Mathews, 1999).

Behavior data collection systems are based on directly observable and objectively defined dimensions of the target behavior, facilitate data collection with high IOA, and specify how often data are graphically depicted, reviewed, and evaluated. Behavior analysts design these systems with accuracy, reliability, and validity in mind, as even the most diligently designed and monitored systems are subject to measurement error (Johnston et al., 2020).

Continuous data collection methods (e.g., frequency, duration; see Table 4.1 in Cooper et al., 2020) that capture all occurrences of the target behavior constitute the gold standard in this regard (Johnston et al., 2020). Interval recording and other discontinuous data collection methods fail to capture all instances of behavior during an observation period and therefore provide a rough estimate of the dimensions of the target behavior. The data collected using discontinuous methods are interpreted with caution given the well-documented variation and measurement error inherent in these systems (Fiske & Delmolino, 2012; Meany-Daboul et al., 2007).

Subjective or retrospective measures, such as questionnaires where stakeholders report on their perceptions of acceptability and efficacy of the token economy, may be helpful in assessing the social validity of the intervention (Common & Lane, 2017). Research has shown, however, that these indirect measures are susceptible to observer bias and may under- or overestimate the magnitude of the treatment effects. Thus, these measures supplement, not supplant, objective and direct measures of behavior (Cosper & Erickson, 1984; Reitman et al., 2004).

26.2.5 Choose When, Where, and with Whom the Token Economy Will Operate

A person's behavior is always a matter of time and place. It is critical, therefore, to be explicit regarding when, where, and with whom the token economy will and will not operate. In some cases, it might operate during all waking hours across all persons and environments. In others, it may be restricted to specific parts of the day or week (e.g., morning, weekends), to certain activities (e.g., evening routine, household chores), to certain environments (e.g., stores, parks), or to certain people (e.g., parents, teachers) who deliver and/or exchange tokens. These factors are individualized in a token economy and tailored to the objective(s) set for a given person. We might add that all stakeholders, including the person(s) for whom the token economy operates, receive instructions concerning the times, settings, and circumstances under which the economy is operational.

26.2.6 Pick Out Tokens

The "tokens" in a token economy are construed as conditioned reinforcers in behavior theory, but in practice, they function more like generalized conditioned reinforcers (Hackenberg, 2009, 2018). We shall return to the distinction in a moment, but for now, the point is simply that a token is like a coin in a traditional currency economy, something that someone earns and then exchanges at a certain time and place for things and events such as a new toy, a favorite snack, a special outing, and so forth.

A conventional token is a physical possession, light and durable, inexpensive, easy to handle

and store, hard to deface or forge, and difficult to steal. Take steps, as needed, to reduce the potential for stigma by making tokens as inconspicuous as possible and by incorporating a person's preferences in the selection of the physical features of the token(s).

Research indicates that the physical features of the token itself can interact with its functional properties. Studies conducted with children diagnosed with ASD, for example, show that incorporating a child's "perseverative interests" (e.g., cartoon figures) into a token's design can augment the reinforcing effects of the token (Carnett et al., 2014; Charlop-Christy & Haymes, 1998). Visually stimulating tokens, according to Hineline (2005), may have the added benefit of strengthening the social validity of the intervention.

Research conducted in educational environments suggests that digital tokens delivered over online school communication platforms may offer an effective alternative to physical tokens (Horner et al., 2018; Robacker et al., 2016; Williamson & McFadzen, 2020). This feature is available on smartphones and tablets and could become an attractive option in future applications of token reinforcement systems. Bear in mind, however, that designing a collection of visually stimulating tokens is no replacement for well-researched procedures that establish a stimulus as a conditioned or generalized conditioned reinforcer.

26.2.7 Stockpile Backup Reinforcements

Backup reinforcements or simply "backups" are the preferred toys, items, activities, treats, privileges, and so on that a person can buy in exchange for the tokens in a token economy. The reinforcing value of a token, in the technical sense of actually strengthening the behavior on which it is contingent, is proportional to the value of the backup(s) with which the token is correlated (Moher et al., 2008). Selecting well-established, ethically responsible backups and managing their availability according to the supplies and demands of the token economy, therefore, are vital to achieving the objective(s) set for the intervention.

There are several well-documented assessments available to identify preferred stimuli with reinforcement potential in a contingent relation. Individuals with sufficient language abilities can provide input on likely backups, but bear in mind that self-reported preferences do not always correspond to actual preferences for children and adults (e.g., Northup et al., 1996). More formalized stimulus preference assessments and/or caregiver interviews may be required if a person has difficulty verbally communicating their preferences (Piazza et al., 2011).

Preference assessments do not guarantee that a given thing or event will serve a reinforcing function, but instead identifies and reveals potential reinforcements. Multiple stimulus without replacement (MSWO) preference assessments (DeLeon & Iwata, 1996) receives high marks in regard to selecting stimuli that are most likely to function as reinforcers (Kang et al., 2013).

The value of a backup changes as a function of several well-researched variables. They include (1) the level of deprivation or restriction of the backup (Ivy et al., 2015; Roane et al., 2005), (2) the effort required to obtain the backup (Reed et al., 2013), (3) the availability of other backups (Foster & Hackenberg, 2004), and (4) the magnitude, quality, and delay to the backup (Mace et al., 1994; Neef et al., 1994). Evaluate preferences often, according to this extensive literature, stay alert to the changing preferences of individual(s), keep a fresh menu of backups handy, and remember that the value of a token is proportionate to the value of the backup(s) in a token economy.

26.2.8 Establish Tokens as Generalized Conditioned Reinforcers

A token in a token economy is defined in behavior analysis as a conditioned reinforcer, one that has acquired the capacity to reinforce "due to its contingent relation to another reinforcer"

(Catania, 1998, p. 391). The function of a token is seldom restricted to a single reinforcer in practice, however, but instead is related to multiple reinforcers. "Generalized conditioned reinforcement" is the term given to "a conditioned reinforcer that is backed-up by many other sources of reinforcement" (Pierce & Cheney, 2017, p. 513). These sources, in a token economy, are the backups, as previously discussed.

The main advantage of establishing a token as a generalized conditioned reinforcer is that it augments the value of the token, thereby creating a stimulus that is capable of reinforcing countless responses so long as the contingent relations remain in effect between backups, responses, and tokens (Defulio et al., 2014; Russell et al., 2018; Sran & Borrero, 2010). In a word, a generalized conditioned reinforcer is a versatile stimulus, one that can transcend most motivational operations, settings, objectives, and individual circumstances.

Two methods for establishing a token as a conditioned reinforcer have emerged in practice guidelines (Ivy et al., 2017; Hackenberg, 2009, 2018). The most common method of the two involves a written or spoken description of the value of the token with respect to the prevailing schedule of token reinforcement, e.g., "When you earn three points, you can chose to play a video game" (Ivy et al., 2017). Incorporating this type of rule appears sufficient to establish a conditioned reinforcer for language-able people; however, the process is not well understood at this time (Moher et al., 2008; see also Hackenberg, 2009, 2018; Harte & Barnes-Holmes, 2021).

The second method is "stimulus pairing" whereby a token is closely associated in time and space with a backup. Fashioned after the traditional "S-S" procedure for establishing a conditioned reinforcer (Hendry, 1969), the protocol involves repeatedly delivering a token and a backup contiguously with, and contingent on, an appropriate, low-effort, and highly probable response. Once the response(s) is occurring at an acceptable level, delays to the time between earning a token and exchanging it for a backup are systematically added until the desired delay is achieved. Incorporating a response whereby the individual exchanges a token for a backup appears to accelerate the process of establishing the token as conditioned generalized reinforcer (Hackenberg, 2009, 2018).

26.2.9 Specify the Schedules of Reinforcement

A token economy is composed of three interrelated schedules of reinforcement. The three schedules specify (1) the response requirement and conditions under which tokens are delivered, called the *token production schedule*; (2) the exchange rate, or the number of tokens needed to trade for backups, called the *token exchange schedule*; and (3) the conditions under which an opportunity to exchange tokens for backups is available, called the *exchange-production schedule* (Hackenberg, 2009, 2018). We turn first to the token production schedule, then to the exchange-production schedule in the section developing exchange rates, and finally to the token exchange schedule.

The token production schedule specifies the contingency between tokens and responses. There are numerous options in this regard, including awarding a token after a fixed or variable number of responses (i.e., ratio schedules) or after the first response following a fixed or variable amount of time (i.e., interval schedules; see Cooper et al., 2020). The token production schedule also specifies the contingency between responses and the number of tokens earned, which can range from small to large depending upon the criteria set for responses and reinforcer amounts. On that point, target responses that occur infrequently, that require considerable time and effort, or that impact an objective in powerful and consequential ways are reinforced most frequently and most often with a large number of tokens relative to target responses without these exceptional qualities (Ghezzi et al., 2008; Miltenberger, 2016).

A great deal is known about schedules of reinforcement and how different schedules affect the rate, pattern, and other characteristics of responding (Ferster & Skinner, 1957; Hackenberg, 2009,

2018). Variable-ratio (VR) schedules often produce higher response rates than fixed-ratio (FR) schedules, fixed-interval (FI) schedules, and variable-interval (VI) schedules (de Luca & Holburn, 1990, 1992; Mazur, 1983), and individuals tend to show a preference for VR over FR and VI over FI schedules (Mazur, 2004; Repp & Deitz, 1975). Responses maintained by a relatively "lean" schedule typically show greater resistance to extinction compared to a denser schedule (Ferster & Skinner, 1957; Kazdin & Polster, 1973), and a strong preference is usually seen for immediate over delayed reinforcers (Romani et al., 2017). These are just a few of the many characteristics of token production schedules, each one offering a great deal of flexibility in terms of achieving a combination of responses and reinforcers that compliments the objective(s) set for a given person.

Managing the number of tokens in circulation is an important consideration when determining how the token production schedule interacts with the token exchange and the exchange-production schedules. Too many tokens can lead to accumulation or "saving," which can decrease the motivation to earn more (Winkler, 1972). Too few tokens in circulation can limit the number of opportunities to exchange tokens for backup reinforcers, thereby reducing the conditioned reinforcing value of the tokens themselves. The most effective token systems allow many opportunities to earn and exchange tokens but arrange the contingencies to keep savings low or nonexistent (Hackenberg, 2009, 2018; Winkler, 1971). Resolving the issue of too many or too few tokens in circulation may require adjustments to the token production schedule, or it may involve making modifications to the token exchange and exchange-production schedules, described below.

26.2.10 Decide When to Exchange Tokens

The exchange-production schedule specifies the conditions under which tokens are exchanged for backups. One option is a response-based schedule, which stipulates that a person can exchange tokens at any time, and a second option is a time-based schedule, which restricts exchanging to certain days or times regardless of the number of tokens an individual earns (Ivy et al., 2017).

A meaningful difference between the two options is the time delay between awarding tokens and exchanging tokens for backups. Response-based exchanges grant access to the backup(s) the moment a person meets the response requirement, while time-based exchanges add a delay to the backup(s). It is most helpful to know that a response-based schedule with a short delay to exchange is most appropriate for young children with and without disabilities and for persons with limited language (e.g., Hendy et al., 2005; Klimas & McLaughlin, 2007). Long delays to exchange can be difficult even for older children and adults and can weaken the positive effects of a token economy (Field et al., 2004; Moore et al., 2001). Indeed, research suggests that the frequency of exchanges is as vital to the success of a token economy as the frequency of awarding tokens (Bullock & Hackenberg, 2006; Webbe & Malagodi, 1978).

26.2.11 Select Exchange Rates

The exchange-production schedule specifies the cost in tokens of the backup(s) and functions in tandem with the token production and exchange-production schedules as a significant factor in determining response requirements in a token economy (Bullock & Hackenberg, 2006; Hackenberg, 2009, 2018). A combination of a thin token production schedule and relatively expensive backups, for example, can limit opportunities to exchange tokens for backups. A dense token production schedule together with relatively inexpensive backups, in contrast, can lead to excessive exchanges that may lower the value of the backup(s) and the tokens (Tarbox et al., 2006; Ward-Horner et al., 2017).

Several exchange-production configurations are available for use. These include (1) a fixed schedule, whereby a person exchanges their tokens after earning a given number of tokens; (2) a variable schedule, whereby a person

exchanges their tokens after earning a variable number of tokens; and (3) a "menu" system, whereby an assortment of concurrently available backups can be purchased in different amounts for different sums of tokens (Ivy et al., 2017). A token economy appears to operate most effectively when variables as opposed to fixed earning requirements are used and when the magnitude and quality of the backup(s) vary in cost (Becraft & Rolider, 2015; Cihon et al., 2019; Madden et al., 2000; Sran & Borrero, 2010; Whitney et al., 2018).

Incorporating a written or pictorial "menu" of backup reinforcers may be helpful when multiple backups are available or when managing the behavior of a person with a language delay (Cooper et al., 2020; Daley, 1969). A visual reminder of the cost of each backup is particularly important when the cost of the backups range from "most expensive" to "least expensive" (Cooper et al., 2020; Ghezzi et al., 2008).

26.2.12 Phase Out the Token Economy

The key elements in a token economy have little in common with the naturally occurring contingencies of reinforcement in the everyday environment, as we said before. The demand to transition from the conditions and contingencies that manage the relevant target responses in a token economy to those that manage the individuals' behavior under more natural and less contrived circumstances is greater in a token economy compared to other ABA behavior management interventions, as we also said before. A plan to phase out the token economy, then, is on a par with the decision to develop and manage a token economy to begin with.

It may come as a surprise to discover that the scientific literature on ending a token economy is sparse compared to the vast amount of information on starting a token economy. What is available instead are well-worn recommendations on a range of topics, from promoting stimulus generalization to increasing resistance to extinction (e.g., Ghezzi & Bishop, 2008; Ghezzi & Rogers, 2011).

Consider schedule thinning, which is regarded in ABA as an essential step toward maintaining the gains made during an intervention after the intervention is over (Cooper et al., 2020). Thinning a schedule of reinforcement in a token economy is complicated by the fact that there are three schedules to consider, the token production schedule, the token exchange schedule, and the exchange-production schedule, as previously described (see also Petursdottir & Ragnarsdottir, 2019). Changes to the token production schedule are possible by systematically increasing the response requirement for token delivery and/or incorporating an intermittent schedule of token delivery (e.g., Christensen et al., 2004; LeBlanc et al., 2000). The token exchange schedule is modified by gradually increasing the cost of backups, particularly for those that are highly preferred and those with no functional equivalent in the natural environment (e.g., Tarbox et al., 2006). The exchange-production schedule is thinned slowly reducing the number of times tokens are exchanged for backups (Kazdin, 1977).

While not specific to phasing out a token economy, there are several procedures available that we consider good candidates for this purpose. They include (1) incorporating a "level system" in the token economy wherein a person passes through a hierarchy of tiered levels which culminate in the termination of contrived contingencies (e.g., Paul & Lentz, 1977; Pritchard et al., 2018), (2) reducing the number and type of backups specific to the token economy and replacing them with reinforcers available in the natural environment, and (3) establishing a self-monitoring repertoire (McLaughlin & Malaby, 1975).

26.3 Conclusion

Kazdin (1978) credits Joseph Lancaster (1778–1838) with developing the prototype of Ayllon and Azrin's renowned token economy. A talented promoter and successful businessperson,

Lancaster designed his "monitorial" system to meet the demand in the nineteenth-century England to educate the growing population of poor children and youth at a time when teachers were in short supply. The solution was simple: The older children (the "monitors") would teach the younger children in small groups under the direction of an adult "master teacher." The young monitors in Lancaster's classroom earned merit badges (tokens) for their performance as teachers and disciplinarians and could exchange their tokens (badges) for prizes such as a new toy, game, book, writing materials, and the like.

Lancaster advertised the monitorial system in mostly commercial terms as an "economy of expense, efficiency of instruction, discipline by routine, motivation by competition, and neutrality of religion" (Kaestle, 1973). Ayllon and Azrin, in stark contrast, viewed the token economy in scientific terms as a "motivating environment based upon reinforcement theory, specifically operant reinforcement theory" (1968, p. 4). This change in purpose, from commercial success to applied behavior science, is a major turning point in the history of ABA. The token economy played the leading role, either as the hero or as the villain, depending on your point of view. As the hero, the token economy exposed the incompetence and systemic malfeasance to many total institutions in the USA and abroad in the 1960s; as the villain, it provided the means and pretext for unscrupulous people to violate the civil rights of persons living in total institutions at the time.

The token economy is understood in ABA today as one of many behavior management interventions. It is a demanding intervention, one that requires a great deal of preparation, planning, and daily management, as our nine key elements show, and one that can be difficult to fade without a plan in place from the start. These features of a token economy leads practitioners to evaluate less intrusive and more natural procedures before turning to the intervention to accomplish a given objective for a given person. It is a course of action in which "minimally invasive" interventions are favored over interventions such as a token economy that require not only a significant amount of time and effort but also experience, knowledge, and commitment of a veteran applied behavior analyst.

References

Baer, D. M., Wolf, M. M., & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis, 1*(1), 91–97. https://doi.org/10.1901/jaba.1968.1-91

Bailey, J. S., & Burch, M. R. (2016). *Ethics for behavior analysts* (3rd ed.). Routledge.

Becraft, J. L., & Rolider, N. U. (2015). Reinforcer variation in a token economy. *Behavioral Interventions, 30*(2), 157–165. https://doi.org/10.1002/bin.1401

Behavior Analyst Certification Board. (2021, August 30). U.S. licensure of behavior analysts. Behavior Analyst Certification Board. https://www.bacb.com/u-s-licensure-of-behavior-analysts/.

Behavior Analyst Certification Board. (2020). *Ethics code for behavior analysts*. Authors.

Bullock, C. E., & Hackenberg, T. D. (2006). Second order schedules of token reinforcement with pigeons: Implications for unit price. *Journal of Experimental Analysis of Behavior, 85*(1), 95–106. https://doi.org/10.1901/jeab.2006.116-04

Catania, A. C. (1998). *Learning* (4th ed.). Prentice Hall.

Carnett, A., Raulston, T., Lang, R., Tostanoski, A., Lee, A., Sigafoos, J., & Machalicek, W. (2014). Effects of perseverative interest-based token economy on challenging and on-task behavior in a child with autism. *Journal of Behavioral Education, 23*, 368–377. https://doi.org/10.1007/s10864-014-9195-7

Charlop-Christy, M. H., & Haymes, L. K. (1998). Using objects of obsession as token reinforcers for children with autism. *Journal of Autism and Developmental Disorders, 28*(3), 189–198. https://doi.org/10.1023/A:1020612201710

Christensen, L., Young, K. R., & Merchant, M. (2004). The effects of peer-mediated positive behavior support program on socially appropriate classroom behavior. *Education and Treatment of Children, 27*, 199–234.

Cihon, J. H., Ferguson, J. L., Milne, C. M., Leaf, J. B., McEachin, J., & Leaf, R. (2019). A preliminary evaluation of a token system with a flexible earning requirement. *Behavior Analysis in Practice, 12*(3), 548–556. https://doi.org/10.1007/s40617-018-00316-3

Common, E. A., & Lane, K. L. (2017). Social validity assessment. In J. K. Luiselli (Ed.), *Applied behavior analysis advanced guidebook: A manual for professional practice* (pp. 73–92). Elsevier Academic Press. https://doi.org/10.1016/B978-0-12-811122-2.00004-8

Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied behavior analysis* (3rd ed.). Pearson.

Cosper, M. R., & Erickson, M. T. (1984). Relationships among observed classroom behavior and three types of teacher ratings. *Behavioral Disorders, 9*(3), 189–195.

Curry, K. (2013). The Sunland Training Centers: Florida's institutes for children with intellectual disabilities. *Florida Public Health Review, 10*, 14–24.

Daley, M. F. (1969). The "reinforcement menu": Finding effective reinforcers. In J. D. Krumboltz & C. E. Thorsen (Eds.), *Behavioral counseling: Cases and techniques* (pp. 42–45). Holt, Rinehart, and Winston.

DeFulio, A., Yankelevitz, R., Bullock, C., & Hackenberg, T. D. (2014). Generalized conditioned reinforcement with pigeons in a token economy. *Journal of Experimental Analysis of Behavior, 102*(1), 26–46. https://doi.org/10.1002/jeab.94

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29*(4), 519–533. https://doi.org/10.1901/jaba.1996.29-519

de Luca, R. V., & Holburn, S. W. (1990). Effects of fixed interval and fixed ratio schedules of token reinforcement on exercise with obese and nonobese boys. *The Psychological Record, 40*(1), 67–82.

de Luca, R. V., & Holburn, S. W. (1992). Effects of a variable-ratio reinforcement schedule with changing criteria on exercise in obese and nonobese boys. *Journal of Applied Behavior Analysis, 25*(3), 671–679. https://doi.org/10.1901/jaba.1992.25-671

Reed, F.D.G, & Codding, R.S. (2011). Intervention integrity assessment. In J.K. Luiselli (Ed.), *Teaching and Behavior Support for Children and Adults with Autism Spectrum Disorder*, (pp. 38–47). New York: Oxford.

Ferster, C. B., & Skinner, B. F. (1957). *Schedules of reinforcement*. Appleton-Century-Crofts.

Field, C. E., Nash, H. M., Handwerk, M. L., & Friman, P. C. (2004). A modification of the token economy for nonresponsive youth in family-style residential care. *Behavior Modification, 28*(3), 438–457. https://doi.org/10.1177/014544503258995

Fiske, K., & Delmolino, L. (2012). Use of discontinuous methods of data collection in behavioral intervention: Guidelines for practitioners. *Behavior Analysis in Practice, 5*(2), 77–81. https://doi.org/10.1007/BF03391826

Foster, T. A., & Hackenberg, T. D. (2004). Unit price and choice in a token-reinforcement context. *Journal of the Experimental Analysis of Behavior, 81*(1), 5–25. https://doi.org/10.1901/jeab.2004.81-5

Ghezzi, P. M., & Bishop, M. R. (2008). Generalized behavior change in young children with autism. In J. K. Luiselli, D. C. Russon, W. P. Christian, & S. M. Wilcynzski (Eds.), *Effective practices for children with autism: Educational and behavior support interventions that work* (pp. 137–158). Oxford University Press.

Ghezzi, P. M., & Rogers, V. R. (2011). Promoting generalization. In J. K. Luiselli (Ed.), *Teaching and behavior support for children and adults with autism spectrum disorders: A "how to" practioner's guide* (pp. 179–186). Oxford University Press.

Ghezzi, P. M., Wilson, G. R., Tarbox, R. S. F., & MacAleese, K. R. (2008). Guidelines for developing and managing a token economy. In W. T. O'Donohue & J. E. Fisher (Eds.), *Cognitive behavior therapy: Applying empirically supported techniques in your practice* (pp. 565–671). John Wiley & Sons.

Hackenberg, T. D. (2009). Token reinforcement: A review and analysis. *Journal of the Experimental Analysis of Behavior, 91*(2), 257–286. https://doi.org/10.1901/jeab.2009.91-257

Hackenberg, T. D. (2018). Token reinforcement: Translational research and application. *Journal of Applied Behavior Analysis, 51*(2), 393–435. https://doi.org/10.1002/jaba.439

Hawkins, R. P., & Mathews, J. R. (1999). Frequent monitoring of clinical outcomes: Research and accountability for clinical practice. *Education and Treatment of Children, 22*(2), 117–135.

Harte, C., & Barnes-Holmes, D. (2021). The status of rule-governed behavior as pliance, tracking, and augmenting within relational frame theory: Middle-level rather then technical terms. The Psychological Record. https://doi.org/10.1007?s40732-021-00458-x

Hendy, H. M., Williams, K. E., & Camise, T. S. (2005). "Kids choice" school lunch program increases children's fruit and vegetable acceptance. *Appetite, 45*(3), 250–263. https://doi.org/10.1016/j.appet.2005.07.006

Hendry, D. P. (1969). *Conditioned reinforcement*. Dorsey Press.

Hineline, P. N. (2005). The aesthetics of behavioral arrangements. *The Behavior Analyst, 28*(1), 15–28. https://doi.org/10.1007/BF03392101

Horner, R., Hew, K., & Tan, C. (2018). Comparing digital badges-and-points with classroom token systems: Effects on elementary school ESL students' classroom behavior and English learning. *Educational Technology & Society, 21*(1), 137–151.

Ivy, J. W., Neef, N. A., Meindl, J. N., & Miller, N. (2015). A preliminary examination of motivating operation and reinforcer class interaction. *Behavioral Interventions, 31*(2), 180–194. https://doi.org/10.1002/bin.1436

Ivy, J. W., Meindl, J. N., Overley, E., & Robson, K. M. (2017). Token economy: A systematic review of procedural descriptions. *Behavior Modification, 41*(5), 708–737. https://doi.org/10.1177/0145445517699559

Johnstone, J. M., Carr, J. E., & Mellichamp, F. H. (2017). A history of the professional credentialing of applied behavior analysts. *The Behavior Analyst, 40*, 523–538.

Johnston, J. M., Pennypacker, H. S., & Green, G. (2020). *Strategies and tactics of behavioral research and practice* (4th ed.). Routledge.

Kaestle, C. F. (1973). *Joseph Lancaster and the monitorial school movement: A documentary history*. Teachers College Press.

Kang, S., O'Reilly, M., Lancioni, G., Falcomata, T. S., Sigafoos, J., & Xu, Z. (2013). Comparison of the predictive validity and consistency among preference assessment procedures: A review of the literature. *Research in Developmental Disabilities, 34*(4), 1125–1133. https://doi.org/10.1016/j.ridd.2012.12.021

Kazdin, A. E. (1977). *The token economy*. Springer.

Kazdin, A. E. (1978). *History of behavior modification: Experimental foundations of contemporary research*. University Park Press.

Kazdin, A. E., & Polster, R. (1973). Intermittent token reinforcement and response maintenance in extinction. *Behavior Therapy, 4*(3), 286–391. https://doi.org/10.1016/S0005-7894(73)80118-2

Klimas, A., & McLaughlin, T. F. (2007). The effects of a token economy system to improve social and academic behavior with rural primary aged child with disabilities. *International Journal of Special Education, 22*(3), 72–77.

Kubrick, S. (Director). (1971). A clockwork orange [Film]. Polaris Productions.

LeBlanc, L. A., Hagopian, L. P., & Maglieri, K. A. (2000). Use of a token economy to eliminate excessive inappropriate social behavior in an adult with developmental disabilities. *Behavioral Interventions, 15*(2), 135–143. https://doi.org/10.1002/(SICI)1099-078X(200004/0615:2<135::AID-BIN51>3.0.CO;2-3

Leaf, J. B., Leaf, R., McEachin, J., Taubman, M., Ala'i-Rosales, S., Ross, R. K., Smith, T., & Weiss, M. J. (2016). Applied behavior analysis is a science and, therefore, progressive. *Journal of Autism and Developmental Disorders, 46*(2), 720–731. https://doi.org/10.1007/s10803-015-2591-6

Lewon, A. B., & Ghezzi, P. M. (2020). An evaluation of the Early Learning Measure as a predictor of outcomes in early intensive behavioral intervention. *Behavioral Interventions, 36*, 388–406.

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55*(1), 3–9. https://doi.org/10.1037/0022-006X.55.1.3

Mace, F. C., Neef, N. A., Shade, D., & Mauro, B. C. (1994). Limited matching on concurrent-schedule reinforcement of academic behavior. *Journal of Applied Behavior Analysis, 27*(4), 585–596. https://doi.org/10.1901/jaba.1994.27-585

Madden, G. J., Bickel, W. K., & Jacobs, E. A. (2000). Three predictions of the economic concept of unit price in a choice context. *Journal of the Experimental Analysis of Behavior, 73*(1), 45–64. https://doi.org/10.1901/jeab.2000.73-45

Mazur, J. E. (1983). Steady-state performance on fixed-, mixed-, and random-ratio schedules. *Journal of the Experimental Analysis of Behavior, 39*(2), 293–307. https://doi.org/10.1901/jeab.1983.39-293

Mazur, J. E. (2004). Risky choice: Selecting between certain and uncertain outcomes. *The Behavior Analyst Today, 5*(2), 190–203. https://doi.org/10.1037/h0100031

McAllister, J. W. (1972). *Report of resident abuse investigating committee*. Division of Retardation, Department of Health and Rehabilitative Services.

McLaughlin, T. F., & Malaby, J. E. (1975). The effects of various token reinforcement contingencies on assignment completion and accuracy during variable and fixed token exchange schedules. *Canadian Journal of Behavioural Science, 7*(4), 411–419. https://doi.org/10.1037/h0081925

Meany-Daboul, M. G., Roscoe, E. M., Bourret, J. C., & Ahearn, W. H. (2007). A comparison of momentary time sampling and partial-interval recording for evaluating functional relations. *Journal of Applied Behavior Analysis, 40*(3), 501–514. https://doi.org/10.1901/jaba.2007.40-501

Miltenberger, R. G. (2016). *Behavior modification: Principles and procedures* (6th ed.). Cengage Learning.

Moher, C. A., Gould, D., Hegg, E., & Mahoney, A. M. (2008). Non-generalized and generalized conditioned reinforcers: Establishment and validation. *Behavioral Interventions, 23*(1), 13–38. https://doi.org/10.1002/bin.253

Moore, J. W., Tingstrom, D. H., Doggett, A., & Carlyon, W. D. (2001). Restructuring an existing token economy in a psychiatric facility for children. *Child and Family Behavior Therapy, 23*(3), 51–57. https://doi.org/10.1300/j019v23n03_04

Moya, C. B., & Achtenberg, R. (1974). Behavior modification: Legal limitations on methods and goals. *Notre Dame Law Review, 50*(2), 230–250.

National Association for Retarded Citizens, *The Record*, Fall, (1972).

Neef, N. A., Shade, D., & Miller, M. S. (1994). Assessing influential dimensions of reinforcers on choice in students with serious emotional disturbance. *Journal of Applied Behavior Analysis, 27*(4), 575–583. https://doi.org/10.1901/jaba.1994.27-575

Northup, J., George, T., Jones, K., Broussard, C., & Vollmer, T. R. (1996). A comparison of reinforcer assessment methods: The utility of verbal and pictorial choice procedures. *Journal of Applied Behavior Analysis, 29*(2), 201–212. https://doi.org/10.1901/jaba.29-201

Page, T. J., & Iwata, B. A. (1986). Interobserver agreement. In A. Poling & R. W. Fuqua (Eds.), *Research methods in applied behavior analysis* (pp. 99–126). Springer. https://doi.org/10.1007/978-1-4684-8786-2_6

Paul, G. L., & Lentz, R. J. (1977). *Psychosocial treatment of chronic mental patients: Milieu versus social-learning programs*. Harvard University Press.

Petursdottir, A. L., & Ragnarsdottir, G. B. (2019). Decreasing student behavior problems, fostering academic engagement through function-based support, and fading of token reinforcement. *Behavioral Interventions, 34*(3), 323–337. https://doi.org/10.1002/bin.1670

Piazza, C. C., Roane, H. S., & Karsten, A. (2011). Identifying and enhancing the effectiveness of positive reinforcement. In W. W. Fisher, C. C. Piazza, & H. S. Roane (Eds.), *Handbook of applied behavior analysis* (pp. 151–164). The Guilford Press.

Pierce, W. D., & Cheney, C. D. (2017). *Behavior analysis and learning: A biobehavioral approach* (6th ed.). Routledge.

Pritchard, D., Penney, H., & Mace, F. C. (2018). The ACIEVE! Program: A point and level system for

reducing severe problem behavior. *Behavioral Interventions, 33*(1), 41–55. https://doi.org/10.1002/bin.1506

Reed, F.D.G, & Codding, R.S. (2011). Intervention integrity assessment. In J.K. Luiselli (Ed.), Teaching and Behavior Support for Children and Adults with Autism Spectrum Disorder (pp. 38–47). New York: Oxford.

Reed, D. D., Niileksela, C. R., & Kaplan, B. A. (2013). Behavioral economics: A tutorial for behavior analysts in practice. *Behavior Analysis in Practice, 6*(1), 34–54.

Reitman, D., Hupp, S. D. A., O'Callaghan, P. M., & Murphy, M. A. (2004). Behavior change and perceptions of change: Evaluating the effectiveness of a token economy. *Child and Family Behavior Therapy, 26*(2), 17–36. https://doi.org/10.1300/J019v26n02_02

Repp, A. C., & Deitz, S. M. (1975). A comparison of fixed-ratio and variable-ratio token-production schedules with human subjects. *The Psychological Record, 25*, 131–137. https://doi.org/10.1007/BF03394296

Roane, H. S., Call, N. A., & Falcomata, T. S. (2005). A preliminary analysis of adaptive responding under open and closed economies. *Journal of Applied Behavior Analysis, 38*(3), 335–348. https://doi.org/10.1901/jaba.2005.85-04

Robacker, C. M., Rivera, C. J., & Warren, S. H. (2016). A token economy made easy through ClassDojo. *Intervention in School and Clinic, 52*(1), 39–43. https://doi.org/10.1177/1053451216630279

Romani, P. W., Alcorn, A. S., Miller, J. R., & Clark, G. (2017). Preference assessment for dimensions of reinforcement to inform token economies targeting problem behavior. *Journal of Behavioral Education, 26*, 221–237. https://doi.org/10.1007/s10864-017-9270-y

Russell, D., Ingvarsson, E. T., Haggar, J. L., & Jessel, J. (2018). Using progressive ratio schedules to evaluate tokens as generalized conditioned reinforcers. *Journal of Applied Behavior Analysis, 51*(1), 40–52. https://doi.org/10.1002/jaba.424

Sran, S. K., & Borrero, J. C. (2010). Assessing the value of choice in a token system. *Journal of Applied Behavior Analysis, 43*(3), 553–557. https://doi.org/10.1901/jaba.2010.43-553

Stolz, S. B. (1978). *Ethical issues in behavior modification*. Jossey-Bass Publishers.

Tarbox, R. S. F., Ghezzi, P. M., & Wilson, G. (2006). The effects of token reinforcement on attending in a young child with autism. *Behavioral Interventions, 21*(3), 155–164. https://doi.org/10.1002/bin.213

Time Magazine. (1971, September 20). Behavior: Skinner's utopia: Panacea, or path to hell? *Time Magazine.* http://content.time.com/time/subscriber/article/0,33009,909994,00.html

Webbe, F. M., & Malagodi, E. F. (1978). Second-order schedules of token reinforcement: Comparisons of performance under fixed-ratio and variable-ratio exchange schedules. *Journal of the Experimental Analysis of Behavior, 30*(2), 219–224. https://doi.org/10.1901/jeab.1978.30-219

Ward-Horner, J. C., Cengher, M., Ross, R. K., & Fienup, D. M. (2017). Arranging response requirements and the distribution of reinforcers: A brief review of preference and performance outcomes. *Journal of Applied Behavior Analysis, 50*(1), 181–185. https://doi.org/10.1002/jaba.350

Wexler, D. B. (1973). Token and taboo: Behavior modification, token economies, and the law. *California Law Review, 61*(1), 81–109. https://doi.org/10.2307/3479877

Whitney, T., Cooper, J. T., & Lingo, A. S. (2018). Using a token economy combined with a mystery motivator for a student with autism exhibiting challenging behavior. *Kentucky Teacher Education Journal, 5*(2), 1–23.

Williamson, R. L., & McFadzen, C. (2020). Evaluating the impact of token economy methods on student on-task behavior with an inclusive Canadian classroom. *International Journal of Technology and Inclusive Education, 9*(1), 1531–1541.

Winkler, R. C. (1971). Reinforcement schedules for individual patients in a token economy. *Behavior Therapy, 2*(4), 534–537. https://doi.org/10.1016/S0005-7894(71)80099-0

Winkler, R. C. (1972). A theory of equilibrium in token economies. *Journal of Abnormal Psychology, 79*(2), 169–173. https://doi.org/10.1037/h0032722