



Effects of Token Reinforcement on Physical Activity and Intrinsic Motivation

Andrew E. Alstot, Matthew Delegato, Lauren Kumpel, Logan Moen, & Travis Rush
Department of Exercise Science | Pacific University | 2043 College Way | Forest Grove, OR 97116

Abstract

Background/Purpose: Although effective in improving physical activity (PA) behavior, extrinsic rewards have been criticized for the potential detriment to one's intrinsic motivation for engaging in the activity for which one was rewarded. However, there is conflicting research on intrinsic motivation in fields outside of PA; when extrinsic rewards have been introduced and subsequently withdrawn systematically, intrinsic motivation can increase. It is unknown how the use of extrinsic rewards, when used to reinforce PA behavior, will impact intrinsic motivation when systematically withdrawn. Therefore, the purpose of this study was to examine the effects of extrinsic rewards, administered as a token economy on two schedules of reinforcement, a fixed interval (FI) schedule and a variable interval (VI) schedule, on the intensity of riding a stationary bicycle as well as its influence on intrinsic motivation for engaging in PA.

Method: Ten participants were asked to ride a stationary bike for several 20-minute sessions. During the baseline phase, participants rode for 20 minutes without extrinsic reward. Mean revolutions per minute (RPM) were calculated. Once a stable baseline pattern emerged, the token economy was introduced. Participants on the FI schedule were awarded one token for every minute they rode above 10% of their mean baseline RPM. For those on the VI schedule, the rate of reinforcement was systematically decreased. During the first token session, participants were awarded one token for every minute above 10% of their baseline mean; session two was increased to 1.5 minutes. Each subsequent token session was increased by 30 seconds, making it increasingly difficult to earn tokens. After each token session, participants were given the opportunity to exchange their earned tokens for a gift card.

Analysis/Results: Mean RPM for baseline and token sessions were plotted on a graph and inspected for response differentiation. The Situational Motivational Scale (SIMS) was administered to participants before and after the intervention to assess changes in intrinsic motivation. Both FI and VI schedules were effective in increasing the intensity with which participants rode the exercise bike. Most participants who were given tokens on the FI schedule decreased in their intrinsic motivation score. However, all VI-scheduled participants' intrinsic motivation increased or remained constant.

Conclusions: Token economies can be useful in improving the physical activity of those who are reinforced. However, to improve performance while increasing or maintaining intrinsic motivation, physical activity professionals should consider introducing extrinsic rewards to improve the behavior and subsequently withdrawing them systematically.

Background

Token economies, which consist of rewarding individuals with tokens when they engage in a pre-defined behavior and allowing the exchange of earned tokens for an assortment of desirable items (Ayllon & Azrin, 1968), have been shown to be effective in changing a variety of behaviors (Kazdin & Bootzin, 1972). Additionally, there is much empirical support for the use of token reinforcement systems to improve various physical activity behaviors as well (Alstot, 2012). However, those who oppose the use of extrinsic, tangible reinforcement argue that using rewards for physical activity engagement will serve as a detriment to individuals' intrinsic motivation for engaging in physical activity (Deci, Koestner, & Ryan, 1999). Some evidence, however, exists in the literature outside of physical activity settings that indicates token rewards can actually improve motivation if implemented appropriately (McGinnis, Friman, & Carlyon, 1999).

Purpose

The purpose of the study was to examine the effects of a token economy, administered on two schedules of reinforcement, on the intensity with which participants rode a stationary bike. The secondary purpose was to examine the influence these extrinsic rewards had on participants' intrinsic motivation for engaging in physical activity.

Method

Participants: 10 individuals (7 males, 3 females), ages 18-24

Experimental Design and Procedures: A multiple baseline across participants design was used to evaluate the effectiveness of the token economy. Using this design, participants each engaged in 10 sessions, but were introduced to the intervention at different times. Participants were presented with two phases of the study: baseline and token economy

- **Baseline** – After completing the Situational Motivation Scale (SIMS; Guay, Vallerand, & Blanchard, 2000) to assess their intrinsic motivation before the intervention, participants were asked to ride a stationary bike (Monark Cycle Ergometer, 894E) for 20 minutes at a pace and resistance level of their choice without receiving outside reinforcement. For each baseline session, mean RPMs were calculated and recorded. Once a steady baseline trend was observed, participants were transitioned to the token economy phase.
- **Token Economy** - Participants rode the same stationary bike for twenty minutes, but were informed that they could earn tokens (i.e., numbered points on a computer screen) for pedaling the bike at a faster rate. Two different schedules of reinforcement were introduced: a fixed interval (FI) schedule and a variable interval (VI) schedule. For participants on the FI schedule of reinforcement, one token was awarded for every minute the participants pedaled at least 10% above the mean RPMs of their baseline phase; a maximum of 20 tokens were available each session – one per minute they were above the criterion RPM rate. For those on the VI schedule, the rate of reinforcement was systematically decreased by increasing the time needed by 30 seconds to earn a token (i.e., session 1 = 1 min per token, session 2 = 1.5 min per token, session 3 = 2 minutes per token, etc.) After each session, participants had the opportunity to trade in their tokens for gift cards or they could save their tokens for a later time. At the conclusion of the last token session, participants were administered the SIMS questionnaire again to assess for changes in intrinsic motivation.

Data Analysis: After each session, mean RPMs were calculated and plotted on a line graph. Graphs were visually inspected to assess differentiation between the baseline and intervention phases where tokens were awarded. Pre- and post-SIMS scores were also assessed to examine changes in participants' intrinsic motivation for engaging in physical activity.

Results

All 10 participants showed an improvement in performance during the token economy phase, regardless of the schedule of reinforcement to which they were subjected (see Figures 1 and 2). This indicates both token systems were effective in increasing the intensity with which participants pedaled the bike. Pre- and post-scores on the SIMS questionnaire indicated that the intrinsic motivation of participants on the FI schedule either remained the same or slightly decreased after the withdrawal of the token system. However, participants on the VI schedule either remained the same or increased their intrinsic motivation after participating in the token economy.

Conclusions

Extrinsic rewards in the form of a token economy can be an effective means of improving physical activity behavior. Practitioners who use these systems should also plan to systematically withdraw these interventions by making it increasingly more difficult to earn tokens. In doing so, the extrinsic rewards are being faded out and the source of reinforcement is transferred to the individual. Therefore, physical activity behaviors can improve while also maintaining or increasing intrinsic motivation.

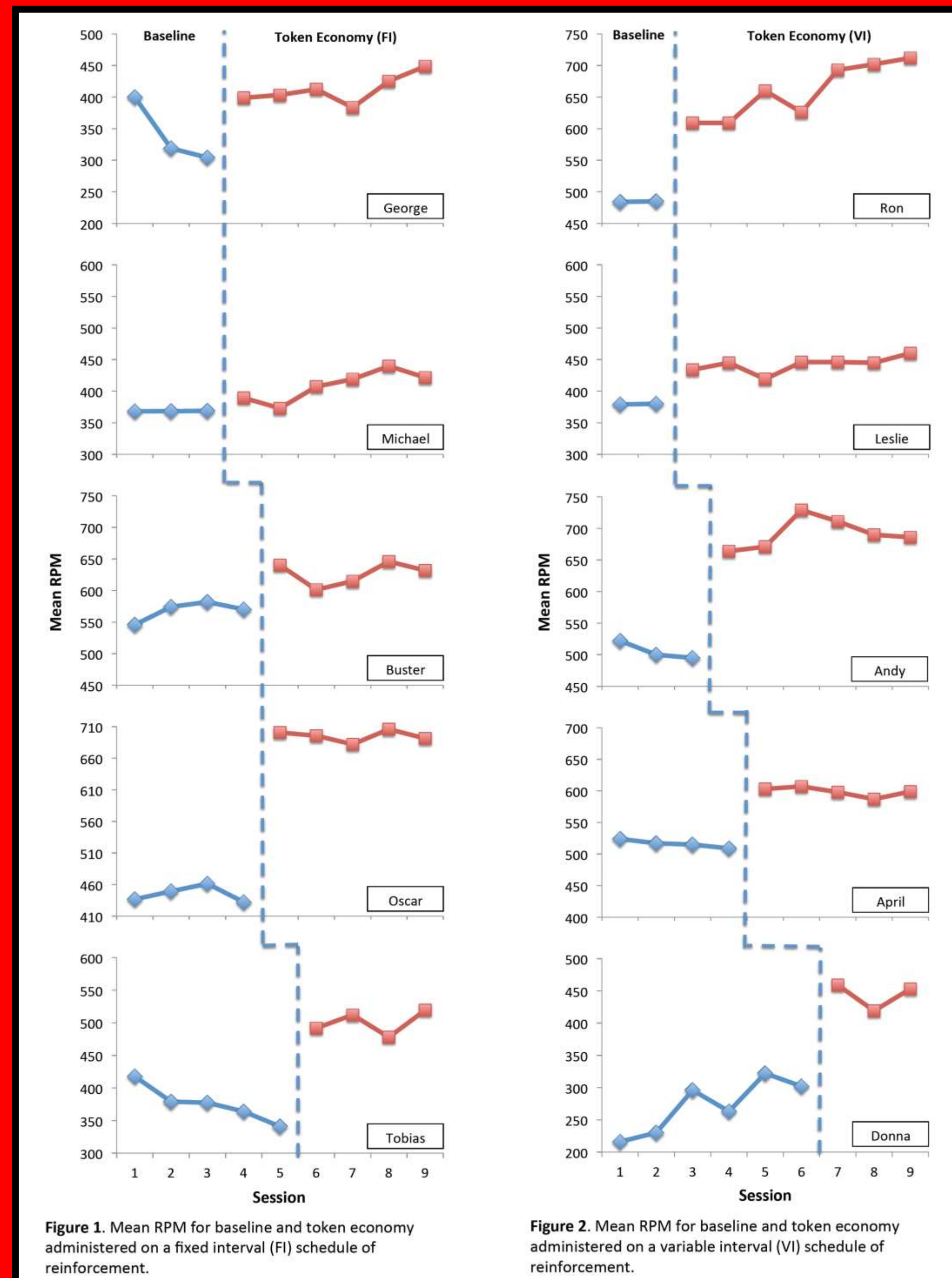


Figure 1. Mean RPM for baseline and token economy administered on a fixed interval (FI) schedule of reinforcement.

Figure 2. Mean RPM for baseline and token economy administered on a variable interval (VI) schedule of reinforcement.

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