

Using Token Reinforcement to Increase Walking for Adults with Intellectual Disabilities

by

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## **Dedication**

I dedicate this manuscript to my parents, Paul and Beth, for their unconditional love and support throughout my life's endeavors, inspiring me to pursue my passions and achieve my goals.

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## **Abstract**

Adults with intellectual disabilities (ID) are at risk for negative health conditions due to high levels of sedentary behavior. Walking and cycling are the most common forms of physical activity engaged in by adults with ID. Research is limited in evaluating physical activity interventions for this population. The purpose of this study will be to evaluate the effectiveness of a token reinforcement intervention to increase distance walked for adults with mild to moderate ID at adult day training centers.

## **Introduction**

Physical activity is defined as any movement exerted by the skeletal muscles that results in energy expenditure (Caspersen, Powell, & Christenson, 1985). Physical activity is important because inactivity or sedentary behavior is the fourth leading risk for mortality worldwide (Winter, Bastiaanse, Hilgenkamp, Evenhuis, & Echetld, 2011; World Health Organization [WHO], 2014). Inactivity contributes to serious health problems including cardiovascular disease, cancers, diabetes, hypertension, and stroke. Globally, one in three adults is inactive and therefore at risk for the negative health conditions stated above (US Department of Health and Human Services [USDHHS], 2008; WHO, 2014). Within the United States, approximately one-third of adults live sedentary lifestyles, walking fewer than 5000 steps per day, and fail to engage in activity to combat these lifestyle diseases. Any activity, regardless of intensity level, is beneficial to those who currently engage in a sedentary lifestyle (Centers for Disease Control and Prevention [CDC], 2014; Conn, Hafdahl, & Mehr, 2011; Finlayson et al., 2009; Finlayson, Turner, & Granat, 2011; Ginis, Nigg, & Smith, 2013; Heller, Fisher, Marks & Hsieh, 2014; King, Rejeski, & Buchner, 1998; Lante, Walkley, Gamble, & Vassos, 2011; Mendonca, Pereira, & Fernhall, 2010; Temple, Anderson, & Walkley, 2000; Winter et al., 2011; WHO, 2014).

One population that is likely to be inactive is individuals with intellectual disabilities (ID). Adults with ID are at a greater risk for being inactive and sedentary compared to typical peers (Bazzano et al., 2009; Bodde, Seo, Frey, Van Puymbroeck, & Lohrmann, 2013; Finlayson et al., 2009, 2011; Heller et al., 2014; Hilgenkamp, Reis, van Wijck, & Evenhuis, 2012; Hsieh,



Rimmer, & Heller, 2013; Lante et al., 2011; Melville, Hamilton, Hankey, Miller, & Boyle, 2007; Mendonca et al., 2010; Peterson, Janz, & Lowe, 2008; Robertson et al., 2000; Temple, Frey, & Stanish, 2006; Winter et al., 2011). Almost one third of adults with ID never or rarely engage in moderate to vigorous physical activity or MVPA (Hsieh et al., 2013). As inactivity leads to being overweight and obese, adults with disabilities have poorer health outcomes than typical peers (Bazzano et al, 2009; Bodde et al., 2013; Fernhall et al., 1996; Finlayson et al., 2009, 2011; Hsieh et al., 2013; Mendonca et al., 2010; Temple et al., 2006).

Research attests to the lower levels of physical fitness for individuals with Down Syndrome (DS) in particular. Comorbid symptoms of low maximal heart rates, respiratory abnormalities, circulatory issues, and muscle weakness make independent, functional living activities more challenging for individuals with DS compared to peers with other diagnoses of ID or typical peers (Carmeli, Kessel, Coleman, & Ayalon, 2002; Crowley et al., 2011; Dodd & Shields, 2005; Mendonca, Pereira, & Fernhall, 2013; Shield & Taylor, 2010). With poorer health outcomes, further implications for those who have DS and live sedentary lifestyles include decreases in life longevity and fewer opportunities for independent living (WHO, 2014). These consequences impact the quality of life and overall independence these individuals experience.

The prevalence of medical conditions experienced by individuals with ID makes visits to a doctor routine. However, physical activity is rarely addressed during physician visits. Other health concerns take precedence, resulting in little communication about resources available for individuals with disabilities to become active. For those that are told they are at risk for serious health concerns due to weight and or inactivity, instructions or interventions for weight loss are rarely provided (Dorgo, Robinson, & Bader, 2009; Hawkins, Stegall, Weber, & Ryan, 2012; Hsieh et al., 2013; Rel-Moya, Castilla-Alvarez, Pichiule-Castaneda, Rico-Blazquez, Escortell-

Mayor, & Gomez-Quevedo, 2012). Caregivers of those with disabilities may also be naïve to the negative health effects of inactivity. Janicki et al. (2002) found that caregivers reported the health status of 81% of the sample of individuals with ID to be good to excellent, when over half were sedentary individuals and categorized as obese. It is unlikely that a person will be in excellent health if the individual is inactive or obese. This becomes a greater concern when health practitioners accept obesity as normative for these adults because they have a disability. By not addressing the issue of obesity and sedentary lifestyles, practitioners are inadvertently making it more likely for these adults to be at greater risk for future health problems (Bodde et al., 2013; CDC, 2011; Janicki et al., 2002; USDHHS, 2008; WHO, 2014).

Santos et al. (2012) found that for older adults, more time spent engaging in sedentary activities resulted in less functional fitness for the individual. Functional fitness is the ability to engage independently in daily living activities without fatigue or tiredness. As adults age and inactivity increases, independence for these adults decrease (Hilgenkamp et al., 2010; Messent, Cook & Long, 1998; Temple et al., 2006). The more an adult can do independently, the more activities and opportunities he or she has to increase his or her quality of life (Hilgenkamp et al., 2010, 2011; Mendonca et al., 2010). Important components of this fitness involve muscle strength and endurance, balance, and cardiorespiratory endurance (Hilgenkamp et al., 2010). These targeted areas have been the focus for interventions involving adults with ID because jobs for individuals with ID are more dependent on physical than cognitive abilities (Croce & Horvat, 1992; Crowley et al., 2011; Dodd & Shield, 2005; Rimmer et al., 1996; Shield et al., 2013; Shield & Taylor, 2010).

Spanos et al. (2013) commented on the inconsistency and limited number of interventions used to address physical activity in adults with disabilities. Lante et al. (2011) and Robertson et al. (2000) claimed that the most effective way to improve the health of individuals with disabilities is to increase their levels of MVPA. Finlayson et al. (2009) discovered that of adults with ID whom

engaged in physical activity, 43% engaged in walking, which was the most common behavior across all levels of MVPA. Effective interventions to increase MVPA with this population need to be developed and evaluated.

Engaging in exercise can be challenging for individuals with ID because exercising might not be reinforced, resources to exercise are limited or unaddressed, and barriers for exercising may be inhibiting such behaviors (Heller, Hsieh, & Rimmer, 2004; Stanish, Temple, & Frey, 2006). Therefore, interventions should focus on creating appropriate contexts for exercise to occur regularly, arranging establishing operations for reinforcers that might maintain physical activity, and reinforcing exercise when it occurs.

The limited research on exercise for adults with ID has varying outcomes. Stanish and Draheim (2005) examined walking by adults with ID across one week. They reported that about 64% of the participants engaged in MVPA five times throughout the week, however only 17% met the recommended 30 min of MVPA for these 5 days. Endurance and duration is crucial to achieve the health benefits accompanying physical activity. Moss (2009) implemented a walking program for adults with ID at risk for coronary heart disease. Participants walked a 400-m loop for 20 min continuously, increasing to 30 min by 12 weeks. Adherence to this program was only 47% and participants who attended 50-70% of the sessions had the greatest increase in fitness levels. The individuals who attended daily and walked more laps had healthier outcomes from the start of the study, so the impact of this study was not as noticeable as it was for those whom were sedentary from the beginning. This study highlighted that any activity for sedentary individuals can be beneficial but consistently engaging in activity is essential. Todd and Reid (2006) utilized self-monitoring, verbal cueing, encouragement, and edible reinforcement to increase distance snowshoed, walked, and jogged for individuals diagnosed with autism. Stickers were used to track the number of laps and edible and social reinforcers were delivered contingent on completing laps. The number of laps

required to earn an edible was increased across phases to fade out the edible reinforcers. This study revealed that the multicomponent intervention resulted in an increase in laps for all participants.

A few studies have implemented token reinforcement to increase duration or frequency of a specified exercise activity for individuals with ID (Alstot, 2012; Bennett et al., 1989; Croce & Horvat, 1992; Todd & Reid, 2006). Bennett et al. (1989) administered tokens for pedaling a predetermined number of rotations on a stationary bike; tokens were exchanged later for backup reinforcers. Time on task increased and variability in exercise behavior decreased with the onset of the intervention. Furthermore, when the token economy was withdrawn, time on task dropped to baseline levels, highlighting the control of the intervention. This study only explored physical activity in 15-min increments. Croce and Horvat (1992) used tokens to reward participants for meeting or exceeding the duration or frequency of activity from the previous session. The participants were encouraged to run/walk/cycle for as long as they could during treatment while maintaining their heart rate in pre-established heart-rate zones. Social reinforcement in the form of encouragement or feedback was provided concurrently during exercise and as feedback at the end of each session. One token was given at the end of the session contingent on meeting the duration or frequency of an exercise from the previous session, and an additional token for every 30 s longer, quarter lap further, or repetition more from the previous session. Tokens were exchanged or accumulated weekly. This study showed increases in exercise for the participants during intervention, with a downward trend towards baseline levels during the retention phase.

Few studies have explored the use of tokens to increase physical activity (Alstot, 2012; Bennett et al., 1989; Croce & Horvat, 1992; Todd & Reid, 2006). This user-friendly, easily-implemented intervention showed promising results for increasing physical activity. However, these studies were limited in that they were conducted in places that the subjects did not spend time on a daily basis (such as work or home), potentially limiting their ability to exercise by requiring a greater

response effort for caregivers to drive the individuals to and from the exercise locations. Preference assessments were also not described in the methods of these studies, which could have limited the individuals' contact with their most potent reinforcers contingent on exercise.

The current study examined a token reinforcement intervention implemented at individuals' worksites to reduce response effort for participation and obstacles to implementation. Providing a walking program at a location where individuals spend time on a daily basis increases the likelihood that the intervention will be implemented efficiently and carried out with high fidelity as part of a daily routine. Furthermore, creating an environment with frequent opportunities to access backup reinforcers, identified through a preference assessment, contingent on walking may promote program adherence and success. Consequently, the purpose of this study was to examine whether token reinforcement will increase distance walked for adults with ID attending an adult day training center (ADT).

## **Method**

### **Participants**

Five men, ages 34 to 67, participated in the study. The participants were diagnosed with mild to moderate intellectual disability and had no physical disabilities that prevented walking. John was 67 years old, diagnosed with moderate intellectual disabilities, was obese and diabetic. Paul was 53 years old and had a diagnosis of mild intellectual disabilities. He was overweight, diabetic and had a doctor's recommendation to engage in physical activity each day. Jerry was 37 years old and had a diagnosis of mild intellectual disabilities. He was obese and smoked cigars during breaks while walking. Elton was 46 years old and had a diagnosis of mild intellectual disabilities. Elton was normal weight and had previously participated in a walking group. Frank was 34 years old and had a diagnosis of moderate intellectual disabilities. He was underweight and worked two mornings out of the week. All participants signed consent forms (see Appendix A). The participant answered the seven questions in the Physical Activity Readiness Questionnaire (PAR-Q) (Thomas & Shepard, 1992) to ascertain that no participant had health risks associated with engaging in walking. No participant answered yes to any of the questions, indicating that exercising would not be detrimental to his health. The participants were told they could leave the study at any time.

### **Setting**

This study was conducted at one adult day training (ADT) center in Florida. Adult day training centers are places where adults with varying disabilities learn functional and occupational skills. Staff members supervise the adults working on skills and activities that enhance their quality of life. After time spent in the center each day, the adults return to their residences.

The ADT center used in this study had a staff to client ratio of 1: 4. The individuals arrived by vans from their residences at 8:30 a.m. and left at 2:30 p.m. All the individuals that attend the ADT were divided into groups, or “crews,” and had a consistent, daily routine with their crew members. Their activities include working in the community, going on outings, or cleaning around the ADT.

### **Materials**

Cones were used to mark a 50-m loop around which the participants walked. The loop was in the same location for all sessions, in an outside, covered corridor where staff had constant supervision. One personalized gift bag was hung for each participant on the fence next to one end of the loop so he could place the tokens in his bag after completing each lap. A data sheet was used by the observers to tally the number of laps completed within the hour (see AppendixB). The bags, tokens, and reinforcers were brought to and from each session by the researcher. Examples of reinforcers earned throughout the study included: Gatorade, diet beverages, Pokémon cards, CD’s, novels, professional wrestling paraphernalia, healthy snack bars, stringbracelets, water bottle, coffee mug, sensory balls, and playing cards. An alarm on a phone was set to alert the participants when the hour walking limit was complete.

### **Target Behaviors and Data Collection**

The primary dependent measure was the number of 50-m loops walked in an hour, measured by the researchers on the data sheet and by the number of tokens placed in the bags after each session. A lap was defined as walking from the end of the loop where the bags were hung to the opposite end, going around the cone at the opposite end, and returning to the starting point. During intervention phases, participants also placed a token in the individualized bag upon completing a lap. If the participant stopped walking after completing over half of a lap, the lap was scored as a completed lap and the participant placed the token in his bag. A zero for the day resulted

when participants had the opportunity but refused. A day without a data point indicated that the participant was absent from the site or was working with his crew, and thus had no opportunity to walk. A secondary dependent measure was frequency of breaks within the hour, tallied on the same data sheet. Throughout all phases in the study, the researcher and independent observer used data sheets to track number of laps walked within the session.

### **Interobserver Agreement and Treatment Integrity**

For 38.1% of the sessions, both the researcher and an independent observer recorded the number of laps and breaks on a data sheet. At the end of the session, interobserver agreement (IOA) was calculated by dividing the lower number of laps by the higher number of laps multiplied by 100 for each participant to obtain a percentage agreement between the researcher and the second observer. The independent observers were graduate research assistants. IOA for John was 99.6% for laps and 95.1% for breaks. IOA for Paul was 99.6% for laps and 97.3% for breaks. IOA for Jerry was 100% for laps and 98.4% for breaks. IOA for Elton was 99.8% for laps and 100% for breaks. IOA for Frank was 99.9% for laps and 100% for breaks.

Treatment integrity was recorded at the end of each session to assure that after receiving the token from the researcher, the participants placed the tokens in their bags and that the number of tokens in the bags equaled the number of laps tallied on the data sheet that the researchers used. This served as a permanent product measure of the researcher's behavior. Treatment integrity was calculated by for each participant by dividing the lower number of laps by the higher number of laps to obtain a percentage agreement between the laps tallied by the researcher and the tokens in the bag. Treatment integrity was 100% for all participants.

### **Design**

An ABAB design was used to evaluate the effectiveness of token reinforcement for increasing distance walked.



## **Procedures**

**Staff/participant meeting.** A meeting was held with the clinical director and the research assistants to describe the study and their roles as independent observers. The researcher and agency agreed that the walking program would occur from 9 a.m. to 10 a.m. each weekday. The investigator discussed the resources that were available at the ADT for the development of the intervention. Establishing participants' individual privileges helped determine potential backup reinforcers included in the preference assessment. The researcher was introduced to the participants, the study was described to the participants, the PAR-Q was completed, consent was obtained, and the schedule was given to the participants so they knew when they had the opportunity to walk.

**Baseline.** Data collection began one week after meeting the participants. Each session, the researcher arrived at least 10 min early to meet the staff member required by the site to be with the walking group, gather the participants, and set up the walking loop. Once all of the participants were together, the researcher asked, "who wants to walk today?" The participants that said they wanted to walk followed the staff member and researcher to the walking loop. Only the participants in this study were permitted to walk the loop. A cone was placed at each end (25 m apart) to mark off the walking loop. Once the loop was set up and it was 9 a.m., the researcher said, "you guys can start walking now!" Sessions lasted for one hour or until the participant stated he was done walking for the day. Participants were allowed to take a break from walking anytime during the session. A break was tallied anytime the participant walked off the walking loop for more than 10 s and if the participant was at the loop when the researcher told the participants to begin walking and the participant waited for more than 10 s to start walking. No tokens or praise were delivered for walking. The researcher stayed at the start of the loop and stated aloud the lap number each participant started (e.g., This is your third lap) in a neutral affect. The researcher tallied the number of laps walked and breaks taken by each participant on the data sheet.

Throughout this phase, prior to conducting the preference assessments, the researcher interviewed the staff and participants to identify what tangibles or edibles the participants preferred (see Appendix C).

**Preference assessment.** After baseline data were stable, the preference assessment was conducted on the next scheduled day. A multiple stimulus preference assessment without replacement was conducted using the stimuli identified by the staff and participants in the interviews. The tangibles and edibles identified by the participants and staff were placed in front of each participant in an array, and he chose one item. That item was removed and in the next trial the array included the remaining choices and the participant chose one item. This was repeated until only one item was left. This assessment was repeated three times for each participant, with at least 5 min between each assessment. A hierarchy of preference for the items was determined from the result of these assessments. Once potential reinforcers were identified, the token exchange rate was determined based on the preference hierarchy. The more preferred the item was, the more tokens it cost. The token exchange rate was based on each individual's baseline levels of walking to ensure each participant had a similar opportunity to earn each reinforcer. The exchange rate for the most preferred item was the average number of laps walked during baseline multiplied by five; the exchange rate for the least preferred potential reinforcer was the baseline average for laps walked. Appendix D shows the token exchange rates. The potential reinforcers that they could earn during the intervention phase were made unavailable to the participants at the ADT during the intervention phase to create an establishing operation. After each participant completed the preference assessments, the researcher brought the participants to the start of the loop and showed the participants their individualized bags. The researcher then demonstrated a lap: starting at the cone, walking to the other side of the loop, around the cone and back to the start, placing a token in the individualized bag. Each

participant rehearsed a lap by walking around the loop and placing his token in his bag. All participants executed this correctly on their first attempt.

**Token reinforcement.** During the token phase, the participants earned tokens they could exchange for backup reinforcers identified through the preference assessments. The start of each session was identical to baseline, except that the researcher told the participants that they would be given a token after completing each lap and that the tokens could be exchanged for their preferred items or edibles at the end of the session or be saved for a later session. After this discussion, the walking program began with the announcement of, “you guys can start walking now!” The participants had an individualized bag hanging from the fence outlining the loop. The participants all started at the opening of the corridor, walked to the opposite side of the loop, turned around the outside of the cone, walked back to the start and were given a token to place in their bags. The participants walked back and forth as much as they decided to within the hour. If the participant stated he wanted a break, he would exit the loop and come back whenever he was ready. The researcher and staff member provided social support in the form of encouraging statements (e.g., “Great job! You are walking for [reinforcer]! Keep up the hard work!”) for 5 s after placing a token in the bag and every other time the participant reached the opposite side of the loop. The start of each session began with 10 s of social support as well. At the end of the hour, the researcher and staff member counted the tokens, told the participants how many laps they walked, and told them what they earned. The participants chose to exchange or accumulate the tokens earned from walking. When the tokens were exchanged for the backup reinforcers, the tokens were returned to the researcher.

**Social Validity**

A questionnaire was given to participants and the staff at the ADT to assess their opinions of the walking program (see Appendix E and F). The questionnaires consisted of questions about activity levels before and after participating in the program and on the program's acceptability.

## Results

### Walking

Figure 1 depicts laps walked per session across all phases for all participants. The triangles on the graph indicate days in which the participants arrived late to the ADT. The first Token Reinforcement phase resulted in a noticeable increase in laps for four out of five participants (John, Paul, Jerry, and Frank). Upon the return to Baseline, the laps decreased for all five participants (to around Baseline levels for four of the five, and to levels lower than the first BL on a decreasing trend for Elton). Once Token Reinforcement was implemented again, all five participants substantially increased their laps to levels around those of the first intervention phase or higher.

During Baseline, John walked a mean of 12.5 laps per session (ranging from 0-16). During the first Token Reinforcement phase, John's mean number of laps per session increased to 24.4 (ranging from 21-28). The return to Baseline resulted in an immediate decrease to a mean of 16.5 (ranging from 14-18). The final Token Reinforcement phase resulted in an immediate increase to a mean of 31 (in an increasing trend ranging from 18-37). John walked the most laps in a session during the last phase of the study.

In the second panel, Paul walked a mean of 16.7 laps per session (ranging from 0-43) during baseline. During the first Token Reinforcement phase, Paul's mean increased to 56 (ranging from 10-70). The return to Baseline resulted in an immediate decrease to a mean of 8.5 (ranging from 0-23). The final Token Reinforcement phase resulted in an immediate increase to a mean of 49.3 (ranging from 0-66) with an increasing trend. Paul sustained an injury unrelated to the study, which prevented him from participating in the rest of the study.

In the third panel, Jerry walked a mean of 6.7 laps per session (ranging from 0-32) in baseline. During the first Token Reinforcement phase, Jerry's mean increased to 39.2 (ranging from 0-53). The return to Baseline resulted in an immediate decrease to a mean of 15. The final Token Reinforcement phase resulted in an immediate increase to a mean of 39.3 (in an increasing trend ranging from 10-60). Jerry walked the most of laps in a session during the last phase of the study.

In the fourth panel, Elton walked a mean of 63.8 laps per session (ranging from 55-74) in baseline. During the first Token Reinforcement phase, Elton's mean increased to 71.4 (ranging from 59-79). The return to Baseline resulted in a decrease to a mean of 58.7 (ranging from 30-78). The final Token Reinforcement phase resulted in an immediate increase to a mean of 70.8 (in an increasing trend ranging from 60-80). Elton walked the most laps in a session during the last phase of the study.

In the last panel, Frank walked a mean of 20.2 laps per session (ranging from 0-59) in Baseline. During the first Token Reinforcement phase Frank's mean increased to 77.3 (ranging from 20-94). The return to Baseline resulted in an immediate decrease to a mean of 25.75 (ranging from 0-72). The final Token Reinforcement phase resulted in an immediate increase to a mean of 71.8 (in an increasing trend ranging from 0-92).

### **Social Validity Questionnaire**

Participants and a staff member completed the social validity questionnaire on the last day of the study (see Appendix E and F). Questions were scored on a 5 point rating scale; strongly disagree (1) to strongly agree (5). The participants' mean score for question 1 was 4.8 (ranging from 4 to 5), question 2 was 4.6 (ranging from 4 to 5), question 3 was 4.8 (ranging from 4 to 5), and question 4 was 4.6 (ranging from 4 to 5). The staff member's scores on question 1 through 4 were 5, 4, 5, and 5 respectively.

## **Preference Assessment**

Preference assessment results are in table 1. Items selected in the preference assessment, percentage of reinforcers chosen within the token reinforcement phases and total cost of reinforcers per participant are included in the table.

## **Discussion**

This study demonstrated that a token reinforcement program increased distanced walked for adults with intellectual disabilities. Across all participants, the baseline phases had the fewest laps walked per session and the intervention phases had the highest number of laps walked per session. For three of the five participants (John, Jerry, and Elton) the highest number of laps walked per session occurred in the second Token Reinforcement phase. There are a few overlapping data points between baseline and intervention for each participant attesting to the daily variability inherent in physical activity. For four of the five participants (John, Paul, Elton, and Frank) there is clear differentiation between baseline and intervention phases. Sessions in which participants were late typically resulted in fewer laps walked.

John had a stable baseline and an immediate increase during token reinforcement phases, with an increasing trend in the last phase of the study. Staff members particularly commented about his increases in physical activity throughout this study, as he was considered one of the least active adults at the ADT.

Paul sustained an injury unrelated to the study after the 27<sup>th</sup> session and was unable to continue. With the implementation of token reinforcement, Paul immediately walked more laps and there was a slightly increasing trend until the end of the phase where his data stabilized. In the return to baseline phase laps drastically dropped and remained low. An instant increase in level occurred in the last token reinforcement phase, with a level similar to the first token phase.

Jerry had clear differentiations between baseline and treatment phases, with immediate increases in laps when tokens were introduced. He was very rigid in his behavior, walking only the



number necessary for each reinforcer. The second Token Reinforcement phase shows the variability in the number of laps he decided to walk to earn various reinforcers.

Elton's walking distance did not have much differentiation across phases throughout the study. Although he had a decreasing trend in the second baseline, his data were stable throughout all other phases in the study. Elton attended each walking session and was the only participant that always walked at least 30 laps per session. He also had the highest number of laps walked throughout the study.

Frank walked the highest number of laps across all participants in a given day; his highest day was 94 laps (about 3 miles) in an hour. He missed the most sessions of any participant, likely attributed to his "crew" working Tuesday and Thursday mornings. Days in which he was late resulted in fewer laps walked. He lost three pounds during this study. Frank and Elton raced each other most mornings, creating a competition that likely increased the number of laps for each of them.

These results are consistent with research from Bennett et al. (1989) Croce and Horvat (1992), and Todd and Reid (2006) indicating that providing reinforcers contingent on exercising in a token economy increases exercise for adults with intellectual disabilities. The current study adds to research by having longer exercise sessions, including a preference assessment to identify individual reinforcers, and promoting physical activity at an ADT, the work site where the participants attended daily. Promoting physical activity at a place where individuals attend daily increases the accessibility and convenience of exercising. Having planned and structured activities increases the likelihood of an individual's engagement in the activity, thus reducing the

response effort to engage in exercise. Making exercise accessible, convenient and planned increases the probability of it occurring.

Unlike Todd and Reid (2006), this study found a functional relationship between token reinforcement and walking as demonstrated in the ABAB design. In Todd and Reid the intervention consisted of token reinforcement along with self-monitoring, cuing, and encouragement and there was no reversal. In this study the exercise session was longer (1 hr) compared to previous research (Bennett et al., 1989; Croce & Horvat, 1992; Moss, 2009; Todd & Reid, 2012). Bennett et al. (1989) conducted sessions that lasted for 15 min, Croce and Horvat (1992) had sessions that lasted up to 40 min, Moss (2009) had sessions that lasted up to 30 min, and Todd and Reid (2012) had 30-min sessions.

Results from the social validity questionnaire from the participants revealed they all enjoyed the walking program. Four out of five participants strongly agree that they are more active now after the walking program than they were before the program started. Three out of the five participants strongly agree that they will continue walking now that the program is completed. Participants also indicated their favorite things about the program included staying healthy, weight loss, earning individual rewards, and gaining endurance. Staff strongly agreed that the program was feasible, participants became more active, and that the reinforcement was effective in increasing exercise for the participants.

The preference assessment was effective in identifying reinforcers for each participant. John and Paul chose more immediate forms of reinforcement by selecting their lowest preferred items compared to accumulating tokens for their highest preferred items. Jerry chose a variety of

reinforcers throughout both phases, selecting both his highest and lowest preferred items. He cycled through his reinforcers, selecting highest preferred items back to back, then switching to lower preferred items and then back to highest preferred items again. This cycle occurred across both token reinforcement phases. Elton and Frank selected their highest reinforcers throughout the study. They accumulated their tokens to exchange them for items with higher level of preference. The total cost for each participant's reinforcers ranged from 9 to 53 dollars, totaling 161 dollars. This intervention was cost effective for the 10-week duration of the study.

Anecdotal reports from staff members at the ADT included the following statements: "I can't believe John and Jerry are walking that much, show me a video!" "It's crazy to see how much they are walking when they have something they are motivated for. This is great for all of them." "This is so good for their health, you know for high blood pressure and diabetes. Anyone here could benefit from it." Staff also commented about weight loss for four of the five participants (John, Paul, Jerry, and Elton). Anecdotal reports from participants included the following statements: "I feel as healthy as a horse!" "I'm as fast as blue lightning," "Look how fast I'm walking, I'm going to set a new record!" "He can't catch me! I'm too fast." "I'm losing weight too! My tummy is going down. I feel good."

Although the token reinforcement program clearly increased walking for the participants, a number of factors appeared to affect the participants' walking throughout the course of the study. One factor was that competing contingencies affected attendance during the walking program for one participant. Frank's crew worked two mornings each week across all phases in the study. Monetary compensation for working rightfully competed with exercise in the mornings for Frank. That he

chose work over walking on days when work was available seemsto be a good decision as the goal of the ADT was to promote meaningful work. The implicationfor future research on exercise is that the exercise program should be made available at multiple times to accommodate work schedules. Other attendance issues that affected the number of laps the participants walked included participants attending doctor appointments or arriving late to the ADT due to transportation issues. Because staff at the ADT picked up the participants from their residences, some mornings participants were late due to staff arriving late or other individuals in their homes refusing to leave. Another factor that may have influenced walking is that the walking loop was outside, under a covered hallway at the ADT, so weather conditions (cold or hot) could have been a factor in how much the participants walked. The participants'choice of clothing may have also influenced their walking. On many occasions individuals did not dress appropriately for physical activity (i.e., wearing steel toe boots with no socks, shorts in cold weather, jeans and dress shirts compared to workout clothes, pants too big with no belt) and on some occasions painful conditions due to walking occurred and influenced the participants'decision to walk (i.e., blisters, sore muscles). Some participants were active on the weekends and evenings outside of this study. Anecdotal reports from participants indicated muscle soreness due to the outings (i.e., attending dance parties, monster truck rallies, And fairs) influenced their willingness to walk or walk as far as usual.

Besides the health benefits associated with physical activity, other potential benefits of increasing physical activity were shown by Croce and Horvat (1992) and Bennett et al. (1989) including increased work activity and time on task. These studies suggest that increased walking may be beneficial for work productivity even when a portion of the workday is used for walking.The

implication is that walking or other exercise programs can be and perhaps should be conducted at work sites for adults with disabilities. Future research should also look into analyzing token economies with other exercise behaviors or in other settings. Although this study was conducted in one particular type of work setting, replicating this research with individuals in residential settings (e.g., in-patient settings, apartments, or in natural homes), school settings, or other work settings would extend our knowledge about the effectiveness of token reinforcement for increasing exercise among individuals with intellectual disabilities. Also, studying staff-implemented physical activity programs in this and other settings would provide information about the generalizability and social validity of activity-promotion programs. Although staff in the ADT positively evaluated the intervention conducted by the researchers during the workday, it is not clear whether the intervention could be sustained by staff if they were responsible for its implementation. As this study utilized a preference assessment to determine individual reinforcers for participants, it is unclear whether it was more successful or effective compared to other studies using rewards not identified with a preference assessment. Future research should focus on determining which of these approaches is more effective and efficient to increase exercise behaviors. More research evaluating a variety of exercise-promotion interventions, in a variety of settings, for adults with varying disabilities is necessary.

## Tables and Figures

**Table 1**

*Items selected in the preference assessment, percentages of reinforcers chosen, and total cost of reinforcers across participants*

Participants	Items chosen in Preference Assessment with Token Exchange Rates	Selection % of Reinforcers in Token Phase 1	Selection % of Reinforcers in Token Phase 2	Total Cost of Reinforcers
John	Book (75, 75) CD (65, 65) Nutella Sticks (60, 50) Uno (45, 45) Word Search (35, 35) Diet Soda (20, 25) Gatorade (15, 25)	Diet Soda: 75% Gatorade: 16.7% Uno: 8.3%	Gatorade: 96% Diet Soda: 4%	\$ 29
Paul	CD (125, 135) Coffee Mug (100, 110) Diet Soda (75, 70) Gatorade (25, 50) Gatorade Chews (50, 25)	Gatorade: 81.8% CD: 9% Gatorade Chews: 9%	Gatorade: 75% Gatorade Chews: 25%	\$ 10

Table 1 Continued

Elton	Book (320, 320) Book: 50% Water Bottle Ball: 50% (256,250) Light up ball (192,200) Word search (128,130) Flavored Water (64, 65)	Book: 100% \$ 52
Frank	CD (125, 320) Book: 50% Book (100, 300) CD: 50% WWE (Token Phase2 only, 200) Water Bottle (120,200) Gatorade (75, 175) Light up Ball (50,100) Cards (25, 65)	Book: 16.7% \$ 40 WWE: 50% Water bottle:16.7% Light up ball:16.7%

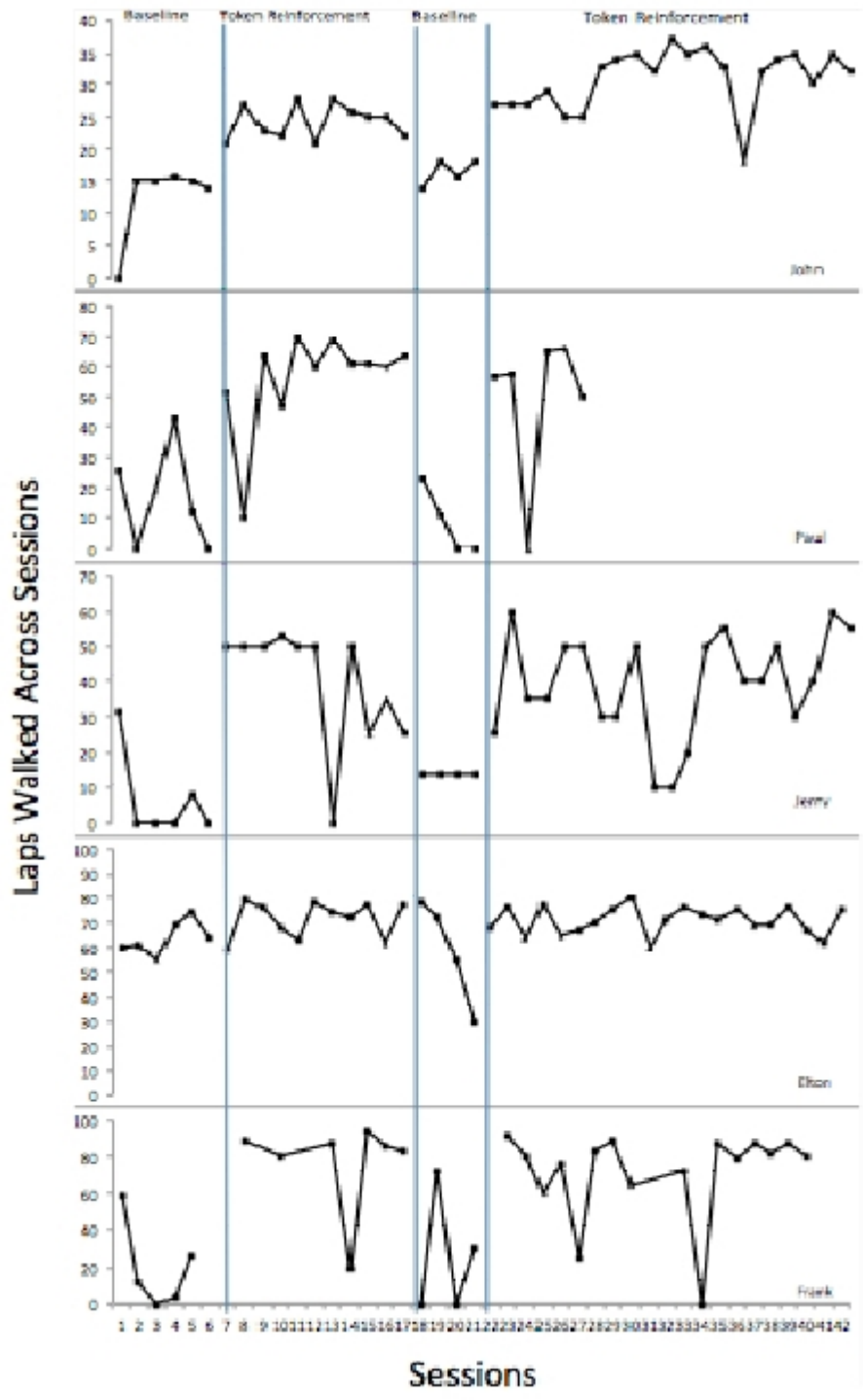


Figure 1. Laps walked per session across participants.



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**Appendix A:**  
**Consent to Participate**



## **Informed Consent to Participate in Research Information to Consider Before Taking Part in this Research Study**

**IRB Study #** Pro0019501

---

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or staff to discuss this consent form with you, please ask him/her to explain any words or information you do not understand. We encourage you to talk with your family and friends before you decide to take part in this study. The nature of the study, risks, discomforts, and other important information about the study are listed below.

Please tell the study investigator or study staff if you are taking part in another research study.

We are asking you to take part in a research study called: Using Token Reinforcement to Increase Distance Walked for Adults with Intellectual Disabilities.

The person who is in charge of this research study is Haley Krentz. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. She is being guided in this research by Raymond Miltenberger.

The research will be conducted at Human Development Center, Inc. (HDC)

---

### **Purpose of the study**

The purpose of this study is to:

- Find out if delivering tokens based on walking laps, that can be later exchanged for preferred items, will increase the time and distance a participant walks
- This method has been effective in increasing other forms of physical activity (snowshoeing, jogging, and weight lifting) for adults with disabilities
- A student is conducting this study for a thesis and will be supervised by a faculty advisor, Raymond Miltenberger

### **Study Procedures**

If you take part in this study, you will be asked to:

- Spend about 2 or 3 months in this study.
  - It will take place each weekday morning for an hour at HDC
-



- Each morning you will have the choice to walk or not participate
- You will be asked what items/activities/food you really enjoy at HDC
- A test will be done to rank these items/activities/food
- You will be able to earn tokens (Velcroed pictures) based on how many laps you walk, and at the end of the session you can decide to keep the tokens or turn them for your items/activities/food you identified
- Your IQ score and diagnosis will be taken from your medical charts
- If your IQ score is too high or too low you will not be qualified to participate in this study
- You will be asked to fill out a questionnaire at the end of the study, asking whether or not you liked participating in the study

### **Total Number of Participants**

About 4-6 individuals will take part in this study at the Human Development Center, Inc.

### **Alternatives:**

You do not have to participate in this research study.

### **Benefits**

The potential benefits of participating in this research study include:

- Health benefits associated with increasing physical activity
- Support from peers and researchers while walking

### **Risks or Discomfort**

This research is considered to be minimal risk. That means that the risks with this study are the same as what you see every day. There are no known other risks to those who take part in this study.

### **Compensation**

You will receive no payment or other compensation for taking part in this study.

### **Cost**

There will be no additional costs to you as a result of being in this study.

### **Authorization to Use and Disclose Protected Health Information**

#### **Who will see your health information?**

In this research study, we use your health information to the extent you allow us. We know that this information is private. The federal privacy laws of the Health Insurance Portability & Accountability Act (HIPAA) protects your health information. If you let us use your information we will protect it as required by the law.

Research at The Human Development Center, Inc. is conducted with the University of South Florida. By signing this form, you are allowing The Human Development Center, Inc. and the University of

South Florida to use personal health information collected about you for research purposes. You are also allowing *The Human Development Center, Inc.* to share your personal health information with individuals or organizations other than USF and *The Human Development Center, Inc.*, who are also involved in the research and listed below.

**Who will disclose (share), receive, and/or use your information?**

To conduct this research, USF and the people and organizations may use or share your information. They may only use and share your information:

- With the people and organizations on this list;
- With you
- As allowed by law.

Also, to the people and organizations listed below in the Privacy and Confidentiality section of this document, the following groups of people may also be able to see information about you and may use the information to conduct the research:

- The medical staff that takes care of you and those who are part of this research study.
- The designated peer review committees such as : *Protocol Review and Monitoring Committee*

**Who else can use and share this information?**

Anyone listed above may use advisors in this research and for the purpose of this study, may share your information with them. If you have questions about who they are, you should ask the Principle Investigator. People who receive your health information for this research study may not be required by the HIPAA Privacy Rule to protect it and may share your information with others without your permission. They can only do so if permitted by the laws. For example, the research assistants may share your information with others. If the research assistant or others share your information, your information may no longer be protected under the HIPAA Privacy Rule.

**How will my information be used?**

By signing this form, you are giving your okay to use and/or share your health information as described for any study/research purposes. Your okay to use your health information will not be withdrawn unless you say otherwise in writing.

As part of this research, USF may collect, use, and share the following information:

- Your diagnosis and IQ score record
- All of your past or current medical and other health records held by The Human Development Center or other health care providers. This includes your mental health and genetic information

You can list any information that you do not want us to use or share in the space below. If you list nothing here, we can use and share all of the information listed above for this research but for nothing else.

**For the Research Participant (you) to complete:**

- I am asking USF and the researchers not to include, use, or share the following health information in this research (if blank, then no information will be excluded):

---

**Your Rights:**

You can refuse to sign this form. If you do not sign this form you will not be able to take part in this research study and will not be able to receive the treatment plan. Your health care outside of this study and benefits will not change.

#### How Do I Withdraw Permission to Use My Information?

You can cancel this form at any time by sending a letter saying you wish to withdraw your okay to use your health information in the research. If you take back your okay:

- You will not be a participant in this research study;
- We will stop collecting new information about you;
- We will use the information collected prior to you canceling. This information may already have been used or shared with others, or we may need it to show the effect of this study; and
- Staff may need to follow-up with you if there is a medical reason to do so.

To cancel this form, please write to:

Principal Investigator  
For IRB Study # Pro0019501  
2402 W Azeele St. Unit 416, Tampa, FL 33609

While we are conducting the research study, we cannot let you see or copy the information we have about you. After the research is completed, you can see the information about you.

#### Privacy and Confidentiality

We will keep your study records private and without your name on any forms. Certain people may need to see your study records. By law, anyone who looks at your records must keep them private. The only people who will be allowed to see these records are:

- The research team, including the Principal Investigator, advisor, and research assistants
- Certain government and university people who need to know more about the study. For example, people who provide guidance on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.
- Any agency of the federal, state, or local government that regulates this research. This includes the Department of Health and Human Services (DHHS) and the Office for Human Research Protection (OHRP).
- The USF Institutional Review Board (IRB) and its related staff, who have supervision responsibilities for this study, staff in the USF Office of Research and Innovation, USF Division of Research Integrity and Compliance, and other USF offices that review this research.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

### **Voluntary Participation / Withdrawal**

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.

#### **You can get the answers to your questions, concerns, or complaints**

If you have any questions, concerns or complaints about this study, or experience an adverse event or unanticipated problem, call Haley Krentz at (630)272-3281.

If you have questions about your rights as a participant in this study, general questions, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638.

### Consent to Take Part in this Research Study

#### and Authorization to Collect, Use and Share Your Health Information

It is up to you to decide whether you want to take part in this study. If you want to take part, please sign the form, if the following statements are true.

**I freely give my consent to take part in this study and authorize that my health information as agreed above, be collected/disclosed in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.**

\_\_\_\_\_  
Signature of Person Taking Part in Study

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Person Taking Part in Study

#### Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I hereby certify that when this person signs this form, to the best of my knowledge, he/ she understands:

- What the study is about;
- What procedures/interventions/investigational drugs or devices will be used;
- What the potential benefits might be; and
- What the known risks might be.

I can confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in the appropriate language. Additionally, this subject reads well enough to understand this document or, if not, this person is able to hear and understand when the form is read to him or her. This subject does not have a medical/psychological problem that would compromise comprehension and therefore makes it hard to understand what is being explained and can, therefore, give legally effective informed consent. This subject is not under any type of anesthesia or analgesic that may cloud their judgment or make it hard to understand what is being explained and, therefore, can be considered competent to give informed consent.

\_\_\_\_\_  
Signature of Person Obtaining Informed Consent / Research Authorization

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Person Obtaining Informed Consent / Research Authorization

**Appendix B:**

**Data Sheet**

***ELTON***

Leftover Laps:  
Laps Today:

Total Laps:  
Breaks:  
Reinforcer:

***PAUL***

Leftover Laps:  
Laps today:

Total Laps:  
Breaks:  
Reinforcer:

***JOHN***

Leftover Laps:  
Laps today:

Total Laps:  
Breaks:  
Reinforcer:

***FRANK***

Leftover Laps:  
Laps Today:

Total Laps:  
Breaks:  
Reinforcer:

***JERRY***

Leftover Laps:  
Laps Today:

Total Laps:  
Breaks:  
Reinforcer:

## **Appendix C:**

### **Interview Questions**

#### Potential Interview Questions to Staff/Participants

1. What are some of the participants/your favorite things to do here?
2. Does the participant/you like to play with certain types items/tangibles?
  - a. i.e. squishy balls, shiny/reflective letters, bubbles, books, etc.
3. What food and drinks does the participant/you prefer?
4. If the participant/you have free time, what does he or she/you like to do?
5. Are there any specific activities this center does already for the participants' contingent on good behavior or task completion?
  - a. i.e. individual privileges (extra free time, picking activities, etc)
6. what are fun activities that the participant/you would like to do more of?
7. Is there any staff member the participant/you enjoy spending time with?

## **Appendix D:**

### **Sample Token Exchange Rate**

Baseline:

- Most active day = 43 laps
- Least active day = 0 laps
- Average laps per day = 25 laps

Hierarchy of Reinforcers from Preference Assessment:

- Most preferred to least preferred (but still a reinforcer)
- CD, coffee cup, diet soda, Gatorade chews, Gatorade
- CD: 125 laps
- Coffee Cup: 100 laps
- Diet Soda: 75 laps
- Gatorade Chews : 50 laps
- Gatorade: 25 laps



**Appendix E:**

**Social Validity: Participants**

1. I walk more now than I did before the walking program?

Strongly Disagree	Disagree	Neutral	Weakly Agree	Strongly Agree
1	2	3	4	5

2. The walking program was enjoyable.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3. I feel more physically active now than I did before the walking program started.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4. I will continue walking after the program is done.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5. What did you like the most of the program?

**Appendix F:**

**Social Validity: Staff**

1. The walking program was feasible with our facility and clients.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2. The walking program was easily implemented.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3. I found this program valuable for the participants.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4. I would consider continuing this program.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5. Is there anything that you would like to change about the program or how it was run?

**Appendix G:**  
**IRB Approval Letter**



RESEARCH INTEGRITY AND COMPLIANCE  
Institutional Review Boards, FWA No. 00001669  
12901 Bruce B. Downs Blvd., MDC095 • Tampa, FL 33612-4799  
© 133 974-5688 • FAX 133 974-3891

November 3, 2014

Haley Krentz  
ABA-Applied Behavior Analysis  
Tampa, FL 33612

**RE: Expedited Approval for Initial Review**

**IRB#: Pro00019501**

**Title: Using Token Reinforcement to Increase Distanced Walked for Adults with Intellectual Disabilities**

**Study Approval Period: 11/2/2014 to 11/2/2015**

Dear Ms. Krentz:

On 11/2/2014, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

**Approved Item(s):**

**Protocol Document(s):**

[IRB](#)

**Consent/Assent Document(s)\*:**

[ConsentForm v1 10.29.14.pdf](#)

\*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis).

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,



Kristen Salomon, Ph.D., Vice Chairperson  
USF Institutional Review Board