Impact of a Preschool Workplace Intervention on Classroom Teachers’ Physical Activity Levels and Quality of Life

Ogechi O. Nwaokelemeh

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IMPACT OF A PRESCHOOL WORKPLACE INTERVENTION ON CLASSROOM
TEACHERS’ PHYSICAL ACTIVITY LEVELS AND WELL-BEING MEASURES

A Dissertation Presented

by

OGECHI O. NWAOKELEMEH

Submitted to Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2015

Department of Kinesiology
IMPACT OF A PRESCHOOL WORKPLACE INTERVENTION ON CLASSROOM TEACHERS’ PHYSICAL ACTIVITY LEVELS AND WELL-BEING MEASURES

A Dissertation Presented

by

OGECHI O. NWAOKELEMEH

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ACKNOWLEDGEMENTS

I would like acknowledge my Lord and Savior, Jesus Christ, for providing me the power and will to complete this dissertation. It was His strength that I drew from when my own was failing. My faith was tested and strengthened in the process and I give Him all the glory and honor for His sustaining power.

I would like to thank my adviser, Sofiya Alhassan, for her patience, feedback and encouragement throughout this project. I would like to express gratitude toward other members of my dissertation committee, Drs. Patty Freedson and Lisa Chasan-Taber, for their continuous support throughout the dissertation process. I would also like to thank the members of the Pediatric Physical Activity Lab and all of the undergraduate students that offered their time, support and encouragement throughout the data collection and dissertation phases.

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ABSTRACT

IMPACT OF A PRESCHOOL WORKPLACE INTERVENTION ON CLASSROOM TEACHERS’ PHYSICAL ACTIVITY LEVELS AND WELL-BEING MEASURES

MAY 2015

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Directed by Professor Sofiya Alhassan, Ph.D.

PURPOSE: To examine the feasibility and efficacy of a three-month, cluster-randomized workplace PA intervention on PA levels and wellbeing measures in preschool classroom teachers.

METHODS: Ten preschool centers were randomized into two groups; short-bouts of structured PA (SBS-PA, n=5) or traditional unstructured PA (TRAD-PA, n=5). The SBS-PA intervention consisted of 10-minute structured, teacher-led PA routines implemented within the classroom setting, followed by 20 minutes of unstructured playtime. The TRAD-PA intervention consisted of supervised 30-minute of unstructured free playtime. Both interventions were implemented during the morning and afternoon designated gross-motor playtime for 30 min/session, five days/week for three months. Participants’ PA levels were assessed for five consecutive days using accelerometers. Outcome measures were between group differences in during-preschool PA, general health status, perceived stress, depression status, exercise self-efficacy and exercise outcome expectations. All measures were assessed at baseline and at 3-months. A multivariate analysis of covariance with repeated measures was used to assess the effect of the intervention on classroom teachers’ PA levels (primary outcome). An analysis of covariance was used to assess effect of the intervention on all remaining variables (secondary outcomes). Intervention fidelity and process evaluations were assessed two days/week using a semi-structured
questionnaire. RESULTS: A total of 43 (SB-PA, n=19; TRAD-PA, n=24) classroom teachers participated in the program (mean±SD; age=35.0±6.0; BMI= 30.0±7.6kg/m²). No significant group by time interaction effects were observed in any of the PA variables. The SBS-PA group exhibited a slight decrease in the percent of time spent in sedentary behavior (baseline, 52.9±12.2; post, 51.2±10.5) and increased their percent time spent in light PA (baseline, 45.2±12.5; post, 47.3±10.1). No significant differences were observed in any of the secondary outcome measures. SBS-PA teachers implemented the protocol as intended only 67.2% of the time. Only 56.6% of SBS-PA and 75.2% of TRAD-PA interventions lasted 30 minutes as instructed. CONCLUSION: In this sample of preschool teachers, it does not appear that a short-bouts PA workplace intervention has an impact on teachers’ PA levels or well-being measures. Strategies to improve protocol adherence should be examined in future workplace PA studies implemented in preschool settings.
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CHAPTER 1
INTRODUCTION

It is well established that there is an obesity epidemic facing children in the United States (180). This epidemic is evident in children as young as 2.9-5 years of age (preschool age). Data from the 2009-2010 National Health and Nutrition Examination Surveys report that 16.9% of preschool-aged children are classified as overweight [body mass index (BMI) ≥ 85th percentile but <95th percentile for their age and gender] and an additional 12.1% are classified as obese [BMI ≥ 95th percentile for their age and gender] (180). Pediatric obesity has been linked to unfavorable health conditions such as sleep apnea, dyslipidemia, type 2 diabetes, and psychological problems such as poor self-esteem (68, 116). Furthermore, this increased prevalence of obesity in children is alarming because obesity tends to track from childhood into adulthood and has been correlated with adult weight status and morbidity (112, 259).

In general, children have a rapid increase in BMI during the first year of life. After nine to twelve months of age, BMI declines and reaches a minimum between 5 to 6 years of age, before beginning a gradual increase through adolescence and most of adulthood. This point of maximal leanness or minimal BMI is referred to as adiposity rebound (233). Early onset of adiposity rebound has been associated with increased risk of overweight/obese status in adolescence, which has been associated with adult obesity status (78, 267). Due to the many factors that contribute to pediatric obesity, experts have suggested that obesity prevention efforts should be initiated as early as possible, particularly in preschool-aged children (33, 48, 141).

The increased prevalence of obesity in preschoolers has been associated with a decrease in physical activity (PA) and an increase in sedentary behavior (9, 84). Currently, it is recommended that preschool-aged children should accumulate at least 120 minutes per day of PA (60 minutes of structured and 60 unstructured) (174). The current guidelines recommend that the acquired PA
should be moderate-to-vigorous in intensity since this activity pattern has been associated with health benefits (2). Unfortunately, most preschoolers fall short of this recommended daily amount of activity (27, 229). In order to meet the current guidelines for daily PA, experts recommend that planned, structured playtime should be incorporated into preschoolers’ daily schedules (60). Between 1995 and 2010, the percentage of three- to five-year olds enrolled in full-day preschool programs increased from 42% to 60% and continues to increase making the preschool setting an ideal environment for PA interventions (194). Additionally, due to the full schedule of an average preschool day, a PA program involving shorter bouts of PA would be more conducive and effective for this setting.

In preschool settings, classroom teachers lead most PA interventions, yet little information is documented regarding the impact of these interventions on teachers’ physical and mental health (Table 1). The impact of PA interventions on preschool classroom teachers’ PA levels and health should be investigated. Similar to children, the prevalence of adult overweight (BMI ≥ 25.0 but <30 kg/m²) and obese (BMI ≥ 30 kg/m²) status has increased in the U.S. (96). Between 1999 and 2010, the overweight and obesity prevalence increased by 4.7% and 5.2%, respectively (96). Currently, 35.7% of U.S. adults (approximately 41 million women and more than 37 million men aged 20 and over) are obese (96). This is a staggering figure and is a critical public health concern, since obesity is a risk factor for several chronic diseases such as heart disease, stroke, type 2 diabetes and certain types of cancer (i.e. breast, kidney, pancreas, gallbladder) (30, 165, 216). Effective obesity preventive strategies need to be implemented in order to adequately combat the obesity epidemic among US adults.
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<td>33 children, 3–5 yr: movement program consisted of one 2-h session(series of 10-min activities); compared with traditional day care program</td>
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<td>Movement program had 61% MVPA time, whereas day care had 22% MVPA between 9–11 a.m. Movement program more active than day care between 9–10 a.m. and 10–11 a.m. (P&lt;0.0001)</td>
<td>Classroom Teacher</td>
<td>None provided</td>
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<td>Mo-suwan et al. (1998) (168)</td>
<td>292 children, 4.5 yr: A 15-min walk before morning class and 20-min aerobic dance session after an afternoon nap; implemented by trained personnel 3 d/wk for 30 weeks</td>
<td>No PA measurement; Triceps skinfold measures, height and weight were measured</td>
<td>Triceps skinfold for INT children decreased from 12.2% to 8.8%; Triceps skinfold in CON children decreased from 11.7% to 9.7%.</td>
<td>Classroom Teacher</td>
<td>None provided</td>
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<td>Binkley and Specker (2004) (32)</td>
<td>178 children, 3–5 yr children: 30 min/d, 5 d/wk for 12 months; jumping, hopping, skipping activities</td>
<td>Actiwatch accelerometer</td>
<td>Significantly higher % time in VPA (P&lt;0.05) in the INT group at 12 months and 18 months</td>
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<td>Fitzgibbon <em>et al.</em> (2005) (94)</td>
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<td>Parent report of exercise frequency and intensity</td>
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<td>Reilly <em>et al.</em> (2006) (200)</td>
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<td>Classroom Teacher</td>
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<td>Hannon and Brown (2008)</td>
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<td>ActiGraph accelerometer</td>
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<td>ActiGraph accelerometer</td>
<td>INT group had greater total MVPA was greater for weeks 7–8 (P&lt;0.05) and higher classroom MVPA during final two weeks (P&lt;0.05)</td>
<td>Classroom Teacher</td>
<td>None provided</td>
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<td>Williams et al. (2009)</td>
<td>270 students and 32 classroom teachers: 10- to 15-min PA sessions, 1 per day for 10 weeks (children); walking intervention (teachers)</td>
<td>Teacher report of frequency and duration of PA program use and amount of time per week in structured PA</td>
<td>PA program added 47 minutes of structured PA per week for children. No significant difference in teachers mean step count (pre- vs. posttest)</td>
<td>Classroom Teacher</td>
<td>Yes (Walking intervention)</td>
</tr>
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<td>Alhassan et al. (2012)</td>
<td>71 children, 3-5 yr; Locomotor skill-oriented (LMS) PA sessions (INT) implemented 30mins/d, 5 d/wk, for 6 months; compared to supervised free playtime (CON)</td>
<td>ActiGraph accelerometer</td>
<td>Significant reduction in during-preschool and total daily %time spent in sedentary activity in LMS-PA group compared to control</td>
<td>Classroom Teacher</td>
<td>None provided</td>
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*INT- Intervention Group; ** CON – Control Group*
Preschool teachers play an instrumental role during the early years of a child’s development. They instruct children in activities designed to promote social, physical, and intellectual growth (194). In the U.S., most preschool teachers are women and according to the U.S. Bureau of Labor Statistics (BLS), earned an average wage of $14.04 per hour in 2010 (219). There is evidence of an inverse association between obesity and socioeconomic status (SES) (5, 56). National Health and Nutrition Examination Survey (NHANES) data shows that higher income women are less likely to be obese than low-income women (70, 181). These issues regarding gender and income place the typical preschool teachers at an increased risk for obesity, highlighting the need for obesity prevention intervention in this demographic.

In 2008, the U.S. Department of Health and Human Services provided PA guidelines for adults, reporting that adults should accumulate at least 30 minutes a day of moderate–intensity PA on most, preferably all days of the week, in order to promote good health and reduce chronic disease risk (191). Several studies have shown that PA can improve several metabolic risk factors associated with cardiovascular disease (105, 198, 255). Additionally, PA has been associated with improvements in self-efficacy, life satisfaction, and psychological well-being (50, 160, 226). It has been reported that increasing participation in moderate-to-vigorous PA (MVPA) is necessary to promote well-being and prevent chronic disease in adult populations, such as preschool teachers (66). Currently, only one in five adults meet the PA guidelines (52). There is also evidence that reductions in PA are more prevalent in women than men and in low SES compare to higher SES individuals (89, 193). As stated earlier, most preschooler teachers are low-SES women, whose work environment (e.g., long work days, providing consistent child care) does not allow much time for them to be physically active outside of work. In light of their low PA levels and limited amount of time to be physically active outside of their work setting,
effective strategies need to be implemented within their work environment to help improve their PA levels.

**Statement of problem**

Workplace PA programs utilizing short bouts (e.g., 10 minutes) of activity have been shown to successfully reduce modifiable health risk behaviors, such as insufficient PA levels (21). It has been established that accumulating the recommended amounts of PA can be accomplished by participating in short bouts of PA throughout the day (64). Physical activity interventions that employ shorter durations of PA may yield more successful results in efforts to increase the PA levels among employees because it may allow for more PA to be added to the daily work routine with minimal disruption. A review by Barr-Anderson et al. reported that this strategy (utilizing shorter bouts of PA during organizational routine) has yielded positive outcomes (21). Although increased attention has been placed on increasing the PA levels of preschool-aged children by adding planned structured playtime into the preschool day, there is limited data reported on the impact of these PA interventions on the PA levels and health status of classroom teachers who lead these sessions (90). This is key because classroom teachers typically lead the structured PA interventions with their students and their PA levels and health status can impact not only their own health but those of their students as well (111, 186). Therefore, the specific aims of this dissertation project were:

**Aims**

**Aim 1 (primary):** To examine the impact of a short bouts PA workplace intervention on classroom teachers’ PA levels.
**Aim 2 (secondary):** To examine the impact of a short bouts PA workplace intervention on classroom teachers’ wellbeing (general health status, stress, depression status, exercise self-efficacy and outcome expectations).

**Hypotheses**

H$_1$: Participation in a preschool PA intervention involving short bouts of PA as part of the designated time for preschoolers’ gross motor playtime will increase classroom teachers’ total daily PA.

Rationale: Integration of short bouts of PA (designed for adults) has been found to improve PA levels in adults in workplace settings, but no study to date has examined the effects of short bouts of PA (designed for preschool-aged children) on preschool teachers’ PA levels.

H$_{a2}$: Participation in a preschool PA intervention involving short bouts of PA as part of the designated time for preschoolers’ gross motor playtime will improve classroom teachers’ wellbeing measures (general health status, stress, depression scores) and exercise self-efficacy and outcome expectations.

Rationale: Studies that have investigated the impact of short bouts of PA have found a positive effect of the intervention on well-being factors (e.g., stress, depression) and clinical disease risk indicators (e.g., BMI). No study to date has examined the effect of preschool design short bouts of PA on preschool classroom teachers’ physical and psychological health.
Significance

Studies that have investigated the impact of short bouts of PA have found a positive effect of the intervention on wellbeing measures (e.g., stress, depression) and clinical disease risk indicators (e.g., BMI). This is the first study to date that has examined the effect of short bouts of PA on preschool classroom teachers’ physical and psychological health. In summary, it is critical to assess the impact of PA interventions on preschool teachers’ PA and health status in light of the increasing prevalence of obesity and mental health conditions in low-SES US adults.
CHAPTER 2
REVIEW OF LITERATURE

Overview

In the past two decades, the prevalence of pediatric obesity has reached alarming levels (180). The increased prevalence of obesity has urged experts to recommend that obesity prevention should be initiated during early childhood, specifically in preschool-aged children (2.9 – 5 years of age) (87, 166, 201). Physical activity (PA) interventions in preschoolers have sought to address the need to prevent obesity and other negative health outcomes in children, but no information has been reported regarding the impact of these interventions on the PA levels and health outcomes of the individuals who are responsible for implementing many of the PA interventions (i.e., preschool classroom teachers). This void in the literature is critical due to the fact that the prevalence of adult obesity has also increased and has been associated with many negative health conditions (88). In order to address the high prevalence of adult obesity, researchers have conducted obesity prevention and PA studies in various settings such as community centers, faith-based institutions, clinics, and work-sites (138, 262, 263). Although several work-site PA interventions have been conducted to help increase PA levels and improve health outcomes in adults, very little is known about the impact of workplace PA interventions in the preschool setting. Preschool teachers spend the majority of their day within the preschool center with little or no time for PA after they leave the preschool center. Therefore, PA interventions implemented during the preschool-day could potentially be used as a viable method to improve preschool classroom teachers’ PA levels, BMI status, and other health outcomes.

This review of literature is divided into four main sections. The first section discusses the public health implication of obesity in children and adults. The second section addresses PA in
preschool-aged children and in adults. The third section will provide an overview on the current state of knowledge on short-bout PA interventions. The last section will cover mental health in the workplace setting.

**Public Health Implications of Obesity**

**Pediatric Obesity**

The prevalence of pediatric obesity has tripled within the past two decades and is a significant public health concern (180). Since 1980, the prevalence of overweight/obesity has increased from 7% to nearly 17% in 2008 (180). The increased prevalence of obesity is alarming because obesity has been related to insulin resistance, hypertension and psychological problems such as poor self-esteem in both children and adults (67, 99, 155, 207, 211, 266). The increasing prevalence of pediatric obesity is also alarming because obesity has been shown to track from childhood into adulthood (118, 214). For example, it has been shown that a one-year old child with a BMI in the 95th percentile is three times more likely to remain obese by the age of three (136). Freedman et al. report that overweight 2- to 5-year-olds were four times as likely to become overweight adults (100). Childhood obesity has been shown to be a predictor of adult heart disease and premature death (29, 61, 69, 192, 235). All the above-mentioned factors highlight the need for effective pediatric health promotion interventions.

**Adult Obesity**

Obesity has also increased to epidemic levels in adults and is a major public health problem within the U.S. (180, 247). According to the latest NHANES data, more than one-third of U.S. adults are obese (35.7%) (180). This is significant because adult obesity has been
associated with a number of physiological (e.g., cardiovascular disease, type 2 diabetes, and some forms of cancer), psychological (e.g., depression) and social consequences (e.g., social discrimination and stigmatization) (190, 247). Adult obesity and its associated health problems are also associated with significant direct (e.g., diagnostic and treatment services) and indirect (related to morbidity and mortality) medical costs. In 2008, the medical cost associated with obesity totaled over $147 billion (190). The negative impact of adult obesity on both individual and societal levels underscores the urgent need to develop strategies to combat this epidemic.

**Physical Activity in Preschool-aged Children**

**Benefits of Physical Activity in Pediatric Population**

Physical activity provides many physical and well-being health benefits to children. Regular PA can help improve cardio-respiratory and muscular fitness, decrease body fat and reduce symptoms of depression (243). It has been reported that these health benefits are associated with even small increases in PA levels (247). Currently, it is recommended that preschoolers should accumulate 120 minutes (60 minutes of structured and 60 minutes of unstructured) per day of PA (174). Unfortunately, most preschool-aged children are not meeting these PA guidelines (240). The numerous benefits of PA among children highlight the need for effective PA interventions within this demographic.

**Preschool Physical Activity Interventions**

Due to the negative consequences of pediatric obesity, experts have recommended that obesity prevention efforts (i.e., improvements in PA and/or nutrition) should be initiated as early as possible, particularly in preschool-aged children (166, 201). As a result many promising preschool PA interventions have been implemented in an effort to increase the PA levels of
preschoolers. Although increased attention has been placed on the PA levels of preschool-aged children by adding planned structured playtime into the preschool school day, there is minimal data reported on the impact of these PA studies on the PA levels and health statuses of the classroom teachers who often lead these sessions (6, 49, 92, 265). A review conducted by Ward and colleagues indicated that the majority of PA preschool studies have been led by classroom teachers (256). This is critical because preschool teachers are at an increased risk for obesity and co-morbidities and evidence that preschool PA interventions can benefit both the child and the teacher can strengthen the case for policy change concerning adding more structured PA in the classroom.

Many of the teacher-led preschool PA studies have been moderately successful in increasing preschoolers’ PA levels and reducing time spent in sedentary activity. Alhassan et al. examined the effects of a teacher-taught, locomotor skill PA program on the PA levels of minority preschoolers (6). Eight preschool classrooms were randomized into treatment (locomotor-based curriculum) or control (supervised unstructured free play) groups. Both the treatment and control interventions were delivered for 30 min/day, five days per week for six months. Classroom teachers in the treatment group implemented lesson plans based on locomotor skills and movement concepts. Teachers in the control classrooms allowed their students to engage in unstructured free play. The treatment group exhibited a reduction in the percent of time spent in sedentary activity during the preschool day (6). Annesi and colleagues conducted an eight-week study in African-American preschoolers designed to compare the effects of a structured PA intervention (i.e., 30-minute lessons using behavioral and self-regulatory skills) verses a usual-care control condition (i.e., unadjusted daily PA lesson plans) (10). The researchers documented a significant increase in MVPA in the treatment group, with a
weekly increase of approximately 40 minutes (10). In 2011, Fitzgibbon and colleagues conducted a 14-week PA intervention designed to assess the impact of a culturally-tailored PA intervention in African-American preschool children (95). The program was conducted in 18 preschools (9 treatment, 9 control) and was teacher-led. Children in the treatment schools participated in 40-minute exercise and nutritional sessions three times per week. Each lesson plan consisted of 20 minutes of PA and 20 minutes of healthy eating lesson plan. Children in the control group received 20-minute health education sessions once a week. The control group lesson plans incorporated information about a variety of general health concepts (no PA or diet information was presented). The authors reported that children in the treatment schools engaged in more MVPA than children in the control schools (group mean difference = 7.46 min/day, P = 0.02) (94, 95). Adams et al. conducted a one-year PA program in 18 preschools that aimed to decrease the obesity prevalence by improving fundamental movement skills (4). The researchers developed a games-based fundamental skills program and trained the preschool staff to facilitate the intervention (4). The intervention consisted of two sets of 10 lessons with each lesson repeated twice per week. After 10 months, children in the intervention schools significantly improved their movement skills and had significant reduction of BMI-z scores as compared to the control group (4). Although classroom teachers implemented the interventions in all the studies (6, 10, 95, 126) described above, researchers did not provide information on the impact of the intervention on the health status of the classroom teachers.

Only one study to date has reported the impact of a PA intervention implemented in the preschool setting on the PA levels of the classroom teacher. In 2009, Williams et al. conducted a preschool PA program using 10-minute PA classroom activities led by the classroom teacher (265). The 10-week program incorporated 10-minute lessons plans designed to promote gross
motor skill development and preschool learning concepts. Two-hundred seventy preschoolers and 32 teachers were involved in this study. The authors reported that the intervention increased the children’s structured PA time by 47 minutes per week (265). A secondary objective of the Williams et al. study was to examine teachers’ daily walking steps. In addition to the 10-minute intervention lessons facilitated by the classroom teachers, classroom teachers also participated in a teacher walking intervention. Teachers used a pedometer to track their daily step counts for 10 weeks. At the end of the 10-week intervention, only 19 (59%) teachers returned their step tracking sheets. Williams and colleagues reported that teachers’ baseline mean step count did not significantly differ from the post-intervention step values. The classroom teachers also completed a baseline and post-intervention teacher PA survey, in which they estimated the number of days per week they participated in four types of PA (sports, stretching, toning, and walking or riding a bicycle). The researchers reported that each individual type of activity increased in frequency by about once a week, suggesting that teachers were more active during the implementation of the preschool intervention curriculum (265). Although this is the only study to provide classroom teacher PA data, the data did not stem from the actual preschool intervention with the preschoolers. The walking intervention was a separate program and may have placed an additional burden on the classroom teacher’s daily schedule. Collecting teacher PA data during the actual teacher-led preschool intervention may prove to be more effective in demonstrating the impact of PA interventions implemented in the preschool setting.
Physical Activity in Adults

Benefits of Physical Activity in Adults

Physical activity has been shown to provide various health benefits to adults. It is recommended that adults should accumulate at least 150 minutes of MVPA per week and researchers have shown even lower levels of PA can be beneficial (56). Moderate-to-vigorous PA has been associated with reductions in cardiovascular disease risk factors, type 2 diabetes and some cancers (56). Regular PA has also been reported to increase life expectancy, improve quality of life, increase bone health as well as improve mental health (56, 255). However, only 20% of adults are meeting the PA recommendations (58). Due to the fact that adults spend about half of their waking hours at work, delivering PA programs in the workplace setting may afford promising potential for PA promotion (80, 195). Workplace PA studies have led to increased PA levels and improvement in various health and workplace-oriented conditions. In 2006, Murphy et al. conducted an 8-week walking intervention (45 minutes, 2/wk) among 37 staff members of the Northern Ireland Civil Service staff (172). They reported an increase in PA and a significant decrease in systolic blood pressure in the intervention group (172). Research has also shown that workplace PA studies may be effective in improving certain mental health outcomes. De Zeeuw and colleagues conducted a workplace PA intervention in a sample of white collar employees (n=30. The participants were randomized to 10-week in-company fitness program with two supervised training sessions per week or to a control group. The researchers reported that 86% of the participants in the exercise group were below the cut-off point of experiencing minimal depression symptoms, compared with 31% of the control participants (72). Improvements in workplace-oriented outcomes (e.g. job stress, productivity, job satisfaction) have been reported as well. Von Theile et al. investigated the impact of adding 2.5 hours of mandatory PA session in
a sample of six dental health care offices (n=177). All sites were randomized into three conditions (PA, reduced work hours (RWH) and control) and self-reported productivity and the workplaces’ production levels (number of patients) were examined longitudinally for one year. The researchers reported a significant increase in the productivity (increased quantity of work, decreased sickness absence) in the PA group compared to the RWH and control groups (254). As indicated in these studies, the workplace setting is a viable and effective setting for increasing PA levels as well as improving various health and workplace-oriented outcomes.

**Workplace Physical Activity Interventions in Academic Settings**

Although researchers have produced promising results from workplace PA studies in various work settings (typically office settings), there are a limited amount of workplace PA studies that have examined the impact of introducing PA among adults in academic settings. The teaching profession has been associated with high levels of stress and opportunities to engage in PA during the work day may prove to be beneficial. However, a limited number of PA studies have been conducted in this setting (134, 162, 204). Researchers have reported that one third of classroom teachers perceive their occupation as highly stressful due to factors such as a heavy workload, difficult students and the physical demands of being a teacher (38, 77). It has been reported that compared to the general population, teachers are at risk for higher levels of psychological distress and experience lower levels of job satisfaction (209, 237). Additionally, the physical and mental health of being a classroom teacher seems to significantly impact the achievement and health of the students (111, 186). As previously stated, PA has been associated with improved physical and mental health and may prove to be effective in alleviating stress and improving other health conditions (e.g. PA levels, psychological factors) in preschool teachers.
However the few workplace studies that have been conducted in academic settings with the aim of increasing PA among teachers have been conducted in university settings (106, 108, 109, 144). For example, Gilson et al. conducted a 10-week workplace PA intervention among a sample of 58 university academic and administrative employees (107). Participants were randomly assigned to either a control (maintained normal routine) or two treatment groups (‘walking routes’ or ‘walking tasks’). The researchers reported a significant intervention effect (p<0.002) for step counts. While step counts decreased in the control group, both intervention groups’ experienced significant increase in their step counts (107).

Although workplace PA interventions have led to promising results in increasing educators’ PA levels in the university setting, only one study to date has been facilitated in preschool workplace setting (265). This is significant for a number of reasons. Firstly, preschool teachers play an instrumental role during the early years of a child’s development by promoting social, physical, and intellectual growth and as previously noted classroom teachers’ health status has been shown to impact their students (130, 173, 248). Secondly, a preschool teachers’ usual daily work schedule (e.g., long work days, providing consistent child care, educating children, etc…) does not allow much time for them to engage in PA outside of work. The typical workday of a preschool teacher is demanding and it would be ideal if any PA intervention delivered in that environment 1) was easily implemented and 2) did not add additional stress to their daily routine (38, 203). On average, preschool centers are open from 7:30 am - 5:30 pm to allow for parents to drop off their children before work and pick them up at the end of the workday (248). The typical day (12 hours) for preschool classroom teachers begins before the official opening of the center because teachers typically need to prepare materials and their classrooms for class activities in addition to performing administrative duties such as hall monitoring and bus
unloading (173). Thirdly, preschool teachers are at an increased risk for obesity due to multiple factors such as poverty and stress (248, 260).

Many preschool teachers in our targeted population (preschool teachers employed in Springfield, MA) are low-socioeconomic status (SES) women (246). NHANES data show that lower-income women are more likely to be obese than high-income women (55, 215). Data from the U.S. Bureau of Labor Statistics indicate that preschool teachers earned an average wage of $14.04 per hour in 2010 (248). In the U.S., the majority of preschool teachers can be defined as vulnerable populations due to their low average annual income (161). In the city of Springfield, MA, 59% of the adults over the age of 25 are overweight and 23% are obese (55). Additionally, the Department of Revenue documents that the average income per capita in Springfield, MA is $12,861, which is less than the average reported income for all Massachusetts cities ($32,721) (76). Given the extreme health vulnerability of this population, and the profound effect these teachers have on their students, feasible work place PA intervention within this at-risk population is warranted. The critical role preschool teachers play in the lives of their students, the need for adults to accumulate more daily PA, and the lack of PA research in this unique population underscore the need to examine the potential benefits that PA can play in this high-stress work setting.

Additionally, the efforts involved in supervising young preschool children for the majority of the day can be physically and mentally exhausting and could potentially decrease the likelihood of the teacher engaging in PA after work (153, 197). In efforts to accumulate the recommended daily amounts of PA, it may be more feasible to engage in PA during the work (preschool) day (54). Due to the full schedule of the preschool teacher, it may be more conducive for teachers to engage in short bouts of PA that they find relatively easy to implement (exercise
self-efficacy) and believe to be beneficial to their general health (outcome expectancy). Self-efficacy and outcome expectancy (two constructs of the Social Cognitive theory) significantly influence a person’s adoption of health-promoting behaviors (18, 20). According to the Social Cognitive Theory, a person with a higher self-efficacy (an individual’s belief that they can perform a particular task) and more positive outcome expectations (beliefs that a given behavior will produce a particular outcome) is more likely to participate in healthy behaviors (i.e. PA, healthy eating practices) (18, 20, 264).

In 2006 review by Kaewthummanukul and colleagues, researchers reported that self-efficacy was the best predictor of PA among employees (128). A number of researchers have reported associations between both exercise self-efficacy and outcome expectancy with PA (98, 121, 132, 145, 264). McAuley and colleagues examined the effects of a 20-week exercise intervention on exercise adherence in sedentary, middle-aged adults (n=114, ages 45-64) (159). Participants were randomly assigned to either an adherence intervention or a control group. Participants in the intervention group met three times a week and walked for 10-15 minutes/session for the first 2 weeks, progressing to 40-minute walks by the middle of the study. The control group met twice a week for 10- to 15- minute sessions consisting of lectures and question and answer sections about various topics (i.e. activity-related injuries, healthy lifestyles, athletic shoe selection). Researchers reported that in the treatment group, exercise self-efficacy predicted exercise adherence at 2 months ($r^2 = 0.18$, $P<0.01$) and exercise frequency at 4 months, ($r^2 = 0.09$, $P<0.05$) ((159). In 2011, Bannegan examined the relationship between self-efficacy and other precursors of PA in a sample of college freshman (n=369) (40). A 12-item Exercise Confidence Survey was used to measure the participants’ confidence in participating in exercise under specific conditions (i.e., ‘stick to your exercise program after a long, tiring day at work or
school’). Results of a factor analysis revealed a significant relationship between the participants’ belief in their resistance to relapse (sticking to program) and making time for exercise, indicating that most students believed they could make time for and adhere to an exercise program (40).

In light of the evidence that exercise self-efficacy and outcome expectations are positively associated with PA, a work place intervention that incorporates PA that can be easily mastered could potentially lead to increased PA levels. Evidence has shown that workplace PA programs can lead to significant reductions in modifiable health risk behaviors, such as insufficient PA levels and improve quality of life factors (e.g., physical and social functioning, psychological factors) (21, 65, 109). Brown and colleagues examined the relationship between PA and employee well-being in 20 workplace studies (43). In their review, Brown et al. found positive associations between PA and the quality of life and emotional well-being of employees. Authors concluded that worksite PA interventions could be a potential strategy for improving the physical and mental health of employees (43).

**Short Bouts PA Workplace Interventions**

In order for a workplace PA intervention to be successfully integrated into the workday, it should be conducted in a manner that does not negatively impact an employee’s work schedule. Short, low-burden PA interventions may prove to be effective in the workplace setting. Barr-Anderson and colleagues reported that recommended daily PA accumulated in short intervals (e.g., <10 minutes) might be more feasible and appealing than longer bouts (21). In 2004, the Los Angeles Lift Off, a randomized controlled workplace PA intervention was conducted in Los Angeles County Department of Health Services’ worksites (273). The purpose of the intervention was to integrate PA into the workplace. The 4-week intervention utilized 10-
minute PA breaks in the form of low-impact aerobic dance and movement set to music (277). The control intervention was instructed to take their normal 10-minute break. Study participants were predominantly sedentary, overweight, middle-aged women of color. The primary measurement was the level of participation and secondary measurements were self-perceived health status, satisfaction with current fitness level, and mood/affective state. Yancey et al. reported that more than 90% of participants participated in the PA breaks and the intervention participants' self-perceived health status ratings were significantly lower than the control participants. The results of this study suggest that employees can be engaged in short bouts of PA as a part of the workday (277).

In 2006, Yancey et al. implemented a wellness intervention that incorporated PA and healthy food choices in 35 nonprofit-sector agencies in Los Angeles (274). Participants in the study complete either a 6-week or 12-week curriculum that included 30-minute weekly training sessions on organizational wellness with 10-minute exercise breaks. The researchers reported a marginal decrease in BMI but significant reductions in feelings of sadness/depression among the 12-week participants. The 6-week participants significantly increased the number of days in which they participated in vigorous PA. Lara and colleagues examined the effects of incorporating group PA sessions into the workday on weight reduction in Mexican Ministry of Health office workers (139). Researchers reported marginally significant reductions in BMI and significant reductions in waist circumference and diastolic blood pressure in the women participants. These studies suggest that worksite strategies that integrated brief periods of PA within the workday can result in significant health and organizational benefits for their employees.
To date, the majority of the short-bout PA interventions that have been conducted in an academic setting are in elementary schools (81, 104, 154, 175, 221, 261). In 2008, Donnelly et al. conducted a 3-year cluster, randomized controlled trial (Physical Activity Across the Curriculum, ‘PAAC’) in 24 elementary schools, involving 4,905 children (81). Classroom teachers delivered 10-minute, moderate-to-vigorous intensity physically active academic lessons nine times a week in the PAAC schools. Researchers reported significantly greater increases in daily PA (p<0.0001) in the PAAC schools compared to the control schools (81, 104). Whitt-Glover and colleagues conducted a randomized controlled policy intervention study geared towards improving during-school PA by introducing 10-minute PA breaks (Instant Recess) in eight elementary schools in North Carolina (261). Direction observation was used to measure student PA levels. The researchers reported a significant increase of light (51%) and moderate-intensity (16%) PA in students engaged in the Instant Recess PA breaks (261). Only one short-bout PA study has been conducted in the preschool setting (methods and results previously described) (265). However, excluding the study conducted by Williams et al., short-bout PA interventions conducted in the classroom setting have only provided data of the impact of the intervention on the students’ PA levels and other academic-related variables (81, 104, 223, 261). As previously mentioned, preschool classroom teachers are at an increased disease risk due to their low SES status, gender and limited opportunities to be physically active. The potential impact of a short-bout PA intervention conducted during the preschool day (i.e. preschool teacher work setting) could help increase preschool teachers’ daily PA levels and overall physical and emotional health.
Mental Health in the Workplace Setting

Perceived Stress in the Workplace Setting

Physiological stress or perceived stress describes the occurrence when an individual perceives that environmental demands exceed his or her adaptive capacity to adequately address the task or situation (124, 125, 205, 269). The term stress often refers to the dynamic relationship between challenging environmental stimuli and a person’s response and other variables (e.g. gender, age, socio-economic status) that influences the two (124, 124, 125, 142). Perceived stress is determined by one's perceptions of their stressfulness (212). Many studies that examine perceived stress investigate the occurrence of environmental events that tax an individual’s ability to cope or on a person’s response to such events (205, 269). The term occupational or job stress involves the response to chronic job-related stress characterized by physical and emotional exhaustion and stress-related disorders (182). According to the World Health Organization, work-related stress describes the response employees may experience when presented with tasks unmatched to their skill set and knowledge and can contribute to poor physical and mental health (269). Perceived stress plays a significant role at the societal level (i.e., costs related to absenteeism, loss of productivity, and health care consumption) as well as on the individual level (e.g., CVD, high tension rates, depression, anger, anxiety, sleep problems, increased drug use) (251). In fact, the World Health Organization has labeled stress as the "the health epidemic of the 21st century” (269).

Stress is commonly evaluated using the Perceived Stress Scale (PSS), which is designed to measure the degree to which situations in an individual’s life are assessed as being stressful (212). The PSS provides a psychometrically valid measure of perceived stress. Cohen et al. documented that the PSS is reliably correlated with life-event scores, depressive and physical
symptomatology and social anxiety (212). It is critical to have a reliable way to measure stress in order to identify individuals that may have high levels of stress and develop effective strategies to reduce stress.

Numerous reviews have been conducted to examine the effectiveness of interventions designed to reduce workplace related stress (163, 169, 170). In 2006, Stansfeld et al. conducted a meta-analysis that examined the associations between well-being work stressors and mental health (218). Researchers reported that job strain and high psychological demands predicted common mental disorders (e.g. depression). (218). In 2006, Siegrist et al. reviewed 46 studies published between 1989 and 2006 that examined the link between workplace well-being stress and health risk behavior (213). Overall, the authors observed modest associations between workplace stress and health risk behavior (i.e., weight gain, smoking, alcohol consumption). The strongest reported association was observed between work perceived stress and overweight status (213). In 2010, Limm et al. conducted a cross-sectional study examining the association between work-related stresses with a range of negative outcomes (147). One hundred and seventy-four industrial employees were assessed for physiological and biological stress markers. Researchers reported that workers with low perceived stress displayed lower health-related complaints such as depression, compared to those with high-perceived stress (146). The potential negative impact of perceived stress on workers’ mental and physical health underscores the need to identify and implement effective strategies to alleviate stress within the workplace setting.

Although many studies have examined the impact of stress in a several different workplace settings, few have studied the impact of stress in the classroom setting. Research on teacher stress has become a major area of international research interest with a focus on assessing the effectiveness of particular intervention strategies to reduce teacher stress (134).
Researchers have sought to investigate psychological burnout that teachers often experience due not only to the potential debilitating health outcomes associated with teacher stress but also to the influence classroom teachers have on the students (46, 189). Burke et al. examined the predictors of psychological burnout among 833 school-based educators and reported that work stressors were strongest predictors of psychological burnout (46). Borg et al. surveyed 710 primary school teachers on their level of job related stress, job satisfaction and career commitment. They reported that teachers whom were less satisfied with their jobs reported higher stress levels (38). The majority of the studies that have examined stress in classroom teachers have been conducted in university faculty or elementary teachers (34, 231). The results of these studies emphasize the need to find effective strategies to reduce stress within the classroom setting.

**Depression**

Depression is characterized by depressed or sad mood, diminished interest in activities which used to be pleasurable, weight gain or loss, psychomotor agitation or retardation, fatigue, inappropriate guilt, difficulties concentrating, as well as recurrent thoughts of death (8). Diagnostic criteria established by the American Psychiatric Association dictate that five or more of the above symptoms must be present for a continuous period of at least two weeks. It is estimated that approximately 18.8 million U.S. adults (9.5% of the adult population) will suffer from a depressive episode within a given year (250). In adults, depression status and severity is often measured using the Beck Depression Inventory (BDI) (23, 26). The BDI is a questionnaire designed to measure behavioral manifestations of depression, registering varying degrees of depression along a continuum (25, 26). The BDI provides a quantitative assessment of the
intensity of depression and studies of internal consistency demonstrated a high degree of reliability (25).

Depression is a major mental health concern in workplace settings and has been positively linked to productivity loss, short-term disability, absenteeism and high medical costs among U.S. adults (57, 103, 131). Researchers have reported significant positive correlations between physiological and psychological health symptoms and the quantity of hours worked with individuals that work as little as 44 hours a week (117, 217). In addition, within a 3-month period, individuals with depression miss an average of 4.8 workdays and suffer 11.5 days of reduced productivity (250). Stewart et al. report that depression is estimated to cause 200 million lost workdays each year at a cost to employers of $17 to $44 billion (222). Virtanen and colleagues examined the association between long working hours and the onset of depressive symptoms in 2,960 full-time employees (2248 men, 712 women) (252). The researchers reported a positive association between the depression and long working hours in women (252). These studies highlight the need to find effective ways to address mental health in the workplace.

**Mental Health and Physical Activity**

Mental health is an increasing concern within the workplace due to its impact on issues such as absenteeism, cognitive ability and productivity (43, 57, 85, 103). Researchers have suggested that PA may play a significant role in managing mild to moderate mental health conditions such as depression and anxiety (185). Physical activity has been associated with improved physical health, life satisfaction, cognitive functioning, and psychological well-being (50). Cross-sectional studies report positive associations between self-reported levels of habitual PA and better mental health and lower levels of depression in the nonclinical and clinical populations (110, 220). Prospective longitudinal studies have also reported similar associations
between PA and mental health (183, 225). For example, DiLorenzo et al. examined the effects of a 12-week aerobic program (bicycle ergometry) on psychological outcomes in 82 adults (79). The program resulted in positive improvements in both physical fitness and psychological measures (i.e. anxiety, depressive symptoms) (79).

In 2010, Sullivan and colleagues examined the acute effects of a 10-minute treadmill protocol on pain, mood and perceived exertion (228). The pilot study included 28 participants who completed two 10-minute treadmill protocol for 5 days per week for three weeks. Mood and pain were measured using a 0-10 Likert scale. The researchers reported an immediate reduction in depressive and anxiolytic symptoms following the protocol. In 2012, Blumenthal and colleagues conducted a randomized control study in which 101 outpatients participants were randomized into three groups [aerobic exercise (3 times/week), sertraline (50-200 mg/day) or placebo] (36). Sertraline is the generic form of Zoloft, a drug used to treat depression (210). At the end of the 16-week program, all groups showed improvement in depression scores, with the participants in the aerobic and sertraline groups achieving larger reductions in depressive symptoms compared to the placebo group (36). Moses et al. conducted a 10-week study that compared the effects of two aerobic programs varying in intensities on mood and well-being of 109 sedentary adults (167). Participants were assigned to four conditions: high intensity aerobic training, moderate intensity aerobic training, attention-placebo and waiting list. Positive psychological benefits were seen with the moderate exercise condition but not in the high exercise or attention-placebo conditions (167).

In 2003, using data from the National Comorbidity Survey (n=8098, a representative sample of U.S. adults, ages 15-54) researchers reported that regular PA was associated with a decreased prevalence of depressive symptoms (110). Although research has shown that
participating in aerobic and muscle-strengthening activities three to five times a week for 30-60 minutes can provide mental health benefits, even lower durations of PA can be beneficial (56), (167). Physical activity has also been shown to have similar effects compared to other anti-depressant strategies, such as medication (35, 36). Effective workplace PA interventions could potentially help to maintain and/or improve the mental health of employees. Although previous PA interventions have reported reductions in stress and depressive symptoms within the workplace, the preschool setting has yet to be investigated. In light of the various stressors that preschool teachers face and the impact of teachers’ overall health on the children in their classrooms, effective strategies need to be implemented in this setting in order to maintain a productive and healthy environment. Therefore, the purpose of this study will be to examine the impact of preschool PA intervention on preschool teachers’ PA activity levels and various psychological measures (i.e. stress, depressive symptoms).
CHAPTER 3
METHODS AND PROCEDURES

Overview

This study examined the effects of a teacher-led PA program designed for preschool-aged children on classroom teachers’ total daily PA and percent of time spent in MVPA. The study assessed the impact of the PA intervention on various well-being measures (general health, stress levels, depression status) among the classroom teachers.

Preschool centers were randomly assigned to either the experimental [short bouts of structured PA (SBS-PA)] or controlled [traditional unstructured PA (TRD-PA)] condition, stratified by preschool center size. Following preliminary assessments (informed consent, baseline survey), participants’ (classroom teachers and preschool-age children) PA levels were assessed for five consecutive days (Monday – Friday). For the SBS-PA program, classroom teachers implemented the SBS-PA program in the classroom setting during the first 10 minutes of their designated gross motor playtime followed by 20 minutes of their usual gross motor playtime. For the TRD-PA program, teachers implemented their usual unstructured gross motor playtime. Both conditions were implemented for 30 minutes in the morning and afternoon for five days per week for three months. All outcome variables were assessed again during the last week of month three. The primary variable of interest (changes in classroom teachers’ PA levels) were assessed using multivariate analysis of covariance an analysis of covariance (MANCOVA). The study protocol is depicted in figure 1.


**School and Participants**

**School Randomization**

Fifteen preschool centers serving low-SES areas in the Springfield, Massachusetts were invited to participate in this study. Ten of the centers that were eligible (had at least two full-day preschool classrooms with approximately 10-20 students per classroom) agreed to participate in this study. Preschool center directors’ declined participation in the study due to reasons such the inability to provide 30 minutes of morning and afternoon gross-motor playtime and an unwillingness to be randomized. Number of classroom teachers per classroom ranged from 1 to 3, for a total number of 60 classroom teachers (Table 2). The directors in charge of each of the programs had already committed to participate in the study. Based on current enrollment information from the participating centers, the number of preschoolers per center ranged from 50 to 200 children.
Table 2. Names of Participating Schools

<table>
<thead>
<tr>
<th>School Name of School</th>
<th># of Centers</th>
<th># of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Children’s House</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Giggle Gardens Inc.</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Jewish Community Center</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Square One</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>New North Citizen Council</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Mini’s and Wynnie’s</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>YMCA of Greater Springfield</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

A cluster-randomized design was used in this study with the primary unit of randomization being the school and the secondary unit being the classroom teacher. Randomization by school and not classroom was chosen because within a given preschool center, all classrooms share resources during gross motor playtime and thus contamination between intervention arms would be unavoidable. Preschool centers (group) were randomized into a treatment [short bouts of structured PA (SBS-PA)] or control (traditional unstructured PA (TRD-PA)] condition after the completion of school PA policy questionnaire. Randomization was stratified based on preschool center size to ensure equal center size in each treatment arm. A cluster-randomized design was used because compared to traditional randomized trials; cluster-randomized trials have four distinguishing characteristics; 1) the unit of assignment is an identifiable group (preschool center) rather than the individual, 2) the units of assignment are allocated to each condition (SBS-PA versus TRD-PA), 3) the units of observation are members (classroom teachers) of the groups that serve as the units of assignments, and 4) there is only one limited number of assignment units in each condition. Classroom teachers within a school who
did not choose to participate in the study were still allowed to participate in the intervention protocol of their particular school; however no assessment data was collected on them.

**Participants Inclusion and Exclusion Criteria**

In order to be eligible for the study, classroom teachers had to be full-time employee of one of the participating preschool centers. To enhance internal validity, classroom teachers were not be eligible if they have any conditions limiting their participation in PA (i.e., unable to participate in routine outdoor play time at preschool, requiring oxygen supplementation for exertion, developmental or physical disability preventing participation in gross motor activities, participants who otherwise cannot increase their PA for any reason); if they had any conditions limiting their participation in the assessment (i.e., unable able to read surveys in English, unwilling to wear the activity monitor). Teachers’ age or physical health conditions were not used as exclusion criteria because PA is the main outcome of interest in this study and all exclusion criteria are centered on the participants’ ability to be physically active. Other variables (i.e., age, demographics) were assessed during analysis to examine their potential impact on teachers’ PA levels.

**Experimental Intervention Theoretical Framework**

Instant Recess (the study intervention) was based on the social ecological model and the Meta-Volition Model (MVM) (16, 17, 224, 279). Meta-volition refers to leaders’ and decision-makers’ motivation or volition to enhance the interests of their own organizations (279). The MVM specifies that a cascade of changes within an organization’s practice and policy can potentially lead to population health behavior change. The model suggests a shift of change from
individual motivation and self-efficacy (e.g., classroom teachers’ exercise self-efficacy) to a collective motivation or volition and efficacy (e.g., preschool centers, schools, health agencies) can lead to population-wide PA participation (279). In respect to the proposed study, the structural integration of short bouts of PA into the daily preschool agenda (i.e. Instant Recess) could lead to organizational changes to PA policy within the preschool centers. As the classroom teachers experience the ease of implementation (i.e., following 10-minute PA routines on a DVD) and potential benefits of the IR intervention (e.g., decreased stress, improved student concentration after PA break), this will reinforce their adherence to the program. These teachers will share their positive experiences with other teachers, stimulating the introduction of short bouts of structured PA in additional classrooms and ultimately spurring an organization change within the preschool center.

MVM is built upon Social Cognitive Theory, and Diffusion of Innovations (14, 15, 17, 206). Social cognitive theory supports a conception that behavior develops, is altered, and maintained through the interplay of personal, behavioral, and environmental factors (18, 19). With respect to this intervention’s focus, personal factors include: the teacher’s interest and participation in SBS-PA; the teacher’s belief that they have the ability to perform behaviors that will secure desired outcomes (self-efficacy); and outcome expectation IR will result in increased PA. Behavioral factors include: the knowledge and skills available and needed to perform the intervention; and the degree of competence attained in using these skills. The structured activities that the classroom teachers implemented in this intervention were developmentally-appropriate for the motor skills of preschool-aged children and therefore the teachers as well as the children were able to easily perform all of movements. Of the three determinants of behavior development, environmental factors (social or physical) had the greatest relative influence on
behavior in this intervention. The physical environment dealt with the structured approach of the intervention. The addition of a daily exposure to SBS-PA influenced the teachers’ ability to perform the activities as well as their PA self-efficacy.

Researchers have shown that classroom teachers are the second largest category of role models among preschoolers, behind family members (272). Classroom teachers play a pivotal role in the early development of preschool-aged children. Incorporation short bouts of teacher-led PA (delivered electronically using a DVD-based toolkit) within the daily preschool day may improve their PA levels. Diffusion of Innovation constructs of trial ability, observability, compatibility, and relative advantage represent characteristics of the IR innovation that make it likely to be implemented. Preschool centers can incorporate organizational modifications on a ‘trial’ basis before committing resources toward implementing long-term changes (270).

Changes in the organizational structure that are perceived to be relatively advantageous (e.g. daily participation in structured, short PA breaks during gross motor playtime) compared to current practices (e.g., relatively inactive supervision of students for 30 minutes or more during the daily gross motor playtime) are likely to be adopted, spurred by communication with colleagues and media coverage of IR. Additionally, individuals who have benefited from the organizational changes within early adopter preschool centers will communicate these benefits to the social networks of both teachers and principals (intra-organizational diffusion). Early evidence of organizational benefits in addition to this word-of-mouth dissemination drive inter-organizational diffusion. Leaders then diffuse these organizational benefits via various professional interactions (e.g., conference discussions and presentations). Inter-sectoral dissemination accompanies evidence of community benefit and subsequently by population decreases in sedentary behavior and increases in PA captured in public health surveillance.
Changes radiate out from preschool centers to other entities such as health and human services agencies, small businesses, local and state government agencies, elected officials, and the fitness industry. Each type of organization provides its own opportunities for further dissemination through its professional networks and changes in the decision-making of its staff/members that affect clients, constituents, patients, students, and others. The IR intervention has the potential to lead to organizational and community health benefits and classroom teachers can play a very significant role in this process. The involvement of classroom teachers accomplishes many things: it makes the recess model more appealing and culturally adaptable; it provides highly-valued but inexpensive incentives for participation that may help to reinforce the activities and may help generalize them to other settings; and it represents a more feasible and sustainable practice and policy change in low-resource schools.

**Intervention Development**

**Short-bouts Physical Activity Interventions Overview**

There is growing evidence that low levels of regular PA and high levels of inactivity have contributed to the increasing prevalence of chronic disease and obesity in the adult and youth populations (31, 37, 91). In efforts to combat this growing public health concern, researchers have employed a promising strategy that involves inserting short activity breaks into an individual’s life, such as their place of work. In adults, PA interventions involving short bouts of PA have been related to improvements in work performance indicators (i.e. productivity, perceived stress), well-being factors, clinical disease risk indicators (i.e. increased cholesterol levels, overweight status) (59, 213). In youth, short bouts of PA interventions have been related to improvements in academic performance (83, 119). Although the use of short activity breaks
has produced promising health-promoting outcomes in previous work-site and school settings, no published studies have examined the effects of SBS-PA on PA in preschool classroom teachers.

**Instant Recess Videos**

The proposed short bouts of structured PA intervention were based on Instant Recess™ (IR). IR was first developed and used in adult populations by Yancey *et al.* at University of California, Los Angeles (UCLA) medical school (271). IR consisted of different 10-minute exercise breaks for adults in various settings such as the work place, sporting events, and churches. Whitt-Glover *et al.* in collaboration with Yancey *et al.* then developed IR to be utilized in elementary school settings for youth (261). Currently, there are 14 adult and 13 youth IR DVDS.

Due to the successful impact of IR on elementary school children’s PA, Yancey *et al.* in collaboration with Head Start programs developed one age-appropriate IR audio CD for preschool-age children called “Tutti Fruitti Instant Recess (*TFIR*).” This audio CD was used as the prototype to develop the study intervention. In collaboration with physical education (PE) specialist, a total of 16 *TFIR* DVDs were created for this intervention. As part of the developmental phase, the PE specialist was tasked to view and modify seven (six adult and one youth) current IR routines to make them age-appropriate (motor skill level and theme) for preschool-aged children. Utilizing the knowledge gained from viewing and helping to revise previous IR videos, the PE specialist and research team developed nine additional *TFIR* routines for the study (for a total of 16 routines, each 10 minutes in duration).

All *TFIR* choreographed routines were required to meet the following requirements: 1) low-to-moderate impact aerobic movements that were simple and easy to learn, 2) each
movement had to start with lower body actions before adding upper body, and 3) movements had to be choreographed to moderate intensity music (~100 - 120 beats/minute) (271). After the modification/creation of all TFIR routines, YouTube links of each routine with its accompanied music tracks (see below for detail) were created and sent to the UCLA IR research team for edits. The UCLA IR research team edited all TFIR routines to determine if the routine met IR theory and movement guide (i.e., music and movement tempo). Research team then modified the TFIR routine to incorporate the suggestions/comments made by UCLA IR research team. An example of the movement-by-movement guide can be found in Appendix 1.

Musical tracks for each TFIR routine were selected after the initial choreography of the routine. Musical tracks were selected from a University of Massachusetts music data base (https://files.me.com/catseyesoup/3frj7g). Three different tracks were selected for each TFIR; one 1-minute track for the warm-up and cool down, two 4-min tracks for the remaining portion of each respective routine. An audio-visual (AV) consultant manipulated the selected tracks to meet a specified tempo (warm-up and cool-down, 95 – 100 bpm; main routine, 105 – 120 bpm) and then merged all selected tracks to produce an audio soundtrack files for each routine. A list of the music tracks used for the intervention and its accompanying TFIR names are listed in Appendix 2.

For each routine, the finalized audio file was used to edit and finalize the movement-by-movement guide. The verbal instruction for each routine’s movement-by-movement guide was then audio recorded. To create each TFIR routine’s audio file, the AV consultant merged the verbal instructions audio file with the soundtrack file. To create the visual movement-by-movement guide, a research staff member was video recorded while performing each routine. Each routine’s visual file was then merged with the audio file to create the audio-visual DVD for
each routine used for the intervention. The intervention material consisted of the *TFIR* DVD and its accompanying movement-by-movement guide. The *TFIR* DVDs were designed to be viewed by the classroom teachers as they lead their students in the 10-minute PA break.

**Procedure**

**Teacher Training**

The study protocol included separate in-service training sessions for classroom teachers in the intervention and control schools. Teachers assigned to the intervention schools received a 2-hour training session that included an overview of the obesity epidemic and the importance of PA and the *TFIR* protocol. During the training session, teachers were taught how to implement and lead preschoolers in *TFIR* routines. Teachers were guided through three IR routines. Teachers from the control schools were given a 1-hour training session that provided information on the obesity epidemic and the importance of allowing their students to play freely during the allocated intervention time. All teachers were provided information on the overall study protocol and the evaluation process. All teachers were asked to follow the protocol during the designated time for gross motor playtime within each normal preschool day and record the times the intervention was implemented during measurement weeks. Technical assistance was provided to teachers and staff in implementing both the treatment and control intervention during the course of the study. Research staff members observed each participating classroom at least once a week to determine if both interventions (SBS-PA and TRAD-PA) implemented as designed (Appendix 3).
Experimental Condition

All the participating preschools provide 60 minutes of daily gross motor free (unstructured) playtime, divided into 30 minutes in the morning and 30 minutes in the afternoon. For this study, TFIR was implemented during the first 10 minutes of the designated gross motor playtime (in their classroom setting). To implement the TFIR protocol, teachers and students simply followed along with the TFIR DVD on a portable DVD player (which was provided to each classroom). The TFIR DVDs were created to be viewed by the classroom teacher while their students followed their lead. After the completion of the 10-minute TFIR DVD, the students were allowed to engage in their usual gross motor playtime activities (unstructured play) for the remaining 20 minutes. The simplicity of the TFIR protocol enhanced the teachers’ ability to implement the intervention. The TFIR protocol was implemented during the morning and afternoon time designated for gross motor playtime for five days per week for three months. Two TFIR DVDs (one for morning and one afternoon playtime) were distributed to teachers each week to ensure that schools are implementing the same TFIR routine. Each set of TFIR DVDs were dropped off the Friday preceding their implementation in order to give classroom teachers by a movement-by-movement guide that included pictures of the movements. Each Monday, a research staff member picked up the TFIR DVDs from the previous week. Classroom teachers were asked to sign a TFIR DVD drop off log at both drop off and pick up times.

Control Condition

The control intervention consisted of traditional long bouts (30 minutes in the morning and 30 minutes in the afternoon) of unstructured gross motor playtime. For this intervention, classroom teachers were asked to simply supervise their students during designated gross motor
playtime. Classroom teachers were instructed to allow their students to play freely on their own or with other children. Teachers were allowed to join their students in play, however the students have to be the one(s) to initiate the play activity. The control intervention was implemented during both the morning and afternoon time designated for gross motor play for five days per week for three months.

**Measurements**

A number of measures were used to assess the impact of this intervention on the outcome variables of interest. Unless otherwise indicated, all variables of interest were assessed at baseline and during the last week of month three of the experimental protocol (Table 3.)

Table 3. Measurement Time points

<table>
<thead>
<tr>
<th>Measures</th>
<th>Baseline</th>
<th>3-Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics (Baseline Survey)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Height</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PA (Actigraph)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PA (Self-Report)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Exercise Self-Efficacy</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>General Health (SF-12 Health Survey)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Stress (Cohen Perceived Stress Scale)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Depression (Beck Depression Inventory)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Outcome Expectations</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Study Evaluation</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Primary Outcome Variable (Physical Activity)

Objective Assessment of PA - Accelerometer

PA was objectively assessed using GT1M (uniaxial) and GT3M (triaxial) Actigraph accelerometers (Actigraph, LLC, Pensacola, FL). The researchers had a limited number of each model of Actigraph accelerometer; therefore, both units were utilized to assess participants’ PA. Researchers have reported that it is reasonable to compare data from both models; therefore the use of both Actigraph models will not impact how the data are collected or reduced (129). The Actigraph is an accelerometer designed to detect accelerations of a magnitude and frequency that correspond with normal human movement, filtering out other forms of motion (e.g., high frequency vibrations). The Actigraph was initialized before each use and results were downloaded directly to a PC-compatible computer using USB cable. Actigraphs were programmed to store data at 60-second epochs on each monitoring day. The Actigraph were attached to an adjustable elastic belt and worn around the participants’ waists, positioned over their right hip. Teachers were asked to wear the Actigraph during all waking hours (during preschool hours and at home) for five consecutive preschool days (Monday – Friday) during measurement weeks and were instructed to remove it only when the monitor would get completely wet. A custom developed software program was used to process all data using the 60-second epochs counts cut offs (101). Average counts per minute and the percent of time spent in different activity intensity thresholds were calculated using the Freedson et al. counts cut-off for light (≤ 1951), moderate (1952-5724), hard (5725-9498) and very hard intensity levels (≥ 9499) (101). To examine PA patterns, the day was divided into during-preschool (7:30am-4:30pm), after- preschool/evening hours (4:31pm-10:00pm) and full-day hours (7:30am-10:00pm).
Subjective assessment of PA – International Physical Activity Questionnaire

Subjective assessment of PA was assessed using a modified version of the short format of the International Physical Activity Questionnaire (IPAQ, Appendix 4). The IPAQ was developed to measure health-related PA in adult populations (ages 18–65 years old) as well as to cross-nationally monitor PA and inactivity (114). Reliability and/or validity data collected from twelve countries on IPAQ instruments have produced a Spearman's $r_s$ of 0.8 and criterion validity of about 0.30 (114). Researchers have concluded that the IPAQ has acceptable measurement properties and is effective in monitoring PA in adult populations.

Anthropometric Measures and Demographic Information

Weight and Height

Standing height was measured twice, to the nearest millimeter, using a direct reading stadiometer. Participants were measured wearing light clothing, with shoes removed and the body positioned such that the heels and buttocks are against the vertical support of the stadiometer, and the head aligned so that the external auditory canal and the lower rim of the orbit are in a horizontal plane. If the two measures differed by more than 5 mm, a third measure was obtained. Body weight was measured twice, to the nearest 0.1 kg, using a digital scale. If the two measures differed by more than 0.2 kg, a third measure was obtained. The mean of the two measures, or the median of the three measures, would be used to calculate each participant’s BMI. Baseline demographics and socioeconomic status were assessed using a structured questionnaire adapted for the intervention (Appendix 5).
Well-being Measures

General Health

General health status was assessed using the SF-36 Health Survey, a multi-purpose, short-form health survey with 36 questions (Appendix 6). The SF-36 was developed from work done by the RAND Corporation and the Medical Outcomes Study and yields an 8-scale profile (i.e., physical functioning, role physical, bodily pain, general health perceptions, vitality, social functioning, role emotional, and mental health) of functional health and well-being scores. In addition, it provides psychometrically-based physical and mental health summary measures and a preference-based health utility index (257). This instrument monitors specific and general populations to estimate disease burden and has been shown to provide reliable and valid information about an individual’s functional health and well-being. The SF-36 Health Survey has been shown to have a reliability statistics > 0.70 (258). Reliability estimates values for other scales used to assess physical and mental summary scores usually ranges between 0.30 - 0.90 (257).

Stress and Depression Status

Stress levels were assessed using the Cohen Perceived Stress Scale (Appendix 7) (212). This psychological instrument measures the degree to which situations in one’s life are assessed as stressful. The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress and is designed to assess participants’ perceptions regarding the unpredictable and overloaded nature of their lives. Cohen et al. have reported correlations between PSS and stress measures, self-reported health and health behavior measures
The authors documented a correlation of 0.76 and 0.64 between stress factors and depression symptomatology in two different samples (63).

Depression status was assessed using the Beck Depression Inventory (21-question self-report inventory that measures the severity of depression in one’s life (Appendix 8) (26). The Beck Depression Inventory (BDI) includes questions about symptoms of depression such as hopelessness and irritability in addition to physical symptoms such as fatigue, weight loss, and lack of interest in sex (26). The BDI has been used in both diseased and non-diseased populations and shown to be highly reliable regardless of the population (24, 45). According to The BDI has a coefficient alpha of 0.80 and a test-retest reliability of 0.93 (26, 45, 82, 253).

Exercise Self-Efficacy and Outcome Expectations

Exercise self-efficacy was assessed using the Self-Efficacy for Exercise Questionnaire, a 14-item measure of an individual’s confidence to engage in exercise when faced with various barriers (e.g., when tired, depressed, have a lot of work to do, etc.). (Appendix 9) The 14 items are averaged to form a composite score. Garcia et al. reported the scale to have a high internal consistency (Cronbach’s alpha = 0.90) and 12-month test–retest reliability (r= 0.67). Exercise outcome expectations were assessed using the Outcome Expectations for Exercise Scale (OEE, Appendix 10) (202). The OEE is a 9-item self-report instrument that measures an individual’s perceived consequences of exercising (i.e., exercise makes my bones stronger, exercise makes me feel better physically, exercise helps me feel less tired). Resnick et al., reported evidence of internal consistency of the OEE (alpha coefficient of .89) and a test-retest reliability of 0.76 (202).
Statistical Analyses

Analysis of Primary and Secondary Outcome Variables

The purpose of this study was to examine the impact of a preschool PA intervention on the PA levels and well-being measures of the preschool classroom teachers. The primary outcome was change in classroom teacher PA levels, with secondary outcomes being behavior change (i.e., exercise self-efficacy, general health, stress levels, and depression status). Descriptive statistics including means ± standard deviations (SD) were calculated for all variables. The primary dependent variables of interest were total daily PA and percent time spent in sedentary, light, and MVPA, which have been reported to be highly correlated to each other (184, 238). The two independent variables for this study are group (SBS-PA and TRAD-PA) and time (baseline and 3-month post). The effect of the intervention on classroom teachers’ PA levels was assessed using multiple analysis of covariance (MANCOVA; to account for the correlation between dependent variable of interest) with repeated measures. Researchers have reported a significant association between PA and BMI (227) and PA and age (51), therefore, MANCOVA models for PA levels were covariated for BMI and age. The effect of the intervention on the classroom teachers’ post PA levels was assessed by a student t-test. The preschool center is the unit of randomization and intervention; however, the individual classroom teacher is the unit of assessment. The effect of the intervention on the classroom teachers’ exercise self-efficacy, stress levels, general health and depression status was assessed using an analysis of covariance (ANCOVA). All ANCOVA models for the secondary outcome variables were covariated for BMI. Statistical significance was set at alpha <0.05. All analyses were computed using SAS (version 9.2).
Sample Size and Power Analysis

In this study, a commercially-used power analysis software program (PASS 13) was used to estimate sample size. Conn et al. conducted a review of workplace PA interventions and reported mean overall effect of 0.21 (two-group pre–post effect on total PA levels) (176). Using a Cohen d effect size of 0.3 (medium effect) it is estimated that 42 teachers (21 per group) will be needed to obtain 80% power in respect to changes in PA levels at the 5% significance level (176). Due to the possibility of a 25% attrition rate, non-participation and/or loss to follow-up the initial recruitment sample size was 52 teachers.
RESULTS

Baseline Participant Characteristics

Classroom teachers from 10 preschool centers (SBS-PA, n=5; TRAD-PA, n=5) were recruited for the study. Seventy-two classroom teachers were employed at the recruited centers and a total 69 teachers (SBS-PA, n=25; TRAD-PA, n=44) were eligible for the study. Ten teachers (SBS-PA, n=1; TRAD-PA, n=9) were absent during one or more of the measurement periods and were excluded from the analyses. Four teachers (SBS-PA, n=0; TRAD-PA, n=4) either switched to classrooms that had younger children (i.e. infants, toddlers) or left the preschool center during study and were excluded from the analyses. Data from eleven teachers (SBS-PA, n=3; TRAD-PA, n=8) were excluded due to insufficient accelerometer wear time (i.e. belt worn less than 3 days). The final sample sized used for the analyses was 44 (SBS-PA, n=19; TRAD-PA, n=25) classroom teachers.

Participants’ baseline demographic and physical measures are presented in Table 4. The study population consisted of all women (age, 36.2±2.0 years) and was comprised of mostly Latino/Hispanic (34.7%) and African-American (29.7%). The majority of the classroom teachers were single (54.6%) and 73.4% earned an annual household income < $39,000. The SBS-PA group had significantly higher BMI than the TRAD-PA group (p = 0.01). The SBS-PA group also had significantly higher annual household income values (p = 0.04). With the exception of these variables, all other measures were not significantly different between the two groups.

Table 4. Baseline demographic characteristics
<table>
<thead>
<tr>
<th>Variable</th>
<th>SBS-PA (n=19)</th>
<th>TRAD-PA (n=24)</th>
<th>P</th>
<th>All (n=43)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>36.0±11.8</td>
<td>35.0 ± 7.8</td>
<td>0.74</td>
<td>35.0±6.0</td>
</tr>
<tr>
<td>Race/Ethnicity (%)</td>
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<td></td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>29.9%</td>
<td>29.6%</td>
<td></td>
<td>29.7%</td>
</tr>
<tr>
<td>Latino/Hispanic</td>
<td>30.8%</td>
<td>38.6%</td>
<td></td>
<td>34.7%</td>
</tr>
<tr>
<td>White</td>
<td>42.3%</td>
<td>31.8%</td>
<td></td>
<td>37.1%</td>
</tr>
<tr>
<td>Body mass index (kg/m^2)</td>
<td>33.7±8.0</td>
<td>27.2±6.0</td>
<td>0.004</td>
<td>30.0±7.6</td>
</tr>
<tr>
<td>Marital status, n (%)</td>
<td></td>
<td></td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>Single-never married</td>
<td>61.5%</td>
<td>47.7%</td>
<td></td>
<td>54.6%</td>
</tr>
<tr>
<td>Married</td>
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<td></td>
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<td>Divorced/Separated or Widowed</td>
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<td>Maximum household education level (%)</td>
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<tr>
<td>High school graduate or less</td>
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<td>2.3%</td>
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<td>1.2.6%</td>
</tr>
<tr>
<td>Some college/technical school</td>
<td>23.1%</td>
<td>40.9%</td>
<td></td>
<td>32.0%</td>
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<tr>
<td>College graduate</td>
<td>65.4%</td>
<td>40.9%</td>
<td></td>
<td>53.2%</td>
</tr>
<tr>
<td>Post graduate</td>
<td>11.5%</td>
<td>15.9%</td>
<td></td>
<td>13.7%</td>
</tr>
<tr>
<td>Annual total household income (%)</td>
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<tr>
<td>Less than $19,999</td>
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<tr>
<td>$20,000 - $39,000</td>
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<td>11.5%</td>
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<td>11.4%</td>
</tr>
<tr>
<td>Over than $60,000</td>
<td>11.5%</td>
<td>2.3%</td>
<td></td>
<td>6.9%</td>
</tr>
</tbody>
</table>

Unless otherwise noted, variables are presented as mean±SD. SBS-PA=Short bout structured-physical activity group; TRAD-PA=Traditional PA group. Significance was set at P ≤ .05.

Participants’ baseline PA and well-being variables are presented in Table 5. Although no significant between group differences were observed for any PA variables, SBS-PA participants spent less time engaged in sedentary activity than the TRAD-PA group (SBS-PA, 52.9%; TRAD-PA, 53.6%). On average, participants spent only 2.2 % of their work day (7:30am -
4:30pm) engaged in MVPA. The SBS-PA group had significantly higher outcome expectancy scores than the TRAD-PA group at baseline (SBS-PA, 17.6±7.5%; TRAD-PA, 11.3±7). No other significant between group differences were observed for any baseline variables.

Table 5. Baseline Physical Activity (PA) and Well-being Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>SBS-PA (n=19)</th>
<th>TRAD-PA (n=24)</th>
<th>P</th>
<th>All (n=43)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Day PA (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary PA</td>
<td>50.9%</td>
<td>53.1%</td>
<td>0.61</td>
<td>52.1%</td>
</tr>
<tr>
<td>Light PA</td>
<td>47.3%</td>
<td>44.4%</td>
<td>0.53</td>
<td>45.7%</td>
</tr>
<tr>
<td>MVPA</td>
<td>1.8%</td>
<td>2.4%</td>
<td>0.38</td>
<td>2.2%</td>
</tr>
<tr>
<td>Total Daily PA (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary PA</td>
<td>52.9%</td>
<td>53.6%</td>
<td>0.86</td>
<td>53.2%</td>
</tr>
<tr>
<td>Light PA</td>
<td>45.1%</td>
<td>43.9%</td>
<td>0.77</td>
<td>44.5%</td>
</tr>
<tr>
<td>MVPA</td>
<td>1.9%</td>
<td>2.4%</td>
<td>0.32</td>
<td>2.1%</td>
</tr>
<tr>
<td>Self-Report PA (MET-min/wk)a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>278.4±304.9</td>
<td>224.3±412.0</td>
<td>0.72</td>
<td>256.9±342.8</td>
</tr>
<tr>
<td>Moderate PA</td>
<td>167.6±247.1</td>
<td>224.3±375.7</td>
<td>0.58</td>
<td>199.3±346.3</td>
</tr>
<tr>
<td>Vigorous PA</td>
<td>653.9±878.7</td>
<td>326.3±474.3</td>
<td>0.15</td>
<td>471.1±693.7</td>
</tr>
<tr>
<td>Total PA</td>
<td>1099.9±1262.4</td>
<td>790.5±987.9</td>
<td>0.37</td>
<td>927.2±1114.3</td>
</tr>
<tr>
<td>Well-being Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Component</td>
<td>86.8±13.8</td>
<td>74.0±30.2</td>
<td>0.07</td>
<td>79.7±25.0</td>
</tr>
<tr>
<td>Emotional Component</td>
<td>68.4±14.7</td>
<td>71.0±7.1</td>
<td>0.47</td>
<td>69.8±11.0</td>
</tr>
<tr>
<td>Energy Component</td>
<td>59.5±14.0</td>
<td>56.3±13.7</td>
<td>0.45</td>
<td>57.7±13.7</td>
</tr>
<tr>
<td>Stress (PSS)</td>
<td>29.2±3.8</td>
<td>29.3±3.1</td>
<td>0.12</td>
<td>29.3±3.4</td>
</tr>
<tr>
<td>Depression (BDI)</td>
<td>4.4±5.6</td>
<td>3.5±6.0</td>
<td>0.34</td>
<td>3.8±5.9</td>
</tr>
<tr>
<td>Self-Efficacy for Exercise (SEE)</td>
<td>51.4±19.1</td>
<td>58.6±18.2</td>
<td>0.21</td>
<td>55.4±18.7</td>
</tr>
</tbody>
</table>
Outcome Expectancy (OEE)  16.7±6.6  14.5±6.0  0.24  15.5±6.3

Unless otherwise noted, variables are presented as mean±SD.  PA = physical activity; SBS-PA=Short bout structured-physical activity group; TRAD-PA=Traditional PA group; Work Day=7:30am - 4:30 pm, Total Day= 7:30am -10:00 pm; MVPA=Moderate-to-vigorous PA; Average accelerometer wear time (mins) = SBS-PA(1,012±501.8); TRAD-PA (1,976.8±1,399.9); MET= metabolic equivalents; SF-36 Health Survey; PSS=Perceived Stress Scale; BDI=Beck Depression Inventory; SEE= Self-Efficacy for Exercise Questionnaire; OEE =Outcome Expectations for Exercise Scale; Significance was set at $P \leq .05$.

a Self-report PA was measured using the International Physical Activity Questionnaire (IPAQ)

**Changes in Physical Activity and Well-being Variables**

SBS-PA teachers were instructed to lead the TFIR intervention twice during each work day for the first 10 minutes of the classroom daily gross motor time throughout the 3-month intervention, while TRAD-PA teachers supervised traditional gross motor time activity (i.e., 30 minutes of unstructured PA). To examine the impact of the interventions on PA and well-being variables (i.e., stress, depression, general health, exercise self-efficacy and outcome expectancy) measurements were taken at baseline and at 3-months. No significant group by time interaction effects was observed in any of the PA variables (objective and self-reported) (Table 6). Both groups decreased their percent time spent in MVPA (SBS-PA, baseline, 1.9±1.5; post, 1.7±1.1; TRAD-PA, baseline, 2.4±1.0; post, 1.9±1.7). Although not significant, the SBS-PA group exhibited a slight decrease in the percent of time spent in sedentary PA (baseline, 52.9±12.2; post, 51.2±10.5) and increased their percent time spent in light PA (baseline, 45.2±12.5; post, 47.3±10.1). The SBS-PA also exhibited a non-significant increase in their self-reported moderate PA (baseline, 146.5±209.9; post, 165.1±208), while the TRAD-PA group documented a non-significant decrease in moderate PA (baseline, 241.1±424.8; post, 92.0±161.6). No significant differences were found in any of the post PA values (Table 7). Additionally, no significant differences were found in any of the well-being variables throughout the study. A non-
significant improvement in outcome expectancy scores were observed in the SBS-PA group (SBS-PA, baseline, 16.7±6.6; post, 18.9±7.7), while a non-significant decrease was seen in the TRAD-PA group (baseline, 14.5±6.0; post, 12.8±3.7). The SBS-PA group demonstrated a slight non-significant improvement in their exercise self-efficacy score (baseline, 51.4±19.1; post, 52.0±7.1) while the TRAD-PA group’s scores remained the same (baseline, 58.6±18.2; post, 58.5±20.6). Although not significant, both groups exhibited a decrease in perceived stress scores (SBS-PA, baseline, 29.2±3.8; post, 6.9; TRAD-PA, baseline, 29.3±3.1; post, 26.5±0.02).

**Study Fidelity and Process Evaluation**

All 16 *TFIR DVDs* were used by the SBS-PA teachers during the 3-month intervention. The number of days each DVD was view in each center varied due teachers reported lack of time, snow days, holidays and preschool center special events. In order to determine if both interventions (SBS-PA and TRAD-PA) were implemented as designed, classroom teachers in each participating classroom were observed at least once a week by researcher staff members. Staff members completed a study fidelity form during each visit and recorded information about various aspects of the intervention protocol (Table 8). The TRAD-PA group completed the entire 30-minute intervention more frequently than the SBS-PA (SBS-PA, 75.2%; TRAD-PA, 56.6%). Although the classroom teachers in the SBS-PA group provided encouragement during the intervention 80.8% of time, they implemented the protocol as intended only 67.2% of the time. Additionally, the SBS-PA group implemented the 20 minutes of gross motor play time that was intended to follow the 10-minute TFIR session only 52.0% of the time. Although the study fidelity among the SBS-PA teachers was relatively low in general, an intervention fidelity (IF) scale was created (ranging from 1 to 7) to identify if there were any differences in PA levels
between SBS-PA teachers who correctly implemented the intervention protocol more frequently (Appendix 11). Seven questions detailing study protocol steps were selected from the study fidelity form. A ‘1’ was documented if the classroom teacher successfully completed an IF item, while a ‘0’ was documented if the IF item was not correctly implemented. A score of 5.25 or higher indicated a 75% or higher IF completion rate (i.e. a ‘high IF implementer) and a score of 5.24 or less indicated that the intervention was correctly implemented less than 75% of the time (i.e. a ‘low’ implementer). Although no significant differences (Table 9) in PA levels were found when comparing low and high IF implementers’ PA levels, high IF teachers decreased more in percentage of time spent in sedentary PA than the low IF group (High IF, baseline, 55.8±16.7; post, 50.8±8.2; Low IF, baseline, 51.5±9.6; post, 53.6±11.1) (Table 9).

Most classroom teachers expressed an appreciation for the study (e.g. “The program is structured and directions were easy to follow”; “It helped me to keep up with my personal routine of exercises”) (Table 10). However, they also documented several challenges that hindered their ability to implement the protocol as instructed. One of the challenges the teachers noted was difficulty with documenting intervention implementation times in the midst of their workday. For example, one participant reported the following on the follow-up survey, “by the time we get the kids inside I have other things to do and forgot to write things down, I mean I did the program so what is the big deal about writing it down “ (Table 11). Another challenge noted by the classroom teachers was difficulty implementing afternoon TFIR intervention due to daily tasks that classroom teachers needed to complete during the afternoon work hours (i.e. waking children from naptime, serving an afternoon snack, preparing children for pick up time, etc). Although there were no significant differences in the PA levels when comparing morning (9:00AM – 12:00PM); and afternoon (2:00PM – 4:30PM) time periods at the end of the 3-month
study, both groups spent a greater percentage of time engaged in sedentary PA during the afternoon (SBS-PA, AM PA, 46.8±14.9; PM PA, 47.4±13.0; TRAD-PA, baseline, 49.6±14.5; post, 51.1±16.0) as well as a slight increase in time spent engaged in MVPA (SBS-PA, AM PA, 1.8±1.1; PM PA, 2.4±1.9; TRAD-PA, baseline, 1.6±1.4; post, 2.5±2.1) (Table 12). Other noted conflicts with the daily preschool schedule were perceived extra time needed to prepare room for intervention and time to complete study questionnaires during data collection periods.
Table 8. Intervention fidelity (assessed via observation)

<table>
<thead>
<tr>
<th>Fidelity Question</th>
<th>SBS-PA (%)</th>
<th>TRAD-PA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did intervention last for at least 30 minutes?</td>
<td>56.6</td>
<td>75.2</td>
</tr>
<tr>
<td>Did MVPA occur at least 50% of intervention time?</td>
<td>65.7</td>
<td>63.2</td>
</tr>
<tr>
<td>During gross motor time, did classroom teachers allow children to play freely on their own?</td>
<td>55.4</td>
<td>75.6</td>
</tr>
<tr>
<td>Was gross motor time outside?</td>
<td>28.3</td>
<td>36.4</td>
</tr>
<tr>
<td>Were children allowed to participate in gross motor time during intervention time?</td>
<td>n/a</td>
<td>87.6</td>
</tr>
<tr>
<td>Was TFIR DVD implemented during the 1st 10 minutes of intervention</td>
<td>86.5</td>
<td>n/a</td>
</tr>
<tr>
<td>Was the TFIR DVD implemented in the expected 10-minute duration?</td>
<td>89.3</td>
<td>n/a</td>
</tr>
<tr>
<td>Did at least 50% of classroom children participate during the TFIR DVD?</td>
<td>75.3</td>
<td>n/a</td>
</tr>
<tr>
<td>Did the majority of the children participate in at least 5 minutes of the TFIR DVD?</td>
<td>75.7</td>
<td>n/a</td>
</tr>
<tr>
<td>Did classroom teacher provide encouragement during the TFIR DVD?</td>
<td>80.8</td>
<td>n/a</td>
</tr>
<tr>
<td>Did classroom teacher implement the TFIR DVD as intended (i.e., teacher leading TFIR DVD and students following teacher)?</td>
<td>67.2</td>
<td>n/a</td>
</tr>
<tr>
<td>Did 20 minutes of gross motor time follow the TFIR?</td>
<td>68.5</td>
<td>n/a</td>
</tr>
<tr>
<td>Did gross motor time last for at least 20 minutes?</td>
<td>52.0</td>
<td>n/a</td>
</tr>
</tbody>
</table>

SBS-PA=Short bout structured-physical activity group; TRAD-PA=Traditional PA group; TFIR = Tutti Fruitti Instant Recess.

Table 9: High vs. Low Intervention Fidelity (IF) Physical Activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low IF (n = 10)</th>
<th>High IF (n = 9)</th>
<th>F value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Post</td>
<td>Baseline</td>
<td>Post</td>
</tr>
<tr>
<td>PA (% Time)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary PA</td>
<td>51.5±9.6</td>
<td>53.6±11.1</td>
<td>55.8±16.7</td>
<td>50.8±8.2</td>
</tr>
<tr>
<td>Light PA</td>
<td>46.5±10.5</td>
<td>44.9±10.6</td>
<td>42.3±16.1</td>
<td>47.5±8.0</td>
</tr>
<tr>
<td>MVPA</td>
<td>2.0±1.4</td>
<td>1.5±1.0</td>
<td>1.9±1.5</td>
<td>1.7±1.3</td>
</tr>
</tbody>
</table>

All values are Mean±SD. PA=Physical activity; SBS-PA=Short bout structured-physical activity group; Low Fidelity= <5.25 IF Score; High Fidelity= ≥5.25 IF Score; (MVPA=moderate-to-vigorous PA; Significance was set at P ≤ 0.05.
Table 10. Study evaluation responses reported by teachers

<table>
<thead>
<tr>
<th>Question</th>
<th>Teacher response</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did you like/enjoy about the study?</td>
<td>“I enjoyed the program and the students liked it as well’</td>
</tr>
<tr>
<td></td>
<td>“It helped me to keep up with my personal routine of exercises”</td>
</tr>
<tr>
<td></td>
<td>“I liked wearing the belt that tracked how much exercise you did”</td>
</tr>
<tr>
<td></td>
<td>“I liked making sure we got gross motor activity in twice a day because sometimes in the past we wouldn’t prioritize and would end up skipping outside time and hating it! So I like making sure we do it every day, 2x a day!”</td>
</tr>
<tr>
<td></td>
<td>“Helping to learn about childhood obesity and help find a way to solve this issue”</td>
</tr>
<tr>
<td></td>
<td>“To make exercise apart of the curriculum”</td>
</tr>
<tr>
<td></td>
<td>“The program is structured and directions were easy to follow”</td>
</tr>
</tbody>
</table>
Table 10. continued)

<table>
<thead>
<tr>
<th>Question</th>
<th>Teacher response</th>
</tr>
</thead>
</table>
| What was the hardest part of being a part of the study? | “Remembering to log the time”  
“I have to keep up doing it (exercises) almost every day and sometimes I forgot to put my belt on time so some of the time was missed.”  
“Remembering to keep the belt on’  
“Filling out all the paperwork’  
“Getting gym/outside time when other rooms try to have it, especially in the afternoons” |
| Is there any part of the study that you would change? | “No, it was fun and pretty easy” |
| Further Comments                               | “It was a very interesting and useful program. I love the goals and objectives of the program’  
“I am looking forward to getting the DVDs so we can use them as well as the regular everyday gross motor activities’  
“All in all, the study was a positive experience and I am glad we participated” |

Table 11. Qualitative data on barriers to study protocol implementation reported by teachers

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>“in order to do the DVD I have to rearrange my classroom, which takes time and then after the DVD: I have to get the children into circle time before they can get dressed to go outside. So although the program is only 30 minutes, it actually took me anywhere from 45 to 60 minutes.”</td>
</tr>
</tbody>
</table>
Excessive paperwork

“by the time we get the kids inside I have other things to do and forgot to write things down, I mean I did the program so what is the big deal about writing it down.”

Preschool schedule

“I could never do the afternoon DVD because I had to get the kids ready to go home. A lot of my kids leave on the bus which leaves after their afternoon snack.”

Table 12. Morning and Afternoon Physical Activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>SBS-PA (n = 19)</th>
<th>P value</th>
<th>TRAD-PA (n = 24)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM PA</td>
<td>PM PA</td>
<td>AM PA</td>
<td>PM PA</td>
</tr>
<tr>
<td></td>
<td>BASELINE (% Time)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary PA</td>
<td>46.8±19.6</td>
<td>43.3±19.0</td>
<td>0.59</td>
<td>45.1±15.2</td>
</tr>
<tr>
<td>Light PA</td>
<td>50.1±19.6</td>
<td>49.6±19.6</td>
<td>0.83</td>
<td>48.6±15.3</td>
</tr>
<tr>
<td>MVPA</td>
<td>2.3±2.1</td>
<td>1.8±1.1</td>
<td>0.49</td>
<td>2.2±1.8</td>
</tr>
<tr>
<td>POST (% Time)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary PA</td>
<td>46.8±14.9</td>
<td>47.4±13.0</td>
<td>0.88</td>
<td>49.6±14.5</td>
</tr>
<tr>
<td>Light PA</td>
<td>51.7±14.7</td>
<td>50.1±12.0</td>
<td>0.73</td>
<td>48.8±13.6</td>
</tr>
<tr>
<td>MVPA</td>
<td>1.8±1.1</td>
<td>2.4±1.9</td>
<td>0.28</td>
<td>1.6±1.4</td>
</tr>
</tbody>
</table>

All values are Mean±SD. PA= physical activity; SBS-PA=Short bout structured-physical activity group (treatment group); TRAD-PA=Traditional PA group (control group); AM PA= Morning PA (9:00AM – 12:00PM); PM PA= Afternoon PA (2:00PM – 4:30PM); MVPA=moderate-to-vigorous PA; Significance was set at P ≤ .05.
CHAPTER 5

DISCUSSION

Introduction

This randomized controlled pilot study is the first to objectively examine the impact of a workplace PA intervention on preschool teachers’ PA levels and psychological wellbeing outcomes. The majority of PA interventions designed to improve the PA level of preschool-age children have been implemented within the preschool settings and therefore have been led by classroom teachers. These teacher-led preschool PA studies have yielded promising results in regards to increasing the PA levels among preschoolers, yet none of them have examined the impact of these PA interventions on the classroom teachers’ PA levels (28, 41, 74, 178). This is critical because adult obesity continues to be a significant public health concern (Flegal, 2012). Similar to children, most adults are not meeting the recommended amounts of PA (1, 249). Lack of time has been reported as the number one reason for low PA participation levels among adults (276). Due to the typical preschool day and their work obligations, preschool teachers have a unique opportunity to engage in structured PA with their classroom students (42, 75, 102, 133, 140, 151). These PA sessions can potentially be effective in increasing the amount of PA that teachers engage in on a daily basis. Currently, there are no studies that have objectively examined the impact of preschool PA interventions on preschool teachers’ PA levels or other health outcomes.

Review of findings

The primary purpose of this 3-month work place PA intervention was to examine the impact of a teacher-led, short bouts-PA intervention on preschool teachers’ PA levels. Compared to the control group (TRAD-PA), the implemented 3-month PA intervention had no significant
increase in MVPA in the treatment group (SBS-PA). Although not significant, there was an increase in light PA in both groups, with a greater increase in the treatment group (SBS-PA) compared to the control group (TRAD-PA). The majority of workplace PA interventions that utilized short bouts of PA (i.e. 10-15 minute activity breaks) did not observe any impact of the intervention on employees’ PA levels (11, 47, 156, 179, 199, 268). The studies that did assess PA primarily used self-report measures and unlike the results of this study, reported an increase in the overall PA levels among the participants’ (22, 43, 232). Dishman et al. conducted a group-randomized 12-week intervention (Move to Improve) in eight Home Depot sites aimed at increasing leisure-time PA among its employees (n=1442). Participants in the intervention group set personal and team goals to accumulate 10-min mixture blocks of PA while participants in the control condition completed the CDC health-risk appraisal and received monthly newsletters describing the health benefits of PA (43). The authors reported greater increases in self-reported MVPA in the intervention group than in the health education control condition. The proportion of participants that met the Healthy People 2010 recommendation for regular participation in either moderate or vigorous PA increased to 51% at intervention sites while remaining near 25% at control sites during the study (43). Although increases in PA levels have been reported in previous workplace PA studies, the use of self-reported PA may not have accurately described the true impact of the intervention on the participants’ PA levels. It has been documented that self-reports have several limitations in terms of their reliability and validity in capturing accurate levels of PA participation. Self-reported PA has been shown to depict greater improvements in PA compared to objective measures (e.g. accelerometer, pedometers) due to an over-estimation of PA and issues of recall and response bias (e.g. social desirability). Although not significant, a similar trend was seen in the current study. Objective measures of PA (i.e. accelerometers) offer
more precise estimates of PA level and remove the issues of bias. (Shepherd, 2003) This underscores the need for more PA workplace studies to use objective measures of PA such as accelerometers to more adequately assess the impact of the intervention on employees’ PA levels.

The TFIR PA sessions were designed to be age-appropriate for preschoolers and therefore may not have been vigorous enough to elicit an increase in MVPA in the classroom teachers. Although increases in MVPA may not have been feasible, the introduction of daily structured PA (in general) to the teachers’ workday may have impacted the lower intensity PA levels (i.e. light PA) in the SBS-PA group. The increase in PA in the TRAD-PA group could have been due to the greater adherence to the study protocol by the control classroom teachers. Teachers in the TRAD-PA group implemented the entire 30-minute intervention at a greater percentage than the SBS-PA teachers (75.2% vs 56.6%). They may have been more active as they interacted with their students during the daily gross motor play time. The reported increase in light PA levels could potentially have significant public health implications because researchers have reported that even modest improvements in PA levels can lead to substantial cardiovascular and other health benefits in women (122). As previously stated, the preschool workplace setting provides an advantageous opportunity for teachers to engage in meaningful amounts of PA as they lead out in preschool PA interventions (41). Although no significant changes in MVPA were observed, this study provides evidence that it may be feasible for preschool classroom teachers to make modest increases in their engagement in light PA throughout their work day via activity breaks. Such increases in time spent in light PA may prove to be significant in light of the health gains acquired via even small increases in PA participation (149, 230).
The impact of this short bouts-PA workplace study on several secondary measures (i.e. exercise self-efficacy and outcome expectations, perceived stress, depression, quality of life) was also examined. Similar to the PA results, there were no significant differences in the psychological well-being measures between the two groups. However, slight non-significant improvements were observed in the SBS-PA group’s self-efficacy scores compared to a decrease that was observed in the TRAD-PA scores. Non-significant improvements were observed in both groups outcome expectancy scores. Although self-efficacy and outcome expectancy play pivotal roles in determining the impact of interventions that were developed using the SCT, there are very few short bouts PA work place studies that have reported the impact of the intervention on these variables (150, 176, 208, 246, 276). Researchers have postulated that higher levels of exercise self-efficacy and the expectation of benefits derived from PA bouts may be correlated to increased PA levels and adherence (93, 246). Rabinowitz et al. investigated the impact of self-efficacy in influencing PA behavior within a sample of 46 manufacturing plant employees (80% women, mean age 34.6 years). Participants completed questionnaires measuring several variables related to their PA beliefs (e.g. exercise self-efficacy, contribution of PA to general feeling of well-being, time for exercise). The authors reported that engaging in PA was positively correlated to exercise self-efficacy. The findings of the current study are consistent with such observations with the SBS-PA teachers demonstrating a greater increase in improvements in their exercise self-efficacy scores than the TRAD-PA group (127).

Researchers have reported that PA may have a positive impact on stress levels and be positively correlated with lower stress levels (123, 234, 245, 281). Similar findings have been reported in PA interventions conducted in work place settings (188). Ng et al. examined the associations between perceived stress and several health behaviors (including PA) in a sample of
working adults (n=12, 110) from 26 worksites involved in the SUCCESS project. The researchers reported that greater perceived stress was associated with lower levels of PA. Although not significant, the SBS-PA group exhibited a slight decrease in their perceived stress. However, the impact of the majority of short bouts-PA workplace studies on employees’ stress levels have not been reported (47, 156, 179, 199, 265). This study is the first to date to provide evidence of the impact of short bouts of PA in the workplace setting on participants’ perceived stress levels.

Findings from previous reviews and studies examining the impact of PA on mental health measures suggest and that increased PA may significantly reduce depression and other mental health disorders (173, 236). Workplace PA interventions have also produced similar results (13). Chu et al. conducted a review that examined the effectiveness of workplace PA interventions on depression and other mental health outcomes with employees and reported that PA interventions are effective in achieving beneficial mental outcomes. However in the current study, similar to the other psychological wellbeing variables, no significant changes were observed in depression scores between the treatment and the control group. The lack of significant change in depression scores may have been due to the length of the study (3 months). Although a review by Teychenne et al. reported that the both shorter and longer duration of PA were associated with a reduced likelihood of depression, previous PA interventions that have reported significant decreases on employees’ depression scores have typically been longer (i.e. > 3 months) in duration (62, 274, 275). For example, King et al. examined the impact of a 12-month exercise training programs on psychological outcomes within a sample of 357 adults who were randomly assigned to one of 4 intervention groups (i.e. assessment-only control group, higher intensity, higher intensity home or lower intensity home). Physical activity was assessed attendance
records at group PA sessions and individual PA logs. All of the participants (regardless of program assignment) showed a reduction of depressive symptoms, noting that vigorous activity not essential in attaining psychological benefits from PA participation (274). The majority PA workplace that have reported an significant deduction of depression symptoms have used self-report measures to report PA levels. (53) Additionally, no short bouts PA workplace studies to date that have examined the impact of the intervention on depression symptoms have used objective means to assess physical activity. The use of self-report measured PA may have produced an over-estimation of PA participation in these studies and may not have accurately assessed the true impact of the PA intervention on the participants. Like, the current study future studies need to use objective PA measurement methods to better ascertain the impact of PA on participants’ depression statuses.

The SBS-PA group also exhibited non-significant improvement in quality of life scores (mental component) relative to the TRAD-PA group. Similarly, previous work-site interventions have not reported significant improvements in the mental health outcome such as quality of life (148, 280). Eriksen et al. evaluated the efficacy of an worksite wellness program (IHP) in a sample of 860 employees who were Randomly placed in three groups; control (n = 344), physical exercise (n = 189), integrated health program (comprising physical exercise and health information) (n = 165) and stress management training (n = 162). Similar to the current study, the authors reported that the physical exercise group showed non-significant improved general health (280).

Although no significant intervention effects were observed on psychological wellbeing outcome measures, the SBS-PA group demonstrated non-significant improvements in key measures (i.e. stress, exercise self-efficacy) that could positivity impact their work environment
and personal health as well. This is significant in light of the high stress levels observed among preschool teachers and the potential health-promoting impact effective PA interventions can in this demographic (3, 177).

**Lack of significant findings in PA and psychological wellbeing variables**

**Study fidelity**

Physical activity workplace interventions are typically tailored to specifically and effectively address the targeted measures of interest (e.g. PA levels, physical fitness, psychological wellbeing). If the study is implemented as originally designed, an accurate assessment of the efficacy of the intervention can be determined. If not, the intended impact of the study may not be feasibly and accurately analyzed. Therefore it is critical that those that facilitate workplace PA interventions implement the study protocol as closely as possible. The lack of study fidelity in the current study did not allow for a clear determination of the efficacy of the study to be realized. Although the intervention was designed to increase preschool teachers’ amount of time spent in MVPA, both the SBS-PA and TRAD-PA groups spent fewer minutes engaged in MVPA, 11.3±4.4 and 8.0±3.3, respectively. The lack of adherence to the study protocol may account for these findings.

Results from the process evaluation indicated that the SBS-PA teachers completed the full 30-minute intervention only 56.6% of the time. Additionally, results from the process evaluations showed the afternoon portion of the intervention was often not completed. The lack of study adherence made it difficult to adequately assess the true impact of the PA intervention on the teachers’ PA levels and psychological wellbeing. Previous studies have documented how the effectiveness of health promotion interventions is dependent on the proper implementation by
the study facilitators and have discussed various barriers that can impede the execution of the study protocol (113, 143). The teachers reported reasons that hindered their ability to fully implement the TFIR protocol in the current study. Although the 30-minute study protocol was designed to fit into the pre-existing preschool center schedule (i.e. daily gross motor playtime), SBS-PA teachers reported that additional time was needed to adequately prepare and implement the protocol (e.g. arranging the classroom, organizing the children into circle time, helping the children to get dressed). The intervention was designed to last 30 minutes (10-minute DVD and 20 minutes of unstructured play), yet the teachers reported that it took up to 45 minutes to fully complete the daily intervention.

Classroom teachers also noted that their afternoon preschool schedule often made it difficult to implement the afternoon portion of the intervention. Teachers had to tend to several tasks in the afternoon that did not allow time for them to complete the 2nd portion of the intervention protocol (e.g. waking children from naps, preparing and serving food during snack time, assist in ushering children to buses during pick-up time). As a result, the teachers were not able to engage in 3-months of added structured PA to their work day (i.e. TFIR PA sessions implemented twice daily). This inability to fully implement the study protocol as designed impeded a proper analysis of the true impact of the study. Additionally, teachers found it difficult to complete the intervention paperwork (e.g. documenting intervention start/stop times, completion of questionnaires during data collection periods) (Table 10). The lack of complete documentation of the start and stop times of each classroom’s gross motor playtime made it difficult to identify the exact times the teachers implemented the daily intervention sessions. Additionally, data collectors did not document the specific time of their respective study fidelity visits. The inclusion of the start and stop times time on the study fidelity form would have
provided more data regarding the exact timing of observed intervention sessions. Although there was a lack of documentation of the exact intervention times, a comparison of a morning and afternoon PA levels was able to be analyzed. Morning and afternoon were defined as 9:00 am to 12:00 pm and 2:00 pm to 4:30 pm, respectively. When comparing morning and afternoon classroom teachers’ PA levels at the end of the study, SBS-PA teachers exhibited a non-significant increase in time spent in sedentary behavior as well as a non-significant increase in MVPA. The small increase in sedentary behavior may have been associated with the difficulty classroom teachers expressed in implementing the afternoon TFIR intervention while the non-significant increase in MVPA may have possibly been associated with the various afternoon job obligations classroom teachers needed to complete.

Previous studies have used other versions of Instant Recess® (10-minute PA breaks). Whitt-glover et al. conducted a teacher-led, randomized controlled study with a delayed intervention control group to examine the impact of Instant Recess® in eight elementary schools (3rd - 5th grade classrooms). Direct observation (28 visits) was used to examine the impact of Instant Recess® on student PA levels and on-task behaviors (39). The authors reported that 11% to 44% of the participating schools engaged in classroom-based PA at baseline and PA increased from baseline to follow-up in the intervention schools, while the control schools decreased in PA. Although the researchers examined the impact of the Instant Recess® protocol on the students’ PA (and not on the teachers’ PA), increases in light PA in the intervention group were also observed. Significant increases in moderate PA (16%) and time spent in on-task behavior was also reported (39). Although the authors reported an increase in PA from baseline to follow-up in the children, they did not provide information on the impact of the intervention on the teacher’s PA levels. In addition, information regarding the adherence to the study protocol (e.g.
number of fully implemented *Instant Recess*® sessions) was not provided. The IF scale used in the current study demonstrated that teachers who correctly implemented the intervention protocol more frequently (‘high’ IF implementers) decreased in percent time spent in sedentary PA more than ‘low IF’ teachers. Although the differences in PA levels between high and low IF teachers were not significant, the findings provide insight of the potential ability of the *TFIR* intervention to increase teachers’ PA levels within the school day. Evaluations that assess such information (such as the fidelity checks conducted in the current study) can provide useful information regarding the impact of the intervention protocol on any observed changes and lead to efforts to improve future study protocols. Overall, more effective strategies need to be implemented in future studies to improve adherence to the intervention protocol throughout the work day, especially in classroom settings.

**Duration of Study**

Another potential factor for the lack of significant findings could be due to the length of the study (i.e. 3 months). A three-month, short bouts PA intervention may not have been long enough to lead to significant changes in the variables of interest (i.e. PA levels, psychological wellbeing). As stated previously, William and colleagues conducted the only other study to report the impact of a PA intervention on preschool teachers’ PA levels. The aim of the 10-week, pre-post walking intervention was to increase the teachers’ (n=19) daily walking steps (measured by a pedometer). Similar to our study the researchers reported no significant PA changes (i.e. teachers’ mean step count) from baseline to post-study (140). To date only a handful of short bouts workplace PA studies have provided results of the impact of the intervention on the
participants’ PA levels (140). The majority of these studies have typically measured PA subjectively (i.e. questionnaire, PA log) (97, 120).

The majority of the workplace short-bouts PA studies did not report the impact of the intervention on participants’ PA levels, but rather on various other measures (e.g. aerobic fitness, BMI, weight loss, work-related variables) (97, 196). Christensen and colleagues conducted a 3-month randomized controlled intervention where the treatment groups completed 10 – 15 minute PA bouts (included strengthening exercises) during working hours while the control group was offered monthly oral presentations (71). The intervention also included cognitive behavioral and nutritional components. At the end of the 3-month study, Christensen et al. reported a significant increase in aerobic fitness in the treatment group. The health promotion information delivered in the cognitive behavioral portion of the intervention may have played a critical role in leading to increases in self efficacy and outcome expectancy within the sample, ultimately leading to significant increases in aerobic fitness (71, 208). Lara et al. conducted a 1-year uncontrolled study in a sample of 335 Mexican Ministry of Health Office workers that integrated 10-minute PA breaks during paid work time. The researchers reported a significant decrease in BMI and waist circumference among the participants (268).

In addition to not reporting PA findings, many studies typically were longer in duration (> 3 months) than the present study. Tayler et al. examined the fidelity, feasibility and impact of a 6-month PA breaks, co-worker led PA intervention in a sample of 14 employees (8 women and 6 men; mean age of 46) (44). A total of 117 sessions (15 minutes per session) were conducted with an average monthly attendance ranging from 76% to 86%. The researchers reported a significant improvement in HDL cholesterol values and an average loss of 14 pounds among participants (44).
The current study duration of 3-month may not have been long enough to induce any significant changes in psychological wellbeing variables. Although there is evidence that regular PA may play an important role in alleviating depression symptoms and perceived stress levels, the TFIR intervention did not produce any significant changes in these variables (236). In a longer study (6 months), Paluska and colleagues examined the impact of PA versus physical fitness on mental health symptoms and mood in a sample of 40 obese, sedentary women. The study compared a lifestyle activity modification (incorporating PA in one’s daily routine) and a structured aerobic program. The researchers reported similar improvements in both groups, suggesting that adding structured PA to one’s daily routine could help to improve the mental health of inactive women (236). There is evidence that self-efficacy is the best predictor of PA among employees and that perceived benefits of PA and perceived health status can also impact PA engagement (100). King and colleagues compared a 12-month exercise training program to an assessment only control condition in 120 sedentary men and women (274). Adherence to the PA intervention was measured by self-report and a 14-item rating scale was used to measured psychological variables. The researchers reported significant between-groups differences in the change in self-efficacy (274). Overall, it appears longer (> 6 months) PA workplace intervention can lead to improvements in PA and other health outcomes.

**Baseline PA levels**

The lack of significant changes in PA levels in this sample may have been impacted by the baseline PA levels of the participants. The current study sample exhibited a lower percentage of time spent in sedentary PA (SBS-PA, baseline, 50.9±15.15; TRAD-PA, baseline, 53.2±14.5) at baseline than has been previously reported (53, 157). Matthews et al. provided the first
objective measure of the amount of time spent in sedentary behavior in the US population after examining the 7-day accelerometer data of 6,329 participants (aged ≥6 years) from the 2003–2004 National Health and Nutrition Examination Survey. The researchers reported that overall, participants spent 54.9% (7.7 hours/day) of their monitored time in sedentary behaviors (157, 158). Matthews et al. also reported that 1 in 4 US adults spent about 70% of their waking hours sitting (157). The nature of the preschool teachers’ daily work duties (supervising and interacting with preschoolers) may have contributed to spending less time sitting and therefore less time spent in sedentary behavior. Overall, the participants in the current study appeared to have been less sedentary (more active) than the national average at baseline and this may have diminished the ability of this 3-month, workplace PA intervention to produce significant PA changes.

**Time of year (seasonal changes)**

It is possible that the time of year could have also impacted the PA results of the study. As the SCT purports, behavior (e.g. being physically active) is influenced by the interactions between intrapersonal, social, and physical environmental factors (150). In cases where characteristics of the external environment may impact a behavior, direct environmental influences may be the strongest set of determinants (150). Several researchers have investigated the impact of seasons and climate on adults’ PA levels and have reported that attributes of the environment, as influenced by season and climate conditions, strongly promote or limit PA (12, 158, 164, 187). For example, Tucker et al. investigated the effect of seasons on levels of PA in a review of 37 primary studies (published 1980–2006) and reported that levels of PA vary with seasonality and that weather has a significant impact of PA behaviors (241). The current study
was conducted from the months October to February (i.e. from autumn to winter). There is evidence that shows a tendency for weight gain due to increased calorie intake and an increase in sedentary behavior due to reduced PA during colder months (158,244). Uitenbroek et al. investigated the seasonal variation in leisure time PA in a sample of 16486 adults (7,202 male and 9,284 female) via phone interviews and reported that PA levels were lower in cold winter months for both indoor and outdoor activities (244). Due to the colder temperatures, people are more inclined to spend time indoors, engaged in sedentary activities (e.g. watching television, computer use) (12). Although the study protocol occurred during the work hours, the participants in the current study were instructed to wear accelerometers for all waking hours during data collections weeks. The seasonal changes may have impacted the amount of PA they engaged in during after work hours and therefore influenced their overall daily PA levels and changes in weight throughout the study.

**Strengths**

This study had a number of strengths. It is the first work place PA study to objectively measure the impact of a PA intervention on preschool teachers PA levels and psychological wellbeing. In light of the current adult and pediatric obesity epidemics in the US, this type of study can potentially assess the impact of preschool PA interventions on health factors in both teachers and the children they supervise at the same time. The use of short bouts of PA is also a strength of this study. Additional strengths of the study were the length and timing for the PA intervention (10 minutes, morning and afternoon gross motor time) allowed the intervention to be added to the daily schedule of the teachers’ work day without being disruptive to the daily activities of their work day. Due to the protocol design, teachers did not have to adjust their daily lessons in order to accommodate the intervention or conducted the PA outside of their typical
work hours. It was designed to be embedded into the normal daily routine in order to decrease the burden of the invention on the teachers’ full schedule. The demographic make-up of the participants (i.e. gender and SES) was another strength of the study. All of the teachers that participated in the study were low-income minority women. No previous study has examined the impact of a PA workplace intervention on this at-risk population.

Limitations

This study also had some limitations. The major limitation was that the study protocol was not implemented fully on a daily basis for various reasons (i.e. lack of study fidelity). The most frequent reason was due to conflicting afterschool schedules in many of the participating preschools. Although Massachusetts preschools are mandated to provide at least 60 minutes of gross motor play time a day (typically broken up into two 30-minute time blocks, one in the morning and one in the afternoon.), several of the participating teachers found it difficult to implement the afternoon gross motor play time. The study was designed to be implemented during both of the daily gross motor times (morning and afternoon). Some teachers had to attend to certain duties after nap time which made the afternoon portion of the intervention difficult to implement. Other limitations were the high teacher turnover rate and the movement of teachers to different non-participating classrooms (e.g. toddler or infant rooms). All of these factors (turn-over rate, switching of rooms, change in work status) caused there to be fewer eligible participants at the end of the study and reduced the sample size, another limitation of the study. Additionally, the inability of the accelerometer to be pick up upper-body movements may have under-estimated the true amount of the teachers’ PA. Many of the movements modeled on the TFIR DVDs involved arm movements and this aspect of the PA accumulated during the
intervention may not have been accounted for in the data recorded on the accelerometers.

Another limitation may be the PA intensity of the TFIR sessions. The movements were designed to be age-appropriate for pre-schooled aged children and may not have been able to elicit MVPA in the teachers that led out in the PA intervention.

**Conclusion and Future Implications**

This study examines the impact of a preschool work place PA intervention on classroom teachers’ PA levels and psychological wellbeing (i.e. stress, depression, quality of life, exercise self-efficacy). As described previously, preschool teachers are at an elevated risk for obesity and other co-morbidities, yet no randomized controlled study has been conducted in this population to date (3, 152, 249, 278). Although not significant, a slight increase in light PA was observed in the SBS-PA group compared to the TRAD-PA group. Additionally a non-significant decrease in perceived stress scores and an increase in outcome expectancy were observed both groups. Although not statistically significant, the observed increase in light PA and decrease in perceived stress is promising in efforts to address the risk factors (e.g. obesity risk, high stress levels) that plague this demographic. It has been reported that any increase in PA in adults can provide important health and mental health benefits (e.g. decreased CVD risks, decreased stress levels) and can help them accumulate the recommended amount of daily PA (1, 249). Teachers experience a significant amount of stress daily which can have a negative impact on their health (134, 135, 137, 242). Evidence has shown that the health status of teachers has an influence on their students for they model behavior patterns that their students may emulate (3, 171). This is of great importance due to the fact the development stages of the young children they supervise. Increasing teachers’ PA levels would not only benefit the teachers, but also could potentially
have an impact on the children in their classroom. This study was the first of its kind and future PA studies in preschool settings should measure and examine the impact of the intervention on not only the children but also the teachers that lead the PA breaks. Efforts should be made in future studies to address the noted limitations in the current study (e.g. study fidelity challenges, completion of intervention documents, sample size). For example, incentives (e.g. free membership to local wellness facilities, wellness health benefits, etc.) may help to encourage adherence to study protocol. Having an increased number of research staff on site for daily data collection (i.e. intervention start/stop times) and to encourage teachers to adhere more closely to the intervention protocol may prove helpful, but may not feasible due to cost. However, greater input from preschool teachers in the development phases of intervention protocols and the implementation of longer interventions may increase the efficacy of PA interventions delivered in preschool settings. Such studies could provide more reliable findings regarding the impact of the PA intervention on the preschool classroom teachers. If evidence can suggest that the addition of short bouts of structured PA can lead to increased time spent in PA and improvement in key mental outcomes (e.g. decrease in stress and depression levels), preschool policy could potentially be change to mandate more PA to be placed in the daily agenda of preschool centers.
APPENDIX 1

EXAMPLE OF IR MOVEMENT GUIDE (TUTTI FRUITTI)

TUTTI FRUITTI

NOTE: Students are pretending to pick fruit during this activity

Warm-up song: “HIP HOP A”

Movement 1 (Minute 0:00 - 1:00) - Warm-Up

1. March in place
2. Roll both shoulders forward
3. Roll both shoulders backward
4. Turn head from side to side (Alternating right and left)
5. Look up and down (Alternating with chin to the sky and chin to the chest)
6. Keep marching in place

Movement 2 (Minute 1:00 - 3:00) – ‘Apple Arms Stretch’

1. Stop marching
2. Bend and reach (2x)
3. March in place
4. Bend and reach (2x)
5. March in place
6. Bend and jump (2x)
7. March in place
8. Bend and jump (2x)
9. March in place
10. Climb up (4x), reach (2x)
    • NOTE: Students are pretending to climb up and down a ladder
11. Climb down (4x), bend and jump to the ground
12. Climb up (4x), reach (2x)
13. Climb down (4x), bend and jump to the ground
14. Climb up (4x), reach (2x)
15. Climb down (4x), bend and jump to the ground
16. March in place
17. Gallop right, place apples in a basket
18. Gallop left, place apples in a basket
19. Gallop right, place apples in a basket
20. Gallop left, place apples in a basket
21. March in place
Movement 3 (Minute 3:00 – 5:00) – ‘The Grape Grab’

1. Step and grab high (2x), grab low (2x), march back
2. Step and grab high (2x), grab low (2x), march back
3. March in place
4. Step right (2x), grab, hop
5. Step left (2x), grab, hop
6. Step right (2x), grab, hop
7. Step left (2x), grab, hop
8. March in place
9. Stomp right, stomp left, stomp right, jump
10. Stomp right, stomp left, stomp right, jump
11. Stomp right, stomp left, stomp right, jump
12. March in place
13. Big stomp (4x), march back, jump and clap (2x)
14. Big stomp (4x), march back
15. March in place

SONG: “SOUND MACHINE” (Minute 5:00 – 9:00)

Movement 4 (Minute 5:00 – 7:00) - ‘The Strawberry Shake’

1. Shake hips right, left, right, left
2. March in place
3. Shake hips right, left, right, left
4. March in place
5. Move to the front, shake hips (4x)
6. Move to the back, shake hips (4x)
7. Move to the front, shake hips (4x)
8. Move to the back, shake hips (4x)
9. March in place
10. Shake hips (4x), jump, turn to the right
11. Shake hips (4x), jump, turn to the front
12. Shake hips (4x), jump, turn to the left
13. Shake hips (4x), jump, turn to the front
14. March in place
15. Gallop right, shake high, shake low
16. Gallop left, shake high, shake low
17. Gallop right, shake high, shake low
18. Gallop left, shake high, shake low
19. March in place

Movement 5 (Minute 7:00 – 9:00)- ‘The Banana Bounce’
1. Bounce (2x)
2. March in place
3. Bounce (2x)
4. March in place
5. Bounce and tap foot (2x)
6. March in place
7. Bounce and tap foot (2x)
8. March in place
9. Slide to the right (2x), bounce (2x)
10. Slide to the left (2x), bounce (2x)
11. Slide to the right (2x), bounce and tap
12. Slide to the left (2x), bounce and tap
13. March in place
14. **Gallop front, move arm back (2x)
15. NOTE: Students are pretending to peel a banana
16. March back, hop (2x)
17. Repeat (2x) from *** - Step 16
18. March in place

COOL-DOWN SONG: “HIP HOP A”

Movement 6 (Minute 9:00 - 10:00) - Cool Down

1. March in place
2. Stop marching
3. Roll both shoulders forward
4. Roll both shoulders backwards
5. Turn head from side to side (Alternating right and left)
6. Look up and down (Alternating with chin to the sky and chin to the chest)
7. Stretch right arm
8. Stretch left arm
9. Take a deep breath and raise arms to the sky
10. Breathe out and bring arms down
### APPENDIX 2

**TUTTI FRUITTI INSTANT RECESS ROUTINES AND MUSICAL TRACKS**

<table>
<thead>
<tr>
<th>IR ROUTINE</th>
<th>WARM-UP</th>
<th>MAIN SONG #1</th>
<th>MAIN SONG #2</th>
<th>COOL DOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Instant Recess DVDs (modified by AV consultant and Research Staff)</td>
<td>Basketball</td>
<td>Blue Smoke (Track 6) CD#0314</td>
<td>In the Place (Track 7) CD#0380</td>
<td>Ice (Track 9) DWCOM 20</td>
</tr>
<tr>
<td></td>
<td>Soccer</td>
<td>Hip Hop A (Track 12) CD#0089</td>
<td>Urban Pets (Track 9) CD#0319</td>
<td>Get Up, Get down (Track5) CD#0298</td>
</tr>
<tr>
<td></td>
<td>Football</td>
<td>Supernova (Track 4) CD#0362</td>
<td>East Coast West Cost (Track 7) CD#00362</td>
<td>Dial In (Track 5) DWCOM 20</td>
</tr>
<tr>
<td></td>
<td>Hip Hop</td>
<td>Blue Smoke (Track 6) CD#0314</td>
<td>Bass Face (Track 11) CD#0445</td>
<td>Against the Flow (Track 20) DWCOM 20</td>
</tr>
<tr>
<td></td>
<td>Fuel up and Lift off</td>
<td>Happy People (Track 3) CD#0440</td>
<td>All Play (Track 7) CD#0457</td>
<td>Sunshine Waves (Track 17) CD#0491</td>
</tr>
<tr>
<td></td>
<td>African Lift Off</td>
<td>African Warrior (Track 1) CD#0161</td>
<td>Stomp (Track 14) CD#0258</td>
<td>On Table Mountain (Track 32) CD#0498</td>
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<tr>
<td></td>
<td>Pow Wow</td>
<td>Beat of my Drum (Track 14) - DEWEB 14</td>
<td>Tarab (Track 41) CD#0161</td>
<td>Tom-Tom Rhythms (Track 49) CD#0161</td>
</tr>
<tr>
<td></td>
<td>Lift Off</td>
<td>No More School (Track 12) CD#0140</td>
<td>Plus Beau (Track 18) CD#0506</td>
<td>Two Steps Forward (Track 2) CD#0471</td>
</tr>
<tr>
<td></td>
<td>Tutti Frutti</td>
<td>Focus (Track 1) CD#0380</td>
<td>Summer Rockin' (Track 6) CD#0140</td>
<td>Sound Machine (Track 21) CD#0135</td>
</tr>
<tr>
<td>Original Instant Recess DVDs</td>
<td>Playground Palooza</td>
<td>Day out Track 4 CD # 0254</td>
<td>Whistle Stop Track 12 CD # 0513</td>
<td>Jumping Around Track 1 CD # 0254</td>
</tr>
<tr>
<td>(modified by AV consultant and Research Staff)</td>
<td>Sensational Circus</td>
<td>Tanktops Track 9 CD # 03</td>
<td>18 Wheeler Track 1 CD # 0365</td>
<td>Ice Track 9 DWCOM 20</td>
</tr>
<tr>
<td>Farmer theme</td>
<td>Happy Days Are Here Track 1 CD # 0471</td>
<td>Jumping Jim Track 1 CD # 0513</td>
<td>Hoedown Showdown Track 12 CD # 0457</td>
<td>Happy Days Are Here Track 1 CD # 0471</td>
</tr>
<tr>
<td>Animal Action</td>
<td>Cat’s Eye Track 4 CD# 0357</td>
<td>Badgering about Track 20 CD # 0319</td>
<td>Scarlett’s Mountain Track 26 CD # HRCB 17</td>
<td>Cat’s Eye Track 4 CD# 0357</td>
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<tr>
<td>Fun-N-Fit</td>
<td>Quirky Track 13 CD # 0153</td>
<td>Hard Work Song Track 13 CD # DWCOM 07</td>
<td>Goodtime Track 1 CD# 0360</td>
<td>Quirky Track 13 CD # 0153</td>
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<tr>
<td>Dance Craze</td>
<td>Time Away 2 Track 9 CD# 0492</td>
<td>Play Time Track 10 CD # 0440</td>
<td>Take Down Track 1 CD # 0381</td>
<td>Time Away 2 Track 9 CD# 0492</td>
</tr>
</tbody>
</table>
APPENDIX 3

STUDY FIDELITY

School: ___________________________  Classroom #: ___________________________
Group: ___________________________  Session time (AM or PM): _________________
Date: ____________________________

STEP Study _ Study Fidelity

After observing the gross motor time, answer the following questions. If you answer ‘NO’ to any question, please provide further information as requested.

ALL SCHOOLS

1. YES  NO  Lesson lasted (at least) 30 minutes
2. YES  NO  Participants were excited to partake in the lesson
3. YES  NO  Moderate-to-vigorous activity occurred at least 50% of lesson time

CONTROL SCHOOL

1. YES  NO  Was gross motor time inside or outside? If inside why?

2. YES  NO  Children were allowed to participate in gross motor time during intervention time?
3. YES  NO  During gross motor time, did classroom teachers allow children to play freely on their own?
4. YES  NO  If gross motor time was indoors, was it in the classroom? If no, where was the gross motor time conducted?_________________________
TREATMENT SCHOOL (Study Fidelity)

1. YES NO  Name of IR DVD: ________________________________

2. YES NO  Was IR DVD implemented during the 1st 10 minutes of intervention?

3. YES NO  Was the IR DVD implemented in the expected 10-minute duration?

4. YES NO  Did at least 50% of classroom children participate during the IR DVD time? If no, why?

5. YES NO  Did the majority of the children participate in at least 5 minutes of the IR DVD intervention time? If not, approximately how many minutes did the majority of the children participate in? __________________________

6. YES NO  Did the majority of the children seem to enjoy the IR DVD?

7. YES NO  Did classroom teacher provide encouragement during the IR DVD?

8. YES NO  Did classroom teacher implement the IR DVD as intended (standing up following movement on screen and enthusiastic about movement)?

Gross motor time

9. YES NO  Did 20 minutes of gross motor time follow the IR DVD?

10. YES NO  How long was the transition between IR DVD and gross motor time? ____

11. YES NO  Did gross motor time last for at least 20 minutes?

12. YES NO  Was gross motor time inside or outside? If inside why?

13. YES NO  During gross motor time, did classroom teachers allow children to play freely on their own?

14. YES NO  If gross motor time was indoors, was it in the classroom? If no, where was the gross motor time conducted? __________________________
APPENDIX 4

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

Vigorous Physical Activity
First we are going to ask you some questions about your participation in vigorous or “hard” activities. These are activities that take hard physical effort, make you breathe much harder than normal, and cause heavy sweating.

1. In general, how many **days per week** do you do vigorous activities like running, heavy lifting, aerobics, or fast bicycling **for at least 10 minutes in a row**? Do not count any vigorous activities you did for less than 10 minutes in a row. Assume that one week is seven (7) days.

   - 0 days a week
   - 1 days a week
   - 2 days a week
   - 3 days a week
   - 4 days a week
   - 5 days a week
   - 6 days a week
   - 7 days a week

2. On the days that you do vigorous activities, how much time do you usually spend doing them? **Only count the time that you spend doing vigorous activity **for at least 10 minutes in a row**.

   - I do not do vigorous activity for more than 10 minutes in a row
   - 10-15 minutes a day
   - 16-30 minutes a day
   - 31-45 minutes a day
   - 46-60 minutes a day
   - More than 60 minutes a day

Daily Walking
Next we are going to ask you about your daily walking.

3. In general, **how many days per week** do you do walk **for at least 10 minutes in a row**? Think about all the walking you do during the day, including walking for exercise, walking to get to places (transportation), walking at work or home, or any other walking that you do during the day. Do not count any walking you did for less than 10 minutes in a row. Assume that

   - 0 days a week
   - 1 days a week
   - 2 days a week
   - 3 days a week
   - 4 days a week
   - 5 days a week
   - 6 days a week
   - 7 days a week
one week is seven (7) days.

4. On the days that you walk, how much time do you usually spend walking? Only count the time that you spend walking **for at least 10 minutes in a row**.
   - I do not walk for more than 10 minutes in a row.
   - 10-15 minutes a day
   - 16-30 minutes a day
   - 31-45 minutes a day
   - 46-60 minutes a day
   - More than 60 minutes a day

5. Of the time you spend walking **for at least 10 minutes in a row**, how much of that time is spent in brisk walking that increases your heart rate and gets you breathing faster than normal?
   - I do not walk briskly for more than 10 minutes in a row.
   - 10-15 minutes a day
   - 16-30 minutes a day
   - 31-45 minutes a day
   - 46-60 minutes a day
   - More than 60 minutes a day

**Other Moderate Physical Activity**

Last, we are going to ask you some questions about your participation in moderate activities other than walking. These are activities that take some physical effort, and increase your heart rate and breathing above resting levels, but is not as hard as vigorous activity. Please do not include walking in any of your answers about moderate activity.

6. In general, how many **days per week** do you do moderate activities like carrying light loads, playing doubles tennis, or regular bicycling **for at least 10 minutes in a row**? *Assume that one week is seven (7) days.*
   - 0 days a week
   - 1 days a week
   - 2 days a week
   - 3 days a week
   - 4 days a week
   - 5 days a week
   - 6 days a week
   - 7 days a week
7. On the days that you do other moderate activities, how much time do you usually spend doing them? *Only count the time that you spend doing moderate activity for at least 10 minutes in a row.*

- [ ] I do not do moderate activity for more than 10 minutes in a row.
- [ ] 10-15 minutes a day
- [ ] 16-30 minutes a day
- [ ] 31-45 minutes a day
- [ ] 46-60 minutes a day
- [ ] More than 60 minutes a day
APPENDIX 5

DEMOGRAPHICS

1. When were you born?  
   
   In what country were you born?

2. How long have you been in the United States?
   
   Less than 1 year
   More than 10 years
   1-5 years
   All my life
   6-10 years

3. Gender:  Male  Female

4. To which of the following races do you consider yourself? You may choose all that apply.
   
   American Indian/Alaska Native
   Asian
   Filipino
   Asian
   Native Hawaiian or Other Pacific Islander
   Black or African American
   White
5. Additionally do you consider yourself to belong to any of the following ethnic groups? You may choose all that apply.

☐ Mexican, Mexican American or Chicano

☐ Puerto Rican

☐ Cuban

☐ Central America (such as Guatemalan, El Salvadoran, Honduran, Nicaraguan, Panamanian, Costa Rican)

☐ South American (such as Argentinean, Bolivian, Chilean, Colombian, Ecuadorian, Paraguayan, Uruguayan, Venezuelan

☐ African/African American

☐ West Indian or Caribbean

☐ Native American Indian

☐ Japanese/Japanese American

☐ Chinese/Chinese American

☐ Filipino

☐ Korean

☐ Cambodian

☐ Vietnamese

☐ Pacific Islander (such as Native Hawaiian, Guamanian, Tongan, Samoan)

☐ Asian Indian

☐ Middle Eastern

☐ European

☐ Other (Please specify):_________________________
6. What is your current marital status? (Please “X” only one answer)

☐ Married

☐ Divorced

☐ Widowed

☐ Single- Never Married

Does your family own the home in which you live?  Yes ☐ No ☐

7. What is the highest level of education that you have completed? (Please “X” only one answer)?

☐ 6th grade or less

☐ 8th grade or less

☐ Attended some High School

☐ High School Graduate or GED

☐ Technical School

☐ Some College

☐ College Graduate

☐ Post Graduate Study
8. What was the approximate total income, before taxes, of your household for the last year? Please include wages, salaries, social security, interest, child support, public assistance, unemployment compensation, rent from property and all other income. (Please “X” only one answer)

- [ ] Less than $5,000
- [ ] $5,000 - $9,999
- [ ] $10,000 – $19,999
- [ ] $20,000 - $29,999
- [ ] $30,000 - $39,999
- [ ] $40,000 - $49,999
- [ ] $50,000 - $59,999
- [ ] $60,000 - $69,999
- [ ] $70,000 - $79,999
- [ ] $80,000 - $89,999
- [ ] $90,000 - $99,999
- [ ] Over $100,000
APPENDIX 6

SF-36 HEALTH SURVEY

This survey asks for your views about your health. Please answer every question. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully, and check the box that best describes your answer.

Thank you for completing this survey!

1) In general, would you say your health is:

Excellent ✔
Very good ☐
Good ☐
Fair ☐
Poor ☐

2) Compared to one year ago, how would you rate your health in general now?

Much better now than one year ago ☐
Somewhat better now than one year ago ☐
About the same as one year ago ☐
Somewhat worse now than one year ago ☐
Much worse now than one year ago ☐

3) The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Vigorous Activities, such as running, lifting heavy objects, participating in strenuous sports</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Moderate Activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Lifting or carrying groceries</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Climbing several flights of stairs</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Climbing one flight of stairs</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Bending, kneeling, or stooping</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Walking more than a mile</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h. Walking several hundred yards</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i. Walking one hundred yards</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>j. Bathing or dressing yourself</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
4) During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

- All of the time
- Most of the time
- Some of the time
- A little of the time
- None of the time

   a. Cut down on the amount of time you spent on work or other activities
   b. Accomplished less than you would like
   c. Were limited in the kind of work or other activities
   d. Had difficulty performing the work or other activities (for example, it took extra effort)

5) During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

   a. Cut down on the amount of time you spent on work or other activities
   b. Accomplished less than you would like
   c. Did work or other activities less carefully than usual

6) During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

   - Not at all
   - Slightly
   - Moderately
   - Quite a bit
   - Extremely
7) How much bodily pain have you had during the past 4 weeks?

- None
- Very Mild
- Mild
- Moderate
- Severe
- Very Severe

8) During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

- Not at all
- A little bit
- Moderately
- Quite a bit
- Extremely

9) These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

a. Did you feel full of life?

b. Have you been very nervous?

c. Have you felt so down in the dumps that nothing could cheer you up?

d. Have you felt calm and peaceful?

e. Did you have a lot of energy?

f. Have you felt downhearted and depressed?

g. Did you feel worn out?

h. Have you been happy?

i. Did you feel tired?
10) During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

11) How TRUE or FALSE is each of the following statements for you?

a. I seem to get sick a little easier than other people
   - Definitely True ☐
   - Mostly True ☐
   - Don’t Know ☐
   - Mostly False ☐
   - Definitely False ☐

b. I am as healthy as anybody I know
   - Definitely True ☐
   - Mostly True ☐
   - Don’t Know ☐
   - Mostly False ☐
   - Definitely False ☐

c. I expect my health to get worse
   - Definitely True ☐
   - Mostly True ☐
   - Don’t Know ☐
   - Mostly False ☐
   - Definitely False ☐

d. My health is excellent
   - Definitely True ☐
   - Mostly True ☐
   - Don’t Know ☐
   - Mostly False ☐
   - Definitely False ☐
APPENDIX 7

PERCEIVED STRESS SCALE

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

For each question, choose from the following alternatives:

0 = Never  1 = Almost never  2 = Sometimes  3 = Fairly Often  4 = Very Often

<table>
<thead>
<tr>
<th>Question</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the last month, how often have you been upset because of something that happened unexpectedly?</td>
<td></td>
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<tr>
<td>2. In the last month, how often have you felt that you were unable to control the important things in your life?</td>
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<tr>
<td>3. In the last month, how often have you felt nervous and “stressed”?</td>
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<tr>
<td>4. In the last month, how often have you dealt successfully with irritating life hassles?</td>
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<tr>
<td>5. In the last month, how often have felt that you were effectively coping with important changes that were occurring in your life?</td>
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<tr>
<td>6. In the last month, how often have you felt confident that your ability to handle your personal problems?</td>
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<tr>
<td>7. In the last month, how often have you felt that things were going your way?</td>
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<tr>
<td>8. In the last month, how often have you found that you could not cope with all the things you had to do?</td>
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<tr>
<td>9. In the last month, how often have you been able to control irritations in your life?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>10. In the last month, how often have you felt that you were on top of things?</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>11. In the last month, how often have you been angered because of things that happened that were outside of your control?</td>
<td></td>
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</tr>
<tr>
<td>12. In the last month, how often have you found yourself thinking about things that you have to accomplish?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13. In the last month, how often have you been able to control the way you spend your time?</td>
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</tr>
<tr>
<td>14. In the last month, how often have your felt difficulties were piling up so high that you could not overcome them?</td>
<td></td>
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</tr>
</tbody>
</table>
Appendix 8

BECK DEPRESSION INVENTORY

On this questionnaire are a group of questions. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUDING TODAY. Circle the number beside the statement you picked. If several statements in the group seem to apply, circle each one. Be sure to read ALL statements in each group before making your choice.

1.
0 I do not feel sad.
1 I feel sad.
2 I am sad all the time and can’t snap out of it.
3 I am so sad or unhappy that I can’t stand it.

2.
0 I am not particularly discouraged about the future.
1 I feel discouraged about the future.
2 I feel I have nothing to look forward to.
3 I feel that the future is hopeless and that things cannot improve.

3.
0 I do not feel like a failure.
1 I feel I have failed more than the average person.
2 As I look back on my life, all I can see is a lot of failures.
3 I feel I am a complete failure as a person.

4.
0 I get as much satisfaction out of things as I used to.
1 I don’t enjoy things the way I used to.
2 I don’t get real satisfaction out of anything anymore.
3 I am dissatisfied or bored with everything.

5.
0 I don’t feel particularly guilty.
1 I feel guilty a good part of the time.
2 I feel guilty most of the time.
3 I feel guilty all the time.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 6. | 0 I don’t feel I am being punished.  
1 I feel I may be punished.  
2 I expect to be punished.  
3 I feel I am being punished.  |
| 7. | 0 I don’t feel disappointed in myself.  
1 I am disappointed in myself.  
2 I am disgusted with myself.  
3 I hate myself.  |
| 8. | 0 I don’t feel I am any worse than anybody else.  
1 I am critical of myself for my weaknesses or mistakes.  
2 I blame myself all the time for my faults.  
3 I blame myself for everything bad that happens.  |
| 9. | 0 I don’t have any thought of killing myself.  
1 I have thoughts of killing myself, but I would not carry them out.  
2 I would like to kill myself.  
3 I would kill myself if I had the chance.  |
| 10. | 0 I don’t cry any more than usual.  
1 I cry more now than I used to.  
2 I cry all the time now.  
3 I used to be able to cry, but now I can’t even cry when I want to.  |
| 11. | 0 I am no more irritated now than I ever am.  
1 I get annoyed or irritated more easily than I used to.  
2 I feel irritated all the time now.  
3 I don’t get irritated at all by the things that used to irritate me.  |
| 12. | 0 I have not lost interest in other people.  
1 I am less interested in people that I used to be.  
2 I have lost most of my interest in other people.  
3 I have lost all of my interest in other people.  |
13.  
0  I make decisions about as well as I ever could.
1  I put off making decisions more than I used to.
2  I have greater difficulty in making decisions than before.
3  I can’t make decisions at all anymore.

14.  
0  I don’t feel I look worse than I used to.
1  I am worried that I am looking old or unattractive.
2  I feel that there are permanent changes in my appearance that make me look unattractive.
3  I believe that I look ugly.

15.  
0  I can work as well as before.
1  It takes an extra effort to get started at doing something.
2  I have to push myself very hard to do anything.
3  I can’t do any work at all.

16.  
0  I can’t sleep as well as usual.
1  I don’t sleep as well as I used to.
2  I wake up 2-3 hours earlier than I used to and find it hard to get back to sleep.
3  I wake up several hours earlier than I used to and cannot get back to sleep.

17.  
0  I don’t get more tired than usual.
1  I get tired more easily than I used to.
2  I get tired from doing almost anything.
3  I am too tired to do anything.

18.  
0  My appetite is no worse than usual.
1  My appetite is not as good as it used to be.
2  My appetite is much worse now.
3  I have no appetite at all anymore.

19.  
0  I haven’t lost much weight, if any lately.
1  I have lost more than 5 pounds.
2  I have lost more than 10 pounds.
3  I have lost more than 15 pounds.

I am purposely trying to lose weight by eating less. **YES** **NO**
20. I am no more worried about my health than usual.
   0 I am worried about my physical problems such as aches and pains; or upset stomach; or constipation.
   1 I am very worried about physical problems and it’s hard to think about anything else.
   2 I am so worried about my physical problems that I cannot think about anything else.

21. I have not noticed any recent changes in my interest in sex.
   0 I am much less interested in sex than I used to be.
   1 I am much less interested in sex now.
   2 I have lost interest in sex completely.
APPENDIX 9

SELF-EFFICACY FOR EXERCISE QUESTIONNAIRE

Using the scale below as a yardstick, please answer the following:
How confident are you that you could exercise under each of the following conditions over the next 6 months?

<table>
<thead>
<tr>
<th>%</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not at all Confident</td>
<td>Somewhat Confident</td>
<td>Absolutely Confident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Over the next 6 months I could exercise….</th>
<th>(0-100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>When tired</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>During or following a personal crisis.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>When feeling depressed.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>When feeling anxious</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>During bad weather</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>When slightly sore from the last time I exercised</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>When on vacation</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>When there are competing interests (like my favorite TV show)</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>When I have a lot of work to do</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>When I haven't reached my exercise goals</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>When I haven’t reached my exercise goals</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Following complete recovery from an illness which has caused me to stop exercising for a week or longer</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>When I have no one to exercise with</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>When my schedule is hectic</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 10

EXERCISE OUTCOME EXPECTATIONS SURVEY

<table>
<thead>
<tr>
<th>Exercise Expectation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes me feel better physically</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Makes my mood better in general</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Helps me feel less tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Makes my muscles stronger</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is an activity I enjoy doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Gives me a sense of personal accomplishment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Makes me more alert mentally</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Improves my endurance in performing my daily activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Helps to strengthen my bones</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX 11

INTERVENTION FIDELITY SCALE

0 = Not Implemented 1 = Implemented Correctly

<table>
<thead>
<tr>
<th>Intervention Fidelity Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lesson lasted (at least) 30 minutes</td>
<td></td>
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<tr>
<td>2. Did MVPA occur at least 50% of intervention time?</td>
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<tr>
<td>3. Was TFIR DVD implemented during the 1st 10 min of intervention?</td>
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<tr>
<td>4. Was the TFIR DVD implemented in the expected 10-minute duration?</td>
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<tr>
<td>5. Did classroom teacher implement the TFIR DVD as intended (i.e., teacher leading TFIR DVD and students following teacher)?</td>
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<tr>
<td>6. Did 20 min of gross-motor time follow the TFIR?</td>
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<tr>
<td>7. Did gross-motor time last for at least 20 min?</td>
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</tbody>
</table>

Total Score :_____/7  = ____ (Intervention Fidelity Score)
APPENDIX 12
TEACHER EVALUATION FORM

1. What did you like/enjoy about the study?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

2. What was the hardest part of being a part of the study?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

3. What aspect of the study do you believe your students enjoyed?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

4. What aspect of the study did your students dislike?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

5. Is there any part of the study you would change?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

6. Further comments?
____________________________________________________________________________
____________________________________________________________________________
APPENDIX 13

INSTANT RECESS DVD EVALUATION FORM

1. What were you two favorite Instant Recess DVDs?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

2. What were your two least favorite Instant Recess DVDs?
____________________________________________________________________________
____________________________________________________________________________
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3. What did you like about the Instant Recess DVDs?
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____________________________________________________________________________
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4. What did you dislike about the Instant Recess DVDs?
____________________________________________________________________________
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5. How would you improve the Instant Recess DVDs?
____________________________________________________________________________
____________________________________________________________________________
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____________________________________________________________________________
____________________________________________________________________________
### Assessment of Individual Instant Recess (IR) DVDs

<table>
<thead>
<tr>
<th>IR DVD</th>
<th>LIKE</th>
<th>DISLIKE</th>
<th>WHY?</th>
<th>How would you improve it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketball Bonaza</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Basketball skills)</td>
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<tr>
<td>Silly Soccer</td>
<td></td>
<td></td>
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<tr>
<td>(Soccer Skills)</td>
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<tr>
<td>Fabulous Football</td>
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<td></td>
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<tr>
<td>(Football skills)</td>
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<tr>
<td>Don’t stop the Hip Hop</td>
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<tr>
<td>(Hip Hop Dance Moves)</td>
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<tr>
<td>Fuel up &amp; Lift Off</td>
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<tr>
<td>(Beach Theme/’Beach Ball’ Moves)</td>
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<tr>
<td>African Lift Off</td>
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<tr>
<td>(African Dance Moves set to Drums)</td>
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<tr>
<td>Pow Wow</td>
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<tr>
<td>(Basketball skills)</td>
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<td></td>
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<tr>
<td>Lift Off</td>
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<tr>
<td>(Basketball skills)</td>
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<tr>
<td>Tutti Frutti</td>
<td></td>
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<tr>
<td>(‘Fruit’-themed Dance Moves)</td>
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<tr>
<td>Playground Palooza</td>
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<tr>
<td>(‘Playground’-themed Dance Moves)</td>
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<tr>
<td>Sensational Circus</td>
<td></td>
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<tr>
<td>(‘Circus’-themed Dance Moves)</td>
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<tr>
<td>Funky Farmer</td>
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<tr>
<td>(‘Farmer’-themed Dance Moves)</td>
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<tr>
<td>Animal Action</td>
<td></td>
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<tr>
<td>(‘Animal’-themed Dance Moves)</td>
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<tr>
<td>Fun-N- Fit</td>
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<tr>
<td>(‘Work out’-themed Dance Moves)</td>
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<tr>
<td>Dance Craze</td>
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<tr>
<td>(Fun Dance Moves)</td>
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</tbody>
</table>
REFERENCES

1. (- 1559-8276 (Print); - 1559-8276 ).


53. Centers for Disease Control and Prevention (CDC);National Center for Health Statistics (NCHS); 2009-2010 [Internet]. Atlanta, GA: Centers for Disease Control and Prevention (CDC) [cited 2014 December/14]. Available from: http://www.cdc.gov/nchs/nhanes.htm.


62. Springfield, Massachusetts [Internet] [cited 2013 March/13]. Available from:


64. Physical Activity Guidelines Advisory Committee Report [Internet]. Washington, DC: Department of Health and Human Services [cited 2012 October 6]. Available from:


doi: 10.1371/journal.pmed.1000058.


76. Census Bureau and the Division of Local Services' Bureau of Local Assessment: Socioeconomic


148. Lindefors N, Andersson G. Anxiety is our heritage and we should administer it well. *Lakartidningen.* 2011; 108(14):785.


254. von Thiele Schwarz U, Hasson H. Employee self-rated productivity and objective organizational production levels: effects of worksite health interventions involving reduced work


270. Yancey A, Miles O, Jordan A.

Organizational characteristics facilitating initiation and institutionalization of physical activity programs in a multi-ethnic, urban community


legacy of health organizational wellness program. *Health Promot Pract.* 2006; 7(3 Suppl):233S-46S.


