MIDDLE SCHOOL TEACHERS' PERCEPTIONS OF STUDENTS STANDING FOR INSTRUCTION

by

Erin Crimone

Bachelor of Arts, Pennsylvania State University, 2002

Bachelor of Science, Pennsylvania State University, 2002

Master of Education, Gannon University, 2007

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This dissertation was presented

by

Erin Crimone

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and approved by

Dr. Renee Rogers, Assistant Professor, Health and Physical Activity

Dr. Charlene Trovato, Associate Professor, Administrative and Policy Studies

Dissertation Advisor: Dr. Mary Margaret Kerr, Professor, Administrative and Policy Studies

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Erin Crimone, EdD

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This study addressed the problem of middle school students being both off task and sedentary during the school day. Students may spend up to six hours sitting during a middle school day (NCES, 2018). Research showed evidence that sedentary behavior, primarily sitting, negatively affects physical health (Cardon, De Clercq, De Bourdeaudhuij, & Breithecker, 2004) and suggested standing during class might decrease student off-task behavior in a variety of class activities and instructional formats (Godwin, 2014). However, prior research has not addressed how teachers view this intervention.

Accordingly, this study explored the feasibility of an intervention to incorporate standing during instruction. This is the first study to reveal teacher acceptability of standing for instruction.

The study gathered perceptions from seven middle school teachers who asked students to stand a minimum of 15 minutes per class period, a minimum of three days per week for five weeks. Students stood for a variety of class activities and instructional formats including lecture, individual in-class activity, group in-class activity, and game. The study consisted of three conditions: pre-intervention, no standing; standing intervention; and post-intervention, no

standing. An on-line survey recorded the teachers' perceptions of student off-task behavior during all phases.

The findings show teachers believe standing for instruction is not only feasible, but also acceptable. Teacher open-ended responses showed 54% of comments were positive, 12% neutral, and 34% negative. Many teachers chose to continue the standing intervention after the study concluded.

Teacher perceptions of student off-task behavior while standing for instruction varied by instructional format and teacher. The common perception was standing for instruction, especially when students were given the choice, reduced off-task behaviors and increased focus. The study revealed teacher perceptions of students who are typically "fidgety" and off task were more on task and focused during the standing intervention. Findings also show a decrease in hall pass use in most teachers' classes when students were standing.

The implications of this study suggest that allowing students a choice to stand is a feasible and acceptable intervention strategy. Providing students with the choice to engage in light physical activity by standing may positively impact behavior, focus, and energy.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

As I reflect on the past few years of this educational journey, I wish to express my deepest gratitude to the incredible people in my life who have supported and encouraged me and have helped me grow as both an educator and as a person.

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1.0 INTRODUCTION

This study explored middle school students' sedentary and off-task behaviors while in school. During a middle school day, students could spend up to six hours being sedentary (NCES, 2018). The study is focused on teacher perceptions of how standing for instruction for minimum of 15 minutes per class period for a minimum of three times per week in the middle school classroom affects student off-task behavior in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games. Literature suggests that standing for instruction to combat students' sedentary behavior in school may decrease student off-task behavior (Schumate & Wills, 2010).

Sedentary children are at risk for a multitude of health issues such as asthma, type II diabetes, high blood pressure, joint issues, sleep apnea, musculoskeletal strain, as well as knee, hip, and foot pain and discomfort. Along with the physical risks, sedentary children are at risk for emotional problems such as low self-esteem, depression, anxiety and social problems (Benden, Wendel, Jeffrey, Zhao, & Morales, 2011). Sedentary children who are also overweight may exhibit academic difficulties, such as being placed in remedial classes, higher likelihood of repeating a grade in school, abnormal scores on behavior rating scales, and higher instances of absenteeism (Benden et al., 2011; Benden, Zhao, Jeffrey, Wendel, & Blake, 2014).

Because of the negative physical, emotional, and academic implications of being sedentary, and because middle school students have a history of being off task in the classroom

(Faul, Stepensky, & Simonsen, 2012), schools are an optimal place for intervention. In the United States, over 95% of children from ages five to seventeen are enrolled in public schools and "no other public institution has as much 'continuous and intensive contact' with children in their formative years" (Joshi, Howat, Bryan, & Dick, 2011, p. 381). Public schools are poised to combat both sedentary and off-task behavior in the classroom.

      The problem of practice explored in this study is that middle school students are both sedentary and off task while in school. During a middle school day, students may spend up to six hours being sedentary (NCES, 2018). The potential for a change in practice to include standing during instruction to reduce and/or eliminate the problems associated with sedentary and off-task behavior has prompted interest in conducting this research. In addition, observations of middle school students in traditional seated classrooms has sparked interest in studying an intervention to combat students being off task.

2.0   REVIEW OF LITERATURE

The following review of relevant literature is organized into six main sections: (1) key terms; (2) search methods; (3) sedentary behavior; (4) physical activity; (5) student behavior; and (6) standing, sit-stand, and stand-biased desks. Each section reflects research done to inform this study of how standing for instruction affects off-task behavior in the middle school classroom. First, key terms of the review are defined to allow the reader an understanding of the terminology used throughout the review of literature.

2.1   KEY TERMS

BMI (Body Mass Index) – the measure of a person's weight in relation to their height

EFA (Experimental Functional Analysis) – as it relates to the assessment of severe behavior disorders; refers to behavioral assessment procedures that involve manipulation of variables hypothesized to maintain problematic behavior (Schumate and Wills, 2010)

Energy Expenditure – "any body movement that works your muscles and requires more energy than resting" (Torbeyns, Bailey, Bos, & Meeusen, 2014, p. 1261)

FBA (Functional Behavior Assessment) – the process of identifying a problem behavior, the causes of the behavior, the purpose of the behavior, and how the behavior interferes with a students' education

GBG (Good Behavior Game) – an approach to management of student behavior by rewarding positive behavior where students are part of a team as well as compete for good behavior as an individual

LMPA (Light to Moderate Physical Activity) - light intensity activities that require the least amount of effort; an activity measured as < 3 METs (e.g., standing, fishing, making a bed) (Prosch, 2013; Harvard T.H. Chan School of Public Health, 2018)

MET (Metabolic Equivalent) – energy required to burn calories (Harvard T.H. Chan School of Public Health, 2018)

MVPA (Moderate to Vigorous Physical Activity) – activities that require more oxygen consumption than light activities; between 3 and 6 METs; (e.g., walking briskly – 4 mph, shooting basketball, vacuuming) (Prosch, 2013; Harvard T.H. Chan School of Public Health, 2018)

NEAT (Non-Exercise Activity Thermogenesis) – energy expenditure of all physical activity other than exercise (Benden, 2011)

Neurocognitive (Neurocognition) – one or more functions involving cognitive functioning of the brain (e.g., executive functioning, working memory) (Mehta, Shortz, & Benden, 2015)

Off-Task – (for this study) defined as any inattentive behavior not attending to or participating in the instructional activities taking place in the class (Dadakhodjaeva, 2017; Faul, Stepensky, & Simonsen, 2012; Schumate & Wills, 2010)

Physical Activity – any bodily movement produced by skeletal muscles that requires energy expenditure (World Health Organization, 2016)

Sedentary Behavior – "any waking activity characterized by an energy expenditure ≤ 1.5 metabolic equivalents and a sitting or reclining posture" (Australian Government Department of Health, 2017)

Sit-Stand Desks – term used for classroom and workplace desks that allow the user to choose whether to sit or stand while using a desk; users of the desk determine the sit or stand position and can alter the physical height of the desk (used interchangeably with "Stand-Biased Desks")

Stand-Biased Desks – term used for classroom and workplace desks that allow the user to choose whether to sit or stand while using a desk; users of the desk determine the sit or stand position and can alter the physical height of the desk (used interchangeably with "Sit-Stand Desks)

Standing Desks – desks that require the user to be in a standing position for use; standing desks, unlike stand-biased or sit-stand desks, are at a fixed position that cannot be altered by the user

TOT (Time on Task) – amount of classroom time when students are actively engaged in learning

Traditional classroom – (for purposes of this review) any classroom where students are using desks designed for sitting

2.2   LITERATURE SEARCH METHODS

This literature review included studies identified via searches using Google Scholar, PittCat, PittCat+, and University of Pittsburgh Health Sciences Library System. Key words researched included: standing for instruction, standing during instruction in middle school, standing desks, sit-stand desks, sedentary behavior, childhood obesity, physical activity, off-task, middle school student behavior, behavior management, sedentary behavior in schools, and academic achievement. The date range for the search was from 1995-2018. Search filters included peer reviewed and scholarly journal articles and full-text online.

2.3   SEDENTARY BEHAVIOR

The research showed evidence that sedentary behavior, primarily sitting, has a negative effect on health, metabolic rate, weight gain, cardiovascular morbidity, chronic disease, and causes back pain (Grunseit et al., 2013; Cardon et al., 2004). Individuals who are mostly sedentary during their work days have a significantly higher risk of mortality regardless of their physical activity outside of the work day, and obese individuals are at the highest risk for health problems associated with prolonged sitting (MacEwen, MacDonald, & Burr, 2015). Sedentary behavior is linked to negative health risks such as obesity, blood pressure issues, reduced cardiorespiratory fitness as well as reduced self-esteem and minimized academic performance (Sherry, Pearson, Clemes, 2016). The literature supports the notion that an increase in sedentary time results in lower energy expenditure, lower school performance, and negatively impacts physical and

mental health, putting overweight and obese children at risk for emotional, academic, and mental health problems (Benden et al., 2011; Benden et al., 2014).

2.3.1 Disease

The literature showed that longer periods of sit time are associated with chronic disease and an increased risk of mortality. More than three consecutive hours of sitting per day has a negative effect on vascular circulation and endothelial function, and prolonged sitting may contribute to vascular aging in lower extremities (Thosar, Bielko, Mather, Johnston, & Wallace, 2015). Research by Thosar et al. (2015) found, "increased sitting time has been associated with chronic diseases and increased risk of mortality even while controlling for leisure time physical activity" (p. 843). The findings also concluded that although sit time is associated with cardiovascular diseases, breaking sit time patterns is beneficial and may lower patterns of cardiovascular disease risk markers (Thosar et al., 2015).

Research also showed that sitting for lengthy periods could result in advanced asymmetries of the trunk and scoliosis because muscles are not actively used while sitting (Drza-Grabiec, Snela, Rykała, Podgórska, & Rachwal, 2015). The Drza-Grabiec et al. (2015) study revealed a correlation between long periods of sitting and spinal pain and health problems for children that can continue throughout adulthood. The research also revealed that chairs common to schools are not suitable for prolonged sitting and do not force correct positioning for the spine (Drza-Grabiec et al., 2015).

2.3.2   Obesity

The most current information for the national childhood obesity rate is 18.5%, with evidence to show that as children get older, their obesity rate increases (Trust for America's Health and the Robert Wood Johnson Foundation, 2018). According to the 2017 data, 13.9% of 2 to 5-year-old children were obese, 18.4% of 6 to 11-year-old children, and 20.6% of 12 to 19-year-old adolescents were obese. Perhaps even more alarming are the ethnic and racial disparities in childhood obesity. Hispanic children have a 25.8% obesity rate and 22% of black children are obese (Trust for America's Health and the Robert Wood Johnson Foundation, 2018). Research shows that less active children are more likely to be overweight, have increased blood pressure, higher insulin, and high cholesterol (Zenzen & Kridli, 2009). The literature identified schools as critical for shaping eating and physical activity patterns of kids and suggested schools may be the key to preventing childhood obesity (Zenzen & Kridli, 2009). Zenzen and Kridli (2009) referenced a study from Veugelers and Fitzgerald (2005) which examined school programs for obesity prevention and found that

> school based healthy eating and physical activity programs provide a great opportunity to enhance the future health and well-being of children because they can reach almost all children and may (1) enhance learning and provide social benefits, (2) enhance health during critical periods of growth and maturation, (3) lower the risk for chronic diseases in adulthood, and (4) help to establish healthy behaviors at an early age that will lead to lifelong healthy habits. (p. 244)

The research showed a positive association with weight maintenance when physical activity is increased and sedentary time is decreased; however, when physical activity is decreased, BMI is increased as are the instances of being overweight and obese (Zenzen &

Kridli, 2009). School intervention programs have the potential to increase physical activity and lower sedentary behavior and the research of Zenzen and Kridli (2009) showed that parental involvement is essential for obesity prevention in children. Zenzen and Kridli (2009) also noted that a hands-on approach to physical activity, specifically a peer-to-peer approach, is beneficial to increasing physical activity in school intervention programs.

The implementation of physical activity intervention programs in schools are being studied because obesity related conditions in school children were shown to lower mental activity due to poor nutrition and are associated with poor behavioral health and peer ridicule. Obesity related issues are also correlated with higher absenteeism, lower GPA, lower standardized test scores, and lower academic performance (Totura et al., 2015). A study conducted by Totura et al. (2015) showed that school-based efforts to increase physical activity in students have contributed to a lower BMI and increased cognitive abilities of school students. The study also reveals that integrating physical activity in classrooms shows a positive increase in performance, increased test scores, and more time on task (2015). The study concluded that an organizational commitment from schools is the key to an obesity prevention plan (2015). Another study looked at students in Japan who were overweight and obese and found that their academic achievement was lower than their physically fit peers (Morita et al., 2016).

Literature also pointed to the notion that healthy students learn better than those who are overweight, obese, and lacking a healthy lifestyle (Koepp et al., 2012). An emerging theme in the research on childhood obesity and the health of children pointed to schools as important entities for the promotion of student health and reduction in obesity (Harrison & Jones, 2012). Research by Harrison and Jones (2012) called upon schools to intervene in the childhood obesity epidemic. It encouraged schools to intercede in students' diet, physical activity, healthy lifestyle

education, and to encourage parental involvement in the health education of students. The literature encouraged schools to consider fitness programs be implemented to prevent childhood obesity and to promote physical activity, which could also be a positive influence on academic achievement (Torrijos-Niño et al., 2014).

2.3.3 Mental health

Research showed that sedentary behavior is a growing concern for school aged children and that being sedentary has a negative effect on the mental health of students and that they may be associated with the same health problems of a person who is not physically active (Minges et al., 2016). Research stated that physical activity is likely to have positive psychosocial outcomes, as physically active people studied were less likely to suffer from mental problems (Biddle & Asare, 2011). The opposite is true as well; those who had significant sedentary behavior had more mental health problems and lower academic achievement (Biddle & Asare, 2011). A recent study by Graham, Richardson, King, and Chiera (2014) showed an association between sedentary behavior and poor physical health. Even when participants had an increase of physical activity, but still had high sedentary behavior (i.e., more than 10 hours per day), there was a high instance of psychological distress. The study also showed that men and women had slightly differing reactions to occupational sedentary behavior (i.e., six or more hours per day); men demonstrated moderate psychological distress and women demonstrated high psychological distress (Graham et al., 2014).

2.3.4 Sedentary behavior in schools

Just as the Graham et al. (2014) study suggested a correlation between psychological distress and gender, there is also literature to support differences between sedentary behavior and physical activity for adolescents. Trilk et al. (2011) showed that girls' participation in physical activity declined more than boys' participation as the girls aged. The study showed that higher sedentary behavior in girls resulted in a lower physical activity rates; however, when middle school girls were involved with sports, lessons, or enrolled in physical activity classes, their rate of sedentary behavior decreased (Trilk et al., 2011). Trilk et al. (2011) also reported that girls in grades 7 through 12 who participated in organized sports, lessons, and classes were more likely to meet national physical activity guidelines than their peers who reported high engagement in television viewing and video game playing. Similarly, the literature suggested that a significant number of adolescents, ages 13-15, throughout the world did not meet the recommendations for MVPA, and that girls were less likely than boys to be active (Malina, Cumming, & Coelho-e-Silva, 2016). Research suggested a way to address girls' low rates of physical activity is through a school-based intervention to incorporate positive behavior changes as well as provide opportunities for physical activity (Robbins, Pfeiffer, Maier, Lo, & Wesolek, 2012).

There is literature to support school-based interventions to combat sedentary behavior. In an article by Fanning et al. (2017), evidence supported a positive relationship between breaks in sedentary time and improvements in health independent of MVPA. The findings by Fanning et al. (2017) were also supported by Hadgraft and Owen (2017) who found, that "adverse health consequences may be remediated through interrupting sitting time" (p. 124). These findings suggested that, even when a person engages in MVPA, if they then spend large amounts of time sitting, they are at risk for the same negative health effects as a person who does not engage in

MVPA. The study also indicated that lower levels of sedentary behavior could be associated with lower cognitive impairment (Fanning et al., 2017). With a trend toward reduction in recess time as well as in physical education time due to standardized testing requirements, students are spending more in-school time being sedentary, which has been shown to influence time on task as well as student behavior (Greico, Jowers, Errisuriz, & Bartholomew, 2016). The results of two studies relating to time on task as well as instructional format conducted by Greico et al. (2016) showed students' time on task increased by 8% after an active lesson and time on task decreased after a sedentary lesson. The same study showed neuropsychological benefit to cognition when a break from sedentary behavior was present in a lesson. Finally, both LMPA and MVPA had increases in time on task compared to a sedentary lesson (Greico et al., 2016).

2.4   PHYSICAL ACTIVITY

Studies showed that physical activity has a positive impact on the health of all people: "people with higher physical activity levels show lower risks of developing metabolic syndrome, cardiovascular disease, diabetes, cancer, hypertension, obesity, and mental health problems such as anxiety and depression" (Torbeyns et al., 2014, p. 1262). Literature suggested that those who are physically active tend to have a better quality of life with less stress and higher self-esteem, better work productivity, enhanced executive function, and better academic performance (Torbeyns et al., 2014). Research also showed a link between physical activity and physical health; 60-minutes per day has been linked to healthy bones, muscles, increased endurance, lowered risk of disease, higher self-esteem, and lowered stress and anxiety (Rasberry et al., 2011). The World Health Organization recommends 60 minutes of moderate to vigorous

physical activity (MVPA) for adolescents ages 5-17 (World Health Organization, 2016). However, the 2016 physical activity statistics on the Centers for Disease Control (CDC) website show that only 21.6% of 6 to 19-year-old children in the United States had 60 or more minutes of MVPA a minimum of 5 days per week (CDC, 2016). The research showed that increased physical activity decreased the risks of cardiovascular disease, obesity, diabetes, hypertension, cancer, and mental health problems, increased scholastic performance, and is linked to improvements in cognitive performance (Wang et al., 2016).

The chart in Table 1 shows a physical activity spectrum under which a variety of activities for healthy adults are categorized into light intensity activity <3.0 METs, moderate intensity activity 3.0-6.0 METs, and vigorous intensity activity >6 METs.

Table 1. *Harvard School of Public Health Physical Activity Chart*

Light intensity activity for healthy adults	Moderate intensity activity for healthy adults	Vigorous intensity activity for healthy adults
<3.0 METs	3.0-6.0 METs	>6 METs
Walking – slowly	Walking – very brisk (4 mph)	Walking/hiking
Sitting – using computer	Cleaning – heavy (washing windows, vacuuming, mopping)	Jogging at 6 mph
Standing – light work (cooking, washing dishes)		Shoveling
Fishing – sitting	Mowing lawn – walking power mower	Carrying heavy loads
Playing most instruments		Bicycling fast (14-16 mph)
	Bicycle – light effort (10-12 mph)	Basketball game
		Soccer game
	Badminton – recreational	Tennis – singles
	Tennis – doubles	

Note. METs are metabolic equivalents. One MET is defined as the energy it takes to sit quietly.

2.4.1　School-based physical activity and academic achievement

Recent research has shown a link between physical activity and academic performance for students at all levels and grades. The association between physical activity and academic performance is seen through physiological, cognitive, emotional, and learning mechanisms. Across 43 studies, there were 251 associations between academic performance and physical activity (Rasberry et al., 2011). Of these studies, 50.5% of the associations were positive, 48% showed the associations were not significant, and one study (5%) showed a negative association between physical activity and academic performance (Rasberry et al., 2011). Extending physical education from twice a week to daily showed an increase in math, reading, and writing test scores as well as a positive association with student attention (Rasberry et al., 2011). Other studies showed one or more associations between physical education and cognitive skills, positive attitude, and increased academic achievement (Rasberry et al., 2011). A two-year long intense physical education program showed an increase in reading, language, and battery scores and no negative (but no increase in) relationship with math scores (Rasberry et al., 2011). Studies also showed that increased physical activity at recess had a positive impact on classroom behavior, with teachers reporting students were more focused, less listless, and fidgeted less. They also reported significantly better classroom behavior when students engaged in at least 15 minutes of daily recess (Rasberry et al., 2011).

Studies also linked physical activity breaks in the classroom with academic achievement. The literature showed positive or no result in activity breaks and the association with academic achievement (Rasberry et al., 2011).   Studies have shown positive improvements in concentration, increased math fluency, improved spatial aptitude, and positive increases in reading and math in elementary students with the implementation of physical activity breaks

(Rasberry et al., 2011). The literature also showed a positive link between cognitive function, academic behaviors, and academic achievement when classrooms incorporated activity breaks in the classroom. The studies showed no negative associations nor any detractions and concluded that adding physical activity breaks may enhance student academic performance (Rasberry et al., 2011).

Growing research surrounds the benefits of physical activity on academic achievement. With one-third of students not meeting the recommended standards for cardiorespiratory fitness, researchers investigated the potential connection to academic achievement (Donnelly & Lambourne, 2011). A study by Donnelly and Lambourne (2011) focused on "fitness and fatness" and their association with cognitive function and academic achievement in schoolchildren. The study revealed that fit children performed better on attention tasks and had an increased amount of cognitive control. The study also showed a positive association between cardiovascular fitness and achievement scores and that aerobic exercise improves executive function in overweight children (Donnelly & Lambourne, 2011). The study also showed that poor physical fitness, high BMI, and "fatness" are a detriment to academic achievement, and achievement scores are significantly lower in overweight vs. non-overweight students (Donnelly & Lambourne, 2011). Donnelly and Lambourne (2011) found that when students are provided with the opportunity for physical activity breaks during their school day, their physical fitness improved, and therefore an improvement in academic achievement was noticeable. The effects of "brain breaks" such as recess may also improve brain functioning and time on task. According to one study by Jarrett et al. (1998), students were on task 85% of the time on days without recess, but 90% of the time when they had recess. In addition, in the same group of students, 16% were fidgety without recess compared with only 7% when participating in recess.

The study suggested that recess had a renewing effect on students, decreased off-task behavior, and reduced the amount of "fidget" time (Jarrett et al., 1998).

Most of the research on the associations between physical activity and academic achievement measured how physical activity impacted academic achievement; however, one study conducted by Lizandra, Devís-Devís, Pérez-Gimeno, Valencia-Peris, and Peiró-Velert (2016) looked at the inverse approach: how academic achievement affected physical activity. This study reported that adolescents who spent time being sedentary were likely to continue sedentary behavior throughout adulthood. The sedentary behaviors led to issues in both childhood and adulthood to include obesity, food intake, cardiovascular disease, metabolic rate, poor health, poor quality of life, sleep issues, insufficient sleep, drug use, low self-esteem, low quality peer relations, and low academic performance (Lizandra et al., 2016). The study determined that higher academic performance leads to lowered sedentary time and that academic performance is "a better predictor of sedentary behaviors than the other way around" (Lizandra et al., 2016).

The studies that looked at a relationship between physical activity and academic achievement showed a positive effect of physical activity on academic performance and a significant relationship between physical activity and cognition (Howie & Pate, 2012). The literature also shows that neuroelectric activity increased with physical activity and physical fitness, and the increases in the neuroelectric activity had a positive effect on cognition and academic achievement (Howie & Pate, 2012). Research also suggested that schools have a potential to increase physical activity throughout the school day and encouraged schools and school districts to implement policies to promote physical activity throughout the school day (Howie & Pate, 2012).

Research showed that academic achievement scores have a positive relationship with physical fitness levels, and academic success is associated with high levels of physical fitness. A relationship between exercise and achievement exists with an increase in cognitive performance, especially executive functioning skills in students who have cardiovascular fitness (Torrijos-Niño et al., 2014). The relationship between physical activity and academic performance is physiological and shows that regular exercise can alleviate stress, anxiety, and depression, and can boost self-esteem, which affect academic achievement (Torrijos-Niño et al., 2014). The Torrijos-Niño et al. (2014) study suggested that neurophysiological changes in the brain might impact the positive association between physical activity and academic performance. Their findings stated, "physical activity increases brain blood flow, improves neuroelectric functionality and stimulates the release of brain derived neurotrophic factor that facilitates learning and maintains cognitive functions by improving synaptic plasticity…. Vascular changes promote angiogenesis and increased cerebral blood flow to cognition related brain areas, increased cerebral levels of neurotransmitters such as serotonin and/or norepinephrine facilitate information processing, and changes to the regulation of neurotrophins influencing neurogenesis" may contribute to the positive relationship between physical activity and academic achievement (Torrijos-Niño et al., 2014, p. 106).

Research showed that academic achievement may be positively associated with physical fitness, physical activity, and healthy fitness zones, but many school-aged children are overweight or obese (Joshi et al., 2011; Torrijos-Niño et al., 2014). According to research, obesity is connected to physical inactivity and a sedentary lifestyle. Sedentary lifestyles lead to health problems and have been shown to have a connection to lower academic achievement; the national cost of obesity doubled from 2001-2005 (Joshi et al., 2011). Literature showed that

physical activity might reduce childhood obesity and increase academic performance. In one study by Joshi et al. (2011), students in healthy fitness zones scored higher on math and reading standardized tests, and students with a healthy BMI scored higher in math and reading compared with students who were obese or overweight. Additionally, there is a statistically significant relationship between ELA and math scores and fitness performance.

A study conducted by Wang et al. (2016) revealed that Chinese middle school students suffered from inadequate physical activity influenced by parental involvement, socioeconomic status, gender, and family support with the largest factor in physical activity (and inactivity) being familial support. When students had positive family support to be physically active during the week and on weekends they were more likely to be physically active and had improvements in cognitive function (Wang et al., 2016).

The literature suggested all fitness variables except for BMI showed significant positive associations with academic performance and that fitness was strongly related to academic performance. The literature also showed that cardiovascular health might be more related to academic performance than weight or BMI because cardiovascular health is associated with cognition (Van Dusen, Kelder, Kohl, Ranjit, & Perry, 2011). Two studies that looked specifically at the connections between physical fitness and standardized academic tests in elementary school students found a direct association between levels of physical fitness and higher scores on the standardized academic tests (Van Dusen et al., 2011). The positive relationship between physical fitness and academic achievement was also related to increased reading and math abilities, whereas obesity had a negative influence on academic achievement and cognitive function (Morita et al., 2016).

2.4.2 Physical activity and behavior and mental health

To assess the connection between physical activity and behavior, a study was conducted by Stylianou et al. (2016) to measure the impact of before school physical activity on children's classroom behavior and readiness to learn. The study revealed that school-based, before school physical activity had a positive impact on children's classroom behavior and readiness to learn (Stylianou et al., 2016). The study also concluded that school-based physical activity may improve behavior, cognition, and academic achievement, and that acute physical activity had a positive influence on cognitive process and executive function (Stylinaou et al., 2016). Students in the study by Stylianou et al. (2016) were shown to have increased on-task behavior on the days in which they participated in before school physical activity. The study suggested that schools might want to consider a delayed start time to allow for school-based physical activity prior to the start of the school day. While the study concluded that more research is necessary on the effects of before school physical activity, the statistically significant increase in on-task behavior on days of participating supports implementation of such a program in schools (Stylinaou et al., 2016)

Along with an influence on academic achievement and cognitive function, research showed a strong connection between sedentary behavior and mental health. Combating sedentary behavior with increased physical activity has the potential to reduce depression and anxiety and to boost self-esteem in children (Biddle & Asare, 2011). According to nine of eleven studies reviewed by Biddle and Asare (2011), there is a negative association between lack of physical activity and mental health. In other words, although evidence is limited, those who engaged in physical activity over those who had no intervention seemed to have potentially beneficial reductions in depression. The studies also showed that lower levels of physical

activity intensity might be effective for anxiety reduction (Biddle & Asare, 2011). Active adults report fewer symptoms of depression and anxiety than inactive adults (Biddle & Asare, 2011). Biddle and Asare (2011) also looked at the physical activity interventions for young people and noted a small benefit of engaging in physical activity and lowering anxiety. The belief is that physical activity is associated with developing positive self-esteem in young people. In addition, the study found that moderate exercise can lead to improved self-esteem as well as improved cognitive function because of increased blood flow to areas of the brain that stimulate learning (Biddle & Asare, 2011). The improvement in cognitive function because of physical activity was noted in adults as well as children, as was improved executive functioning and concentration. The study also showed that schoolchildren had improved behavior, attention, and concentration when they could take breaks throughout the school day to engage in physical activity (Biddle & Asare, 2011). The research suggests that physical activity in the classroom will enhance student learning and reduce classroom disturbances and negative behaviors (Biddle & Asare, 2011). Not only was physical activity shown to have a positive influence on classroom behaviors and achievement, it was also likely to have positive psychosocial outcomes as physically active people were less likely to suffer from mental health problems. The opposite is true as well; those who had significant sedentary behavior had more mental health problems and lower academic achievement (Biddle & Asare, 2011).

2.5   OFF-TASK STUDENT BEHAVIOR

A wide breadth of literature is dedicated to recognizing the ongoing problem of student off-task behavior, its negative impact on student achievement, and the loss of instructional time in the

classroom (Godwin et al., 2016). Off-task behavior refers to classroom activities in which students are not engaged with the content, have inappropriate interactions with teachers or classmates, and attend to stimuli other than that of the content being delivered (Kilian, Hofer, Fries, & Kuhnle, 2010). Off-task behavior has been shown to have negative academic and social impacts for students and commonly leads to office referrals (Godwin et al., 2016). An office discipline referral can cost up to 20 minutes of instruction time for a student and up to 45 minutes of time for a building level administrator (Dadakhodjaeva, 2017). Recent research has focused on responses to off-task behavior as well as the causes of off-task behavior including, but not limited to, instructional activity, instructional format, motivation, prompting, executive functioning, deviant behavior, low motivation for school, antisocial behavior, and lack of interest in the academic task (Leflot, van Lier, Onghena, & Colpin, 2010; Godwin et al., 2016; Faul, Stepensky, & Simonsen, 2012). Off-task student behavior disrupts the learning process, negatively impacts academic achievement, decreases time of instruction (Dadakhodjaeva, 2017), and is a significant problem in educational settings.

2.5.1   Behavior management

As a response to student off-task behaviors, strategies have been developed to address the behaviors and find a way to reduce and/or eliminate problem, off-task behaviors in the middle school classroom as well as in elementary and high school classrooms.

One strategy for behavior management identified in the literature involved using an EFA (experimental functional analysis) to identify relationships between the environment and the behaviors. When an EFA is conducted, there is a deliberate manipulation of the antecedent and consequent events to identify functional relations between the environment and student behavior

34

(Schumate & Wills, 2010). Once the connections are identified, the literature suggested implementing function-based interventions in the environment as a specific intervention rather than using a teacher's general classroom management strategy (Schumate & Wills, 2010).

Literature showed teacher prompting to be an effective method of behavior management in middle school students. A study conducted by Faul, Stepensky, and Simonsen (2012) showed that teacher prompting interventions decreased student off-task behavior when teachers delivered prompts with a high degree of fidelity and no variability of wording. The study indicated that there was no reinforcement for on-task behavior and no comments regarding the preferred behavior of the students (Faul et al., 2012). The study indicated that a specific prompt tied to the positive expectations of the school and classroom decreased students' off-task behavior (Faul et al., 2012).

Recent studies have identified a behavior intervention using the "Good Behavior Game" (GBG) as a way to combat off-task student behavior. The GBG is used to promote positive social behavior while aiming to prevent disruptions to the classroom environment and student learning (Leflot et al., 2010). Studies have shown that many undesirable student behaviors are met with negative teacher reactions and therefore the student has gained the attention they are seeking; yet the attention is for a negative behavior, thus perpetuating the off-task behavior (Sutherland & Oswald, 2005). The GBG has been found to have a positive effect on students as well as on teacher reactions to student behavior because it focuses on praise for appropriate, on-task, positive behavior. The GBG has been shown to be effective in reducing off-task and undesirable student behavior (Leflot et al., 2010). Using the GBG has also shown a decrease in negative teacher remarks and an increase in positive teacher remarks to students. Teachers

engaging in the GBG used more praise when compared to a control group of teachers, and students displayed fewer off-task behaviors (Leflot et al., 2010).

In a study conducted by Dadakhodjaeva (2017), a variation of the GBG was used with middle school students to determine if Class Dojo (an online behavior management application) was effective in managing passive off-task behavior. The results of the study suggested Class Dojo is an effective intervention for academic engagement. The study also suggested that off-task behavior decreased with middle school students when using Class Dojo in conjunction with the GBG. Teachers rated the application as slightly effective in decreasing passive off-task behavior (Dadakhodjaeva, 2017).

2.5.2   Instructional format and delivery

Recent literature looked at the conditions leading to off-task behavior to determine appropriate intervention strategies. A study by Godwin et al. (2016) examined instructional format, design, and duration as it correlated to student off-task behavior. The research showed that the duration of an instructional activity might influence a student's off-task behaviors. Small group instruction based upon student ability have been shown to be more effective for combating off-task behaviors than whole group instruction (Kulik, 1992). The Godwin et al. (2016) study examined the relationship between off-task behaviors and specific instructional formats such as individual work, group work, and whole-group instruction to evaluate the instructional formats most likely to prevent off-task behaviors. The results of the study suggested that different types of instruction elicit different types of off-task behaviors such as environmental distractions occurring during whole-group instruction, but peer off-task behaviors occur more often during small group or partner work (Godwin et al., 2016). The study showed that the lowest rates of

off-task behavior occurred during individual and small group instruction and that off-task behavior was displayed most often during whole-group instruction (Godwin et al., 2016). Results also showed longer instructional activities (i.e., 30 min or longer) had a higher rate of off-task behavior than shorter instructional activities (i.e., 10 min) (Godwin et al., 2016). Finally, while the highest rate of off-task behavior was seen during whole-group instruction, the type of off-task behavior in this format was environment as well as self-distraction (Godwin et al., 2016).

In a study by Greico et al. (2016), the instructional format of playing a game in class was studied regarding student time on task, physical activity, and behavior. The study results showed a negative association between student time on task and a sedentary lesson, but a positive increase in time on task when engaged in a competitive lesson. Study results also indicated that physically active lessons were followed by an increase in time on task when compared to a control group of sedentary students (Greico et al., 2016).

2.6   STANDING, SIT-STAND, AND STAND-BIASED DESKS

Recent studies have raised awareness of the dangers of sitting. Workplaces have begun to combat sedentary behavior by using sit to stand (or stand-biased) desks as an attempt to positively influence the health of its workers. For children in a school setting there is evidence that energy expenditure is greater when children stand as opposed to when they sit, and that small changes in energy expenditure can positively influence health (Benden et al., 2014). The research specifically looked at the non-exercise activity thermogenesis (NEAT) which happens while students are standing as opposed to sitting while in the classroom (Benden et al., 2011;

Benden et al., 2014). Limited research exists on the neurocognitive benefits of implementing standing in classrooms at the elementary and secondary level; however, the studies that have been done point to an encouraging relationship between standing/stand-biased desks and positive neurocognitive benefits (Cardon et al., 2004).

2.6.1 Standing, sit-stand, and stand-biased desks in the workplace

According to research conducted by Grunseit et al. (2013), sit-stand desks reduced time sitting at work, had a high usability, and were highly accepted by participants. Those who used sit-stand desks during the study reported being motivated by several different factors, one of which is the potential health benefits of standing at work and having the option for sit to stand desks. The research shows that general impressions from adults using sit-stand desks were positive because they had the flexibility to sit or stand for each work-related activity (Grunseit et al., 2013). Grunseit et al. (2013) also found that sit-stand desks allowed users to develop time and task based routines to benefit from standing while working. In a study by Chau et al. (2014), workers not only reported an increased awareness of sitting and standing time while at work, but also when outside of work. Users of the sit-stand desk reported monitoring their sit time by using time-based and task-based routines. Time-based routines were reported by participants as self-regulated sit and stand times to ensure an adequate amount of stand time and lower amount of sit time. Task-based routines were also reported as self-regulated and required the completion of a task to alter position from sit to stand or stand to sit (Chau et al., 2014). Sit-stand desk implementation positively impacted the engagement in outside of work physical activity for users as well as raised energy levels both in and out of the workplace (Chau et al., 2014; Grunseit et al., 2013).

Workers who used sit-stand workstations reported using the desks because of curiosity regarding the potential health benefits such as cardiovascular improvement, musculoskeletal improvements, and improved posture (Chau et al., 2016). The study by Chau et al. (2016) showed that the implementation of sit-stand desks in the workplace raised awareness of sit time, reduced back pain, lowered fatigue, raised energy levels, increased productivity, and improved concentration among adult users. Research also showed sit-stand desks were positively received by adult office workers and the lowered sit time sustained workers' energy throughout the workday and even outside of the workday after 19 weeks of using the sit-stand desks (Chau et al., 2014; Chau et al., 2016). Research also showed no loss of productivity when sit-stand desks were implemented and that they can feasibly be implemented as a means for reducing sedentary behavior in the workplace (Chau et al., 2014; Chau et al., 2016; Grunseit et al., 2013). Though research supported the positive effects of sit-stand workstations in an office setting, it also showed evidence of some reported negative associations with the desks:

1. Reports of sit-stand desks being distracting to others in the office,

2. Issues of confidentiality when using the desks in an open floor plan office,

3. Height restrictions, and

4. Distance from the computer when standing at the desks.

Most of the negatives reported in the research dealt with the design, size, and/or shape of the desks (Chau et al., 2016).

Studies showed that one-third of adults' waking hours are spent at work, and those who work in offices sit for most their day (Grunseit et al., 2013). In a study of sit-stand desks, the use of sit-stand desks was reported by subjects to be for one of three reasons: health, productivity, or office set-up. Those who used the sit-stand desks reported higher energy levels and more

movement throughout the day (Grunseit et al., 2013). Subjects in the study reported more positive than negative effects of using the sit-stand desks, especially the electric powered desks vs. the manual desks, as the electric desks were reportedly used more often because of convenience. The study by Grunseit et al. (2013) also showed that, though some reported standing desks being a distraction in a small office space, the benefits outweighed the drawbacks; those who used the desks were more active throughout the day, not only when just standing at their desks. Office workers who used sit-stand desks reported that they felt more efficient and productive and overall sit time decreased (Grunseit et al., 2013).

The research to date has found that standing desks decrease sedentary time in and out of work and positively impact productivity (MacEwen et al., 2015). A study conducted by MacEwen et al. (2015) showed that workers using standing desks showed, "significant improvements in fatigue, vigor, tension, confusion, depression, and total mood disturbance" (MacEwen et al., 2015, p.55). Standing desks in the workplace also contributed to increased energy, better health, decreased stress, and increased production. According to the MacEwen et al. (2015) study, over a three-month period, those who used a standing desk had a reduction in weight, but not in Body Mass Index (BMI) or in waist/hip relation. The study showed that participants using standing desks reported higher energy levels, higher levels of physical activity, improvements in mood, and less feelings of drowsiness, and suggested that standing desks, "may be effective in improving overall health considering both physiological and mental health components" (MacEwen et al., 2015, p.57).

In a study by Torbeyns et al. (2014), the benefits of standing desks were evidenced by reports of positive mental health and happiness. The study linked standing desks with physical activity and "brain plasticity by facilitating neurogenerative, neuroadaptive, and neuroprotective

processes" (Torbeyns et al., 2014, p. 1262) which can help in all types of learning and mental functioning. Though research positively links physical activity with several physical and mental health benefits, according to the literature, sedentary behavior is a stronger factor in determining a person's health than physical activity (Torbeyns et al., 2014). The study by Torbeyns et al. (2014) showed that when adults use standing desks, they not only combat sedentary behavior, but they also have the same effects as participating in physical activity. The study showed lowered upper back and neck pain, higher levels of comfort, increased energy levels, better health, lowered stress, and improved focus when adults used standing workstations.

2.6.2   Standing, sit-stand, and stand-biased desks for students

In two studies by Benden et al. conducted in 2011 and 2014, children were provided sit-stand desks in their elementary school classrooms. The standing workstations allowed the students the option to stand to combat sedentary behavior. The study showed that students who chose to stand while in the classroom had a higher energy expenditure, more calorie expenditure, an increased rate of physical activity, and less stress on their spinal structures. The standing workstations allowed students to "fidget" which research showed increases energy expenditure. Those who used standing desks increased their mean step count by 1.61 and .12 in consecutive semesters of school. The overweight students in the class increased their step count by .78. The literature also showed that standing desks did not cause harm, have the potential for increased energy expenditure among all children, and that there is an association between classroom furniture and energy expenditure (Benden et al., 2011, Benden et al. 2014, Sherry et al., 2016). Research suggested that the environmental change to standing, sit-stand, or stand-biased desks

might improve academics, mental health, and physical health of school-aged children (Benden et al. 2014).

A study conducted by Mehta et al., (2015) revealed that stand-biased desks increased student attention and focus based upon teacher reports and perception. The same study reported a notable increase in energy and caloric expenditure among students in classrooms with stand-biased desks (Mehta et al., 2015). The Mehta et al. (2015) study also showed that stand-biased desks increased executive functioning, working memory, and cognitive performance. The increase in working memory, executive function, and cognitive performance along with brain activation was improved by 7-14% in the study. The research of the neurocognitive benefits of stand-biased desks also addressed health benefits of stand-biased desks including an increase in physical activity and energy expenditure (Mehta et al., 2015).

To increase physical activity and energy expenditure and to combat sedentary behavior, research has been conducted to determine the feasibility and benefits of an activity permissive curriculum. An activity permissive curriculum promotes physical activity throughout the school day and seeks opportunities to minimize sedentary environments within the school (Minges et al., 2016). The literature showed that one way to implement an activity permissive curriculum is to encourage time spent standing using standing desks in classrooms. According to a study by Minges et al. (2016), standing desks, "encourage more time spent standing and in light ambulatory movement, improved postural control and function, and increased muscular activity and energy expenditure" (p. 2). The impact of standing desks showed standing time increased from 26.4% to 30.6%, 24 minutes to 40 minutes longer per school and waking day. It also noted a significant decrease in sitting time from 64 minutes to 59 minutes. The implementation of standing desks also showed a higher mean step count, more calories burned, higher calorie

expenditure, and decreased pain in the students participating in the study. The increased caloric expenditure in the study showed that students burned 32 more calories per hour than prior to using the standing desks. The caloric expenditure was equivalent to 225 calories more per day, which is comparable to walking for one hour (Minges et al., 2016).

Research suggested that the classroom is an ideal setting to combat sedentary behavior because children sit for long periods during school. Evidence showed that Canadian and American children spend 60% of their waking hours sedentary and that children in the United Kingdom spend 65% of their waking hours sitting (Sherry et al., 2016). Evidence also linked sedentary behavior in childhood to children being overweight and having poor fitness as both children as adults. Sedentary childhood behavior is also associated with high cholesterol and chronic fatigue syndrome as an adult, and low academic achievement, low energy expenditure, and increased back pain as children (Hinckson et al., 2013). The literature suggested school implement standing desks, sit-stand desks, and/or stand-biased desks to combat sedentary behavior. Reviews of research showed that standing desks were not detrimental to the learning environment in schools and that children were typically enthusiastic about using standing desks in their classrooms (Hinckson et al., 2013; Sherry et al., 2016). Literature also noted that healthy students learn better than those who are overweight, obese, and lacking a healthy lifestyle (Koepp et al., 2012). Standing, sit-stand, and stand-biased desks were also associated with less sitting, and increased standing time, as well as an increase in physical activity, energy expenditure, and improvement in health (Hinckson et al., 2013; Sherry et al., 2016). In a study conducted by Koepp et al. (2012), students wore pedometers to track their step count when standing desks were implemented. The results showed the increase in steps recorded on the pedometer was up 19% when students were at standing desks as opposed to when they were in

the traditional classroom without standing desks. Though not statistically significant in the studies reviewed, there is a growing belief that positive changes in classroom behavior were evident among students using standing desks. The belief that there is a link between standing for instruction and positive changes in classroom behavior needs further exploration.

Research regarding height adjustable desks in the classroom revealed that, compared to traditional classrooms, students utilizing height adjustable desks spent 25% less time sitting and 24% more time standing (Sudholz et al., 2016). Sudholz et al. (2016) conducted a study of students in a secondary school where students were using height adjustable desks. Half of the students reported feeling more energetic across the school day when using standing desks and reported an increase in physical activity in other parts of the day. The study also indicated that students with height adjustable desks reported 20 minutes less sitting and 17 minutes more standing time than in the traditional classroom, as well as a decrease in sustained bouts of sit time. Sudholz et al. (2016) found decreasing sit time important because excessive sedentary behavior may be a health risk factor, hinder cognitive development and academic achievement, decrease physical activity, and decrease psychosocial health in both childhood and adulthood.

The literature supported the notion that height adjustable desks reduced sit time. Two-thirds of secondary students reported working well with the desks; however, one-third of secondary students reported difficulties paying attention and becoming distracted when using the desk. Note that the teachers did not report the desks being too disruptive (Sudholz et al., 2016). There is also some evidence that standing may induce musculoskeletal pain and discomfort (Sudholz et al., 2016). The majority of secondary students and teachers reported wanting to continue using the height adjustable desks after the conclusion of the study (Sudholz et al., 2016). The Sudholz et al. (2016) study of height adjustable desks in the secondary classroom

found that students who used height-adjustable desks for 24 months had higher grades than those who were in a traditional classroom. It also revealed that high school students who used sit-stand desks for 28 weeks significantly improved executive function and working memory. The research showed that the secondary school data regarding the implementation of height-adjustable desks is consistent with the primary school data, which has found that height adjustable desks have no negative effects, are feasible, may reduce sit time as compared to traditional classrooms, and may have potential to improve adolescent health by reducing sedentary behavior in schools (Sudholz et al., 2016).

2.7   SUMMARY

Standing will not replace exercise nor will it eliminate childhood obesity; however, it may alter student behavior to promote more physical activity throughout the school day and outside of school. It may encourage routines in which movement and standing become a habit. When adults in the workplace used standing desks, they reported sustaining more energy, no loss of productivity, and were more efficient and productive (Chau, 2016 & Grunseit et. al., 2013). Efficiency and productivity are indicators of on-task behaviors as are increased working memory, executive function, and cognitive performance as reported using sit-stand desks in schools (Mehta et al., 2015). Significant research showed a link between physical activity, achievement, behavior, and mental and physical health. A breadth of research also shows that adolescents are sedentary at school as well as outside of school, and the implementation of standing desks has shown positive benefits for students. While standing cannot supplant MVPA,

it may be a way for schools to address students' sedentary behavior, encourage physical activity outside of the classroom, and combat off-task behavior.

There is a growing belief that positive changes in classroom behavior were evident among students using standing desks (Koepp et al., 2012); however, literature showing a link between physical activity, specifically LMPA in the form of standing, and behavior is sparse. Behavioral research showed that different instructional formats may influence student off-task behavior (Godwin et al., 2016) and that function-based interventions may decrease off-task behavior (Schumate & Wills, 2010). A belief exists that there are positive changes in behavior when students are standing, and that instructional format and function-based interventions may decrease off-task behavior. Therefore, further research needs to explore the connection between standing for instruction and off-task behavior in a variety of instructional formats. Thus far, research has not shed light on teacher acceptance of students standing for instruction without the use of a standing desk, but for now, standing desks are not practical for generalizability because of their high cost. This study looked at a more practical, no cost, intervention of students standing for instruction.

3.0   METHODS

The question to be answered in this study is what are teacher perceptions of how standing for instruction in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games affects student off-task behavior in the middle school classroom? The teachers involved in the study had students in each of their classes stand for a minimum of 15 minutes per 42-minute class period, a minimum of three days per week for five weeks. The method of data collection used for this study was a survey of middle school teachers who instruct students in grades 6 through 8. The researcher examined teacher perceptions of student off-task behavior when students stood during instruction in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games.

Implementing standing during instruction was a change to the current practice at Mid-Atlantic Middle School. Currently, all students typically sit for the duration (approximately 42-48 minutes) of academic classes in the school. Prior to the standing intervention, data were collected on teacher perceptions of student off-task behavior in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games in a traditional classroom. Teachers then implemented the standing intervention during instruction for a minimum of 15 minutes per 42-minute class a minimum of three days per week for five weeks. At the end of each week of implementation of standing for instruction, teachers

filled out a survey regarding their perceptions of how the intervention affected student off-task behavior during a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games. After the five-week intervention period, teachers returned to a traditional classroom. Due to scheduling restraints at the end of one week in the traditional classroom, the post-intervention survey in the traditional classroom was completed five weeks after the intervention.

3.1   DESIGN OF STUDY

Teachers completed a survey about their perceptions of student off-task behavior in their classroom prior to any interventions, while students were seated in a traditional classroom. Teachers then implemented standing during instruction for a minimum of 15 minutes of each class period, a minimum of three days per week for five weeks. Teachers kept record of the dates, times, standing duration, and the lesson activity while engaging in the intervention. Teachers completed a survey about their perceptions of student off-task behavior in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games once a week for five weeks while the standing intervention was implemented. After the five-week intervention period, teachers returned to a traditional classroom. Five weeks after returning to a traditional classroom, the teachers completed the survey once again. By conducting teacher perception surveys before, during, and after the intervention, the researcher determined whether teachers perceived that standing during instruction in a variety of class activities and instructional formats affected student off-task behavior.

3.2   INQUIRY SETTING

The site of the study was Mid-Atlantic Middle School located in the Middle Atlantic region of the United States. The school enrolls 748 students in grades 6 through 8. Student demographics are 85.5% white, 11.1% Asian, 2.1% Black, 0.8% Hispanic, 0.5% other races; 5.5% of the student population is part of the National School Lunch Free and Reduced Lunch Program. The Mid-Atlantic Middle School is part of a large suburban school district that serves students in kindergarten through grade twelve. The mission of the district includes an inclusive environment to prepare students for success in a world that is constantly changing. The middle school concept at Mid-Atlantic Middle School follows the teaming model for grades 6 and 7 and the junior high model for grade 8. In the teaming model, teams comprised of approximately 125 students have the same teachers for math, science, social studies, English, reading, unified arts, music, and physical education. Eighth graders following the departmentalized junior high model have an individual schedule for each subject: math, science, social studies, English, reading, unified arts, music, and physical education. The Mid-Atlantic Middle School is part of a 1:1 technology initiative in the district, therefore each student and teacher has a district issued iPad. Teachers in the Mid-Atlantic Middle School regularly attend professional development sessions for the implementation of the iPads in the classroom to engage students in learning. The curriculum is rigorous and is updated in five-year cycles to ensure students are exposed to new trends in education. Finally, the Mid-Atlantic School District has established a wellness policy indicating district schools will provide curriculum and programs to promote and educate students about lifelong physical activity and provide opportunities for developmentally appropriate physical activity during the school day (Mid-Atlantic School District, 2015).

The Mid-Atlantic Middle School teachers attend regular meetings with their subject specific departments, grade levels, team meetings (6th and 7th grade teachers), all-staff meetings, as well as meetings for student-centered committees led by teachers in the school. The principals of the building regularly attend the meetings and work with the staff daily. The two administrators in the building observe the teachers informally a minimum of two times per year and formally two times per year every three years. The principals are typically in classrooms approximately four hours per week each week of the school year. Mid-Atlantic Middle School was selected because the researcher is the building assistant principal and has established relationships with students, teachers, families, and stakeholders. The teachers involved with the study were volunteers who were interested in participation. Middle school teachers were chosen because of the researcher's observations of students being off task and disengaged in the traditional classroom. The researcher observed sixth through eighth grade teachers on a regular basis and observed that students spending most of the class time sitting tended to be off task. Conversely, when students moved around the room, worked with an interactive board, or stood for some time during the class, they appeared to be more engaged and appeared to have better behavior.

The Mid-Atlantic School District's policy (2015) specifically describes the need for opportunities for physical activity throughout the school day, as well as the promotion of lifelong physical activity. The policy also creates a link between education and physical activity, which encourages developmentally appropriate physical activity during the school day. The wellness policy provides a framework for combating sedentary behavior in the classroom and is an opportune environment for the implementation of interventions aiming to reduce sitting, thus standing for instruction (Sherry et al., 2016).

3.3   PARTICIPANTS

The participants were a group of teacher volunteers who are employees of Mid-Atlantic Middle School. There are currently 71 teachers at Mid-Atlantic Middle School whose ages range from 23 to 63 years; the median age is 38. Each teacher holds a Bachelor's Degree in Education and a teaching certificate from the state of Pennsylvania. Teachers were recruited to participate in the study during a staff meeting in October of the 2017-18 school year. The researcher read the recruitment script (see Appendix A) to the entire middle school staff of teachers to solicit volunteers to be a part of the study. All 12 teachers who volunteered to be a part of the study were accepted. Of the 12, seven participants saw the study through to fruition; therefore, results from those seven teachers were included in the study. Teachers who participated in the study implemented the standing intervention with students in their classes by having students stand for instruction for a minimum of 15 minutes per 42-minute class period a minimum of three days per week for five weeks. The researcher held a meeting with the participants on Thursday, October 19, 2017 to review the expectations of the study, to provide the teachers with information regarding what constituted off-task behaviors, and to define "standing" (see Appendix B).

3.4   MEASURES

The method used to collect data for the study was a survey. Survey research is defined as "the collection of information from a sample of individuals through their responses to questions" (Check & Schutt, 2012, p. 160). The survey method allowed for various ways of data collection as well as for participants to answer a variety of questions (Pronto, 2015). Unlike other methods

of data collection, survey allowed for contingency questions as well as open-ended questions for participants to self-report and reflect.

The teacher perception survey was done via a web-based using the University of Pittsburgh Qualtrics system. Mertens (2015) described the convenience of web-based surveys and their ability to reach a broad number of people and accommodate participants as well as researchers. Mertens (2015) also acknowledged that the use of surveys has become increasingly popular; therefore, there are more resources available for survey analysis.

The study used similar instrumentation as in Chen, McCray, Adams, and Leow (2014), where teachers responded to surveys using a five-point Likert scale for each survey statement. The survey questions were presented in a side-by-side table using a five-point Likert scale rating the answers as none, a few, half the class, most of the class, and all of the class (see Appendix C). The questions were designed to prompt responses of teacher perceptions of student off-task behavior in the past week during the following class activities and instructional formats: lecture, individual class project/activity, group project/activity, and game.

Teachers were also asked to share any additional perceptions they had regarding student behavior during the week through an open-ended response question. Additionally, teachers were asked to share anything else about their experience of having students stand for instruction during the week (see Appendix C).

Finally, teachers were asked multiple-choice questions regarding how many days and minutes per week students were asked to stand. The final multiple-choice question in the survey asked teachers to report how many students declined to stand for instruction when asked to do so.

3.5   DATA ANALYSIS

The survey included Likert-type, close-ended questions assessing teacher perceptions of student off-task behavior while standing for a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games. The categorical data were analyzed in bar graphs of the average of the five weeks of data gathered while teachers implemented the intervention and compared with the responses prior to the intervention and after the intervention. The data were reported using bar graphs for each individual teacher response. The data charts showed the student participation information reported by teachers for seven weeks, including pre- and post-intervention data.

Student participation data by number of class periods standing are illustrated in Figure 1.
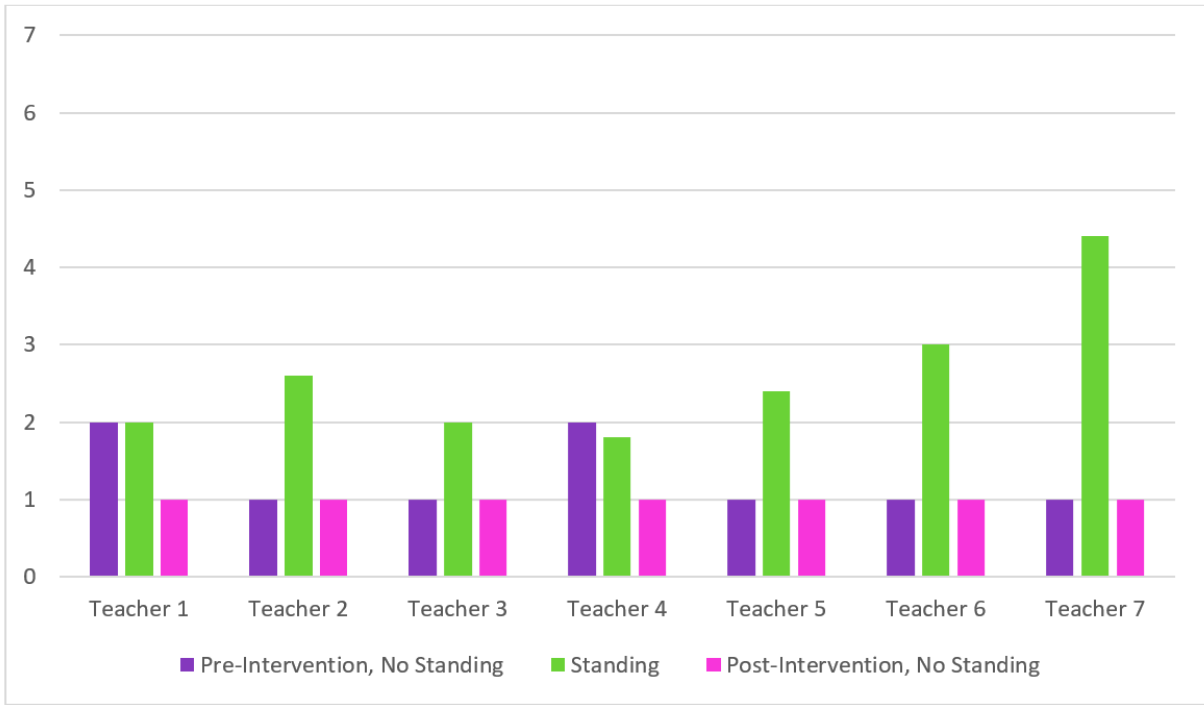
Chart Key:
1=0 class periods
2=1-5 class periods
3=6-10 class periods
4=11-15 class periods
5=16-20 class periods
6=21-24 class periods
7=25 class periods

Figure 1. Class Periods Standing

Student participation data by minutes per class period standing are shown in Figure 2.
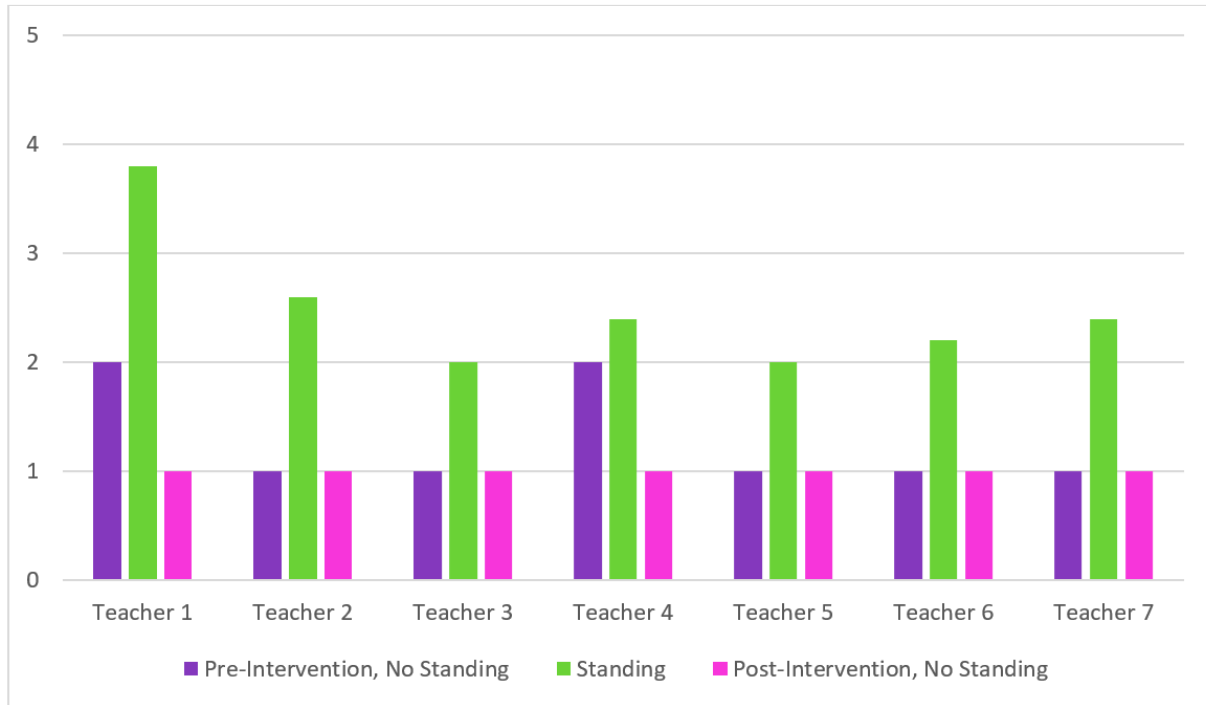
Figure 2. Minutes Per Class Period Standing

Student participation data for students declining to stand for instruction are illustrated in Figure 3.
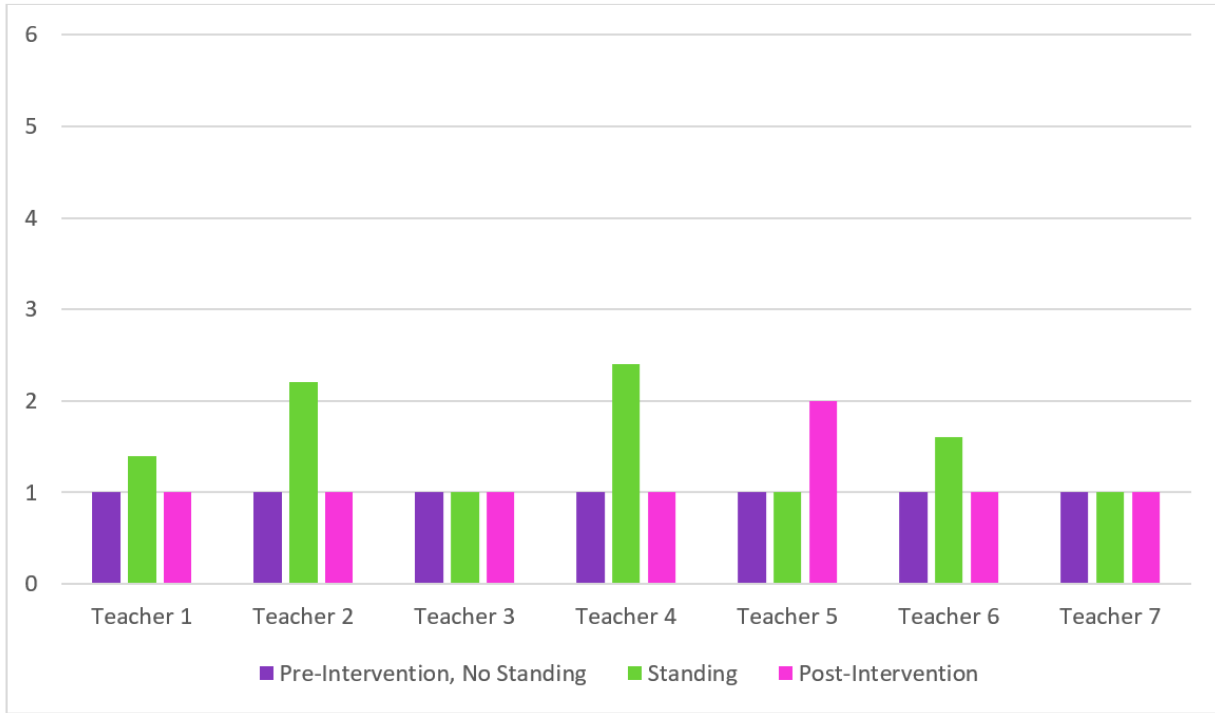
Figure 3. Declining to Stand for Instruction

Teacher perception data for off-task behavior and number of students who left the room during each instructional format (i.e., lecture, individual in-class activity, group in-class activity, and game) are shown in Figures 4-11.
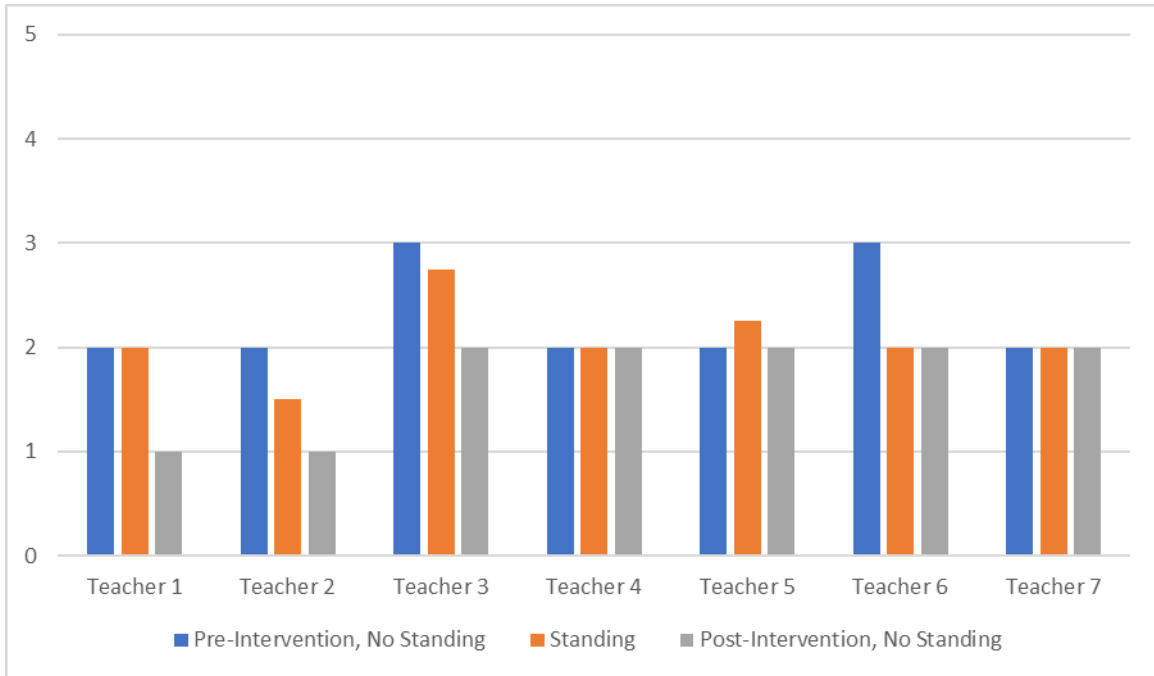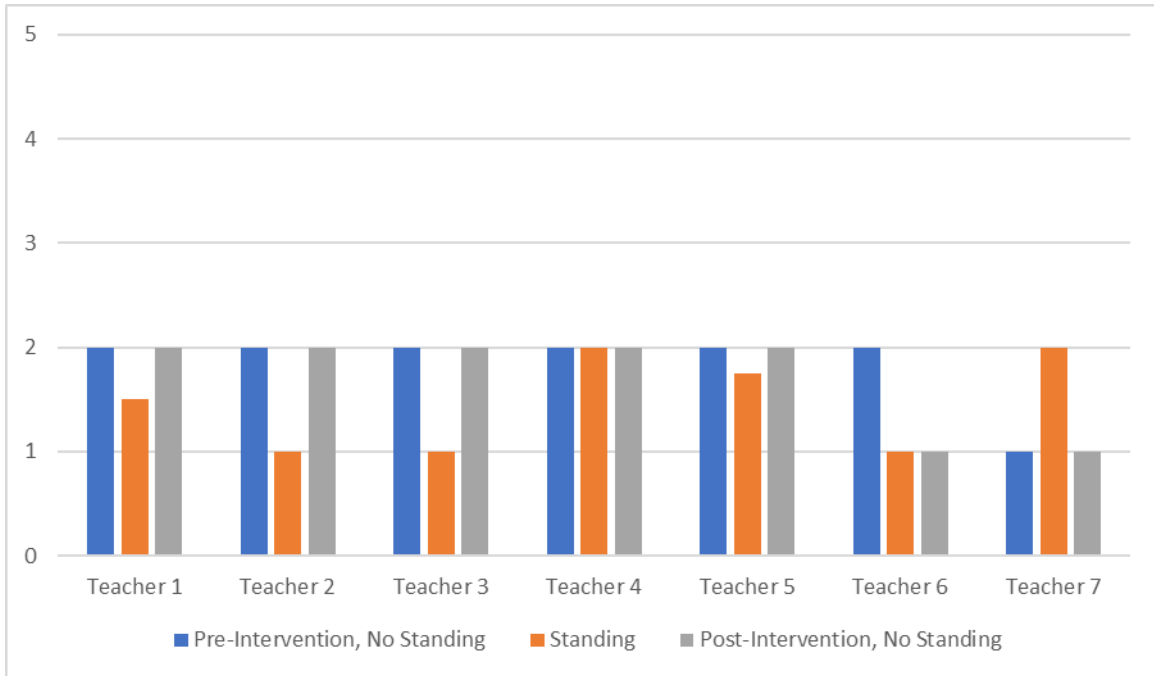
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 4. Lecture Off-Task Behavior
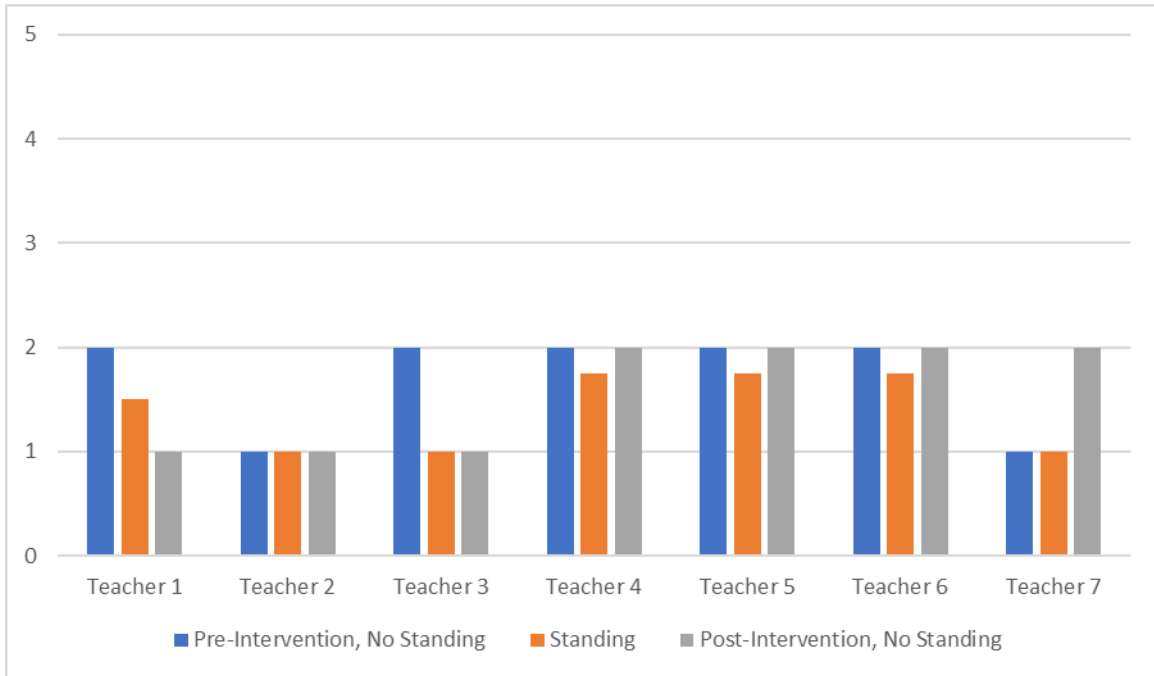
Figure 5. Lecture Students Who Left the Classroom
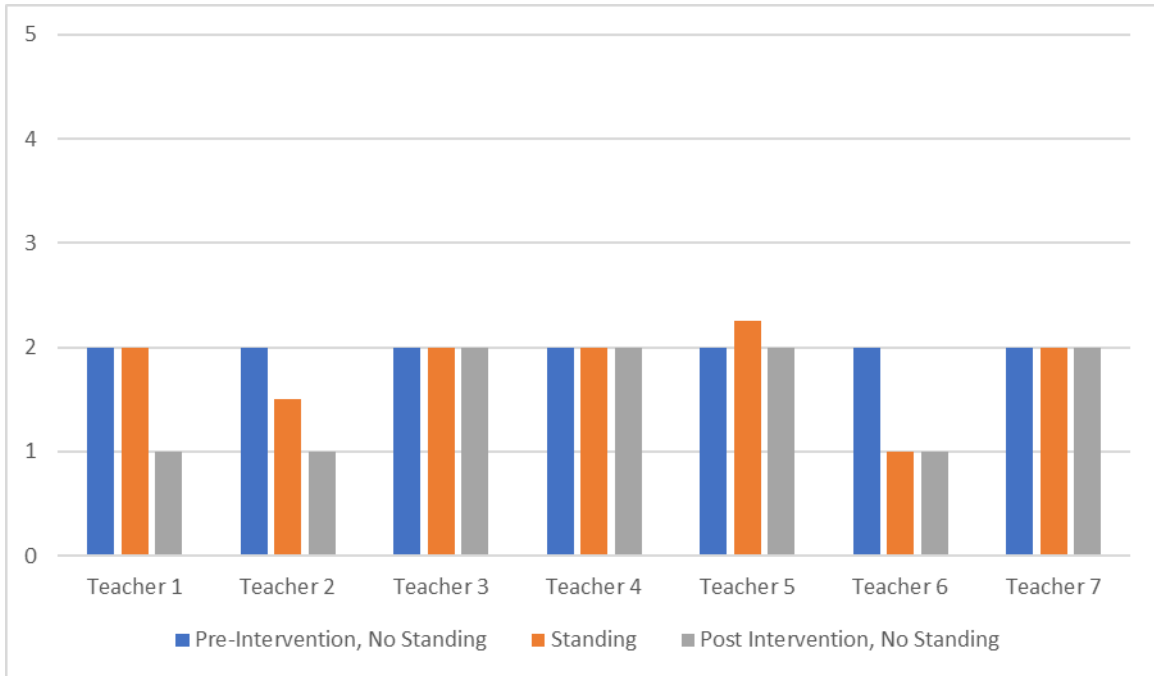
Figure 6. Individual In-Class Activity Off-Task Behavior

Figure 7. Individual In-Class Activity Students Who Left the Classroom

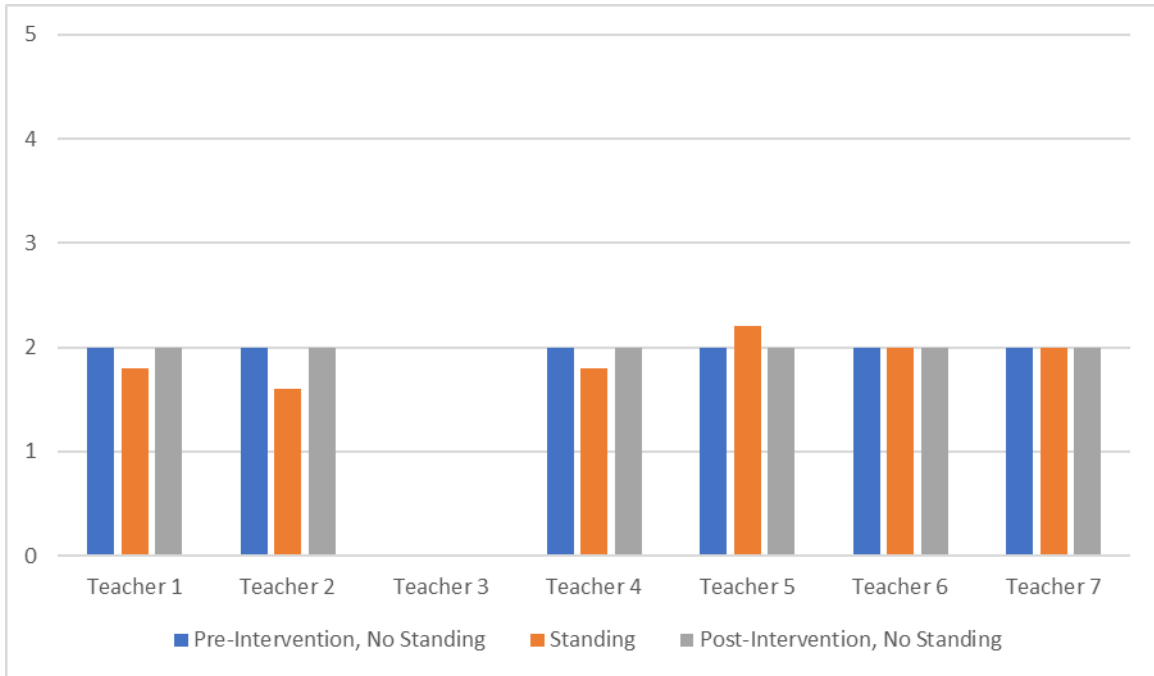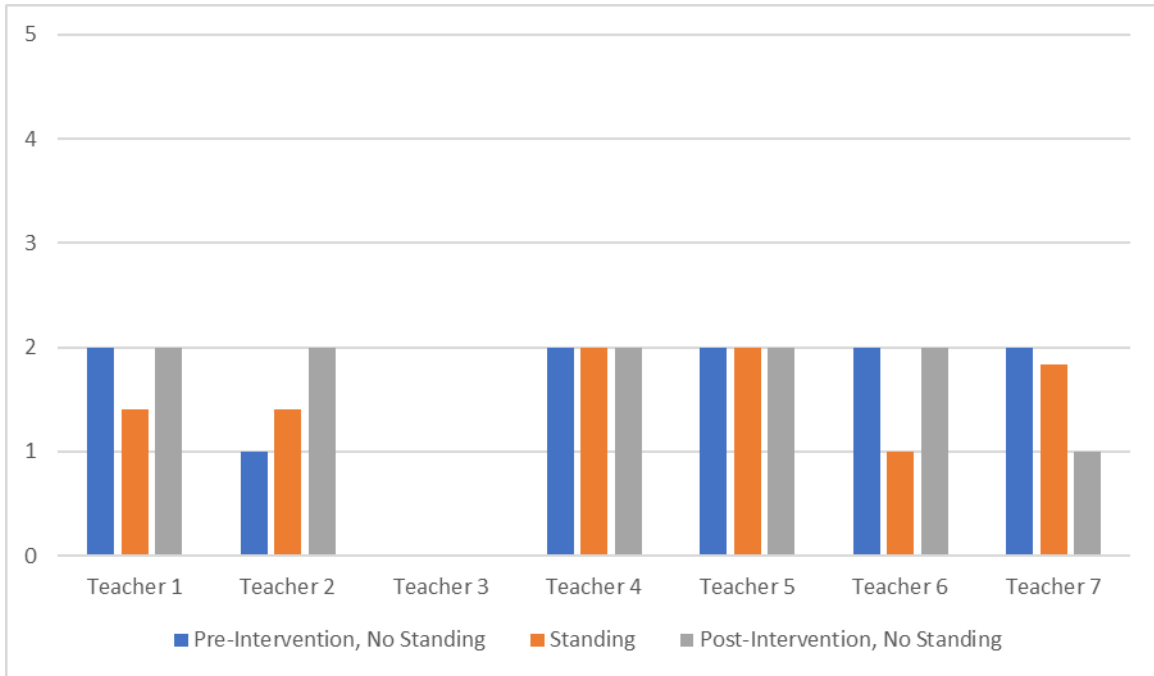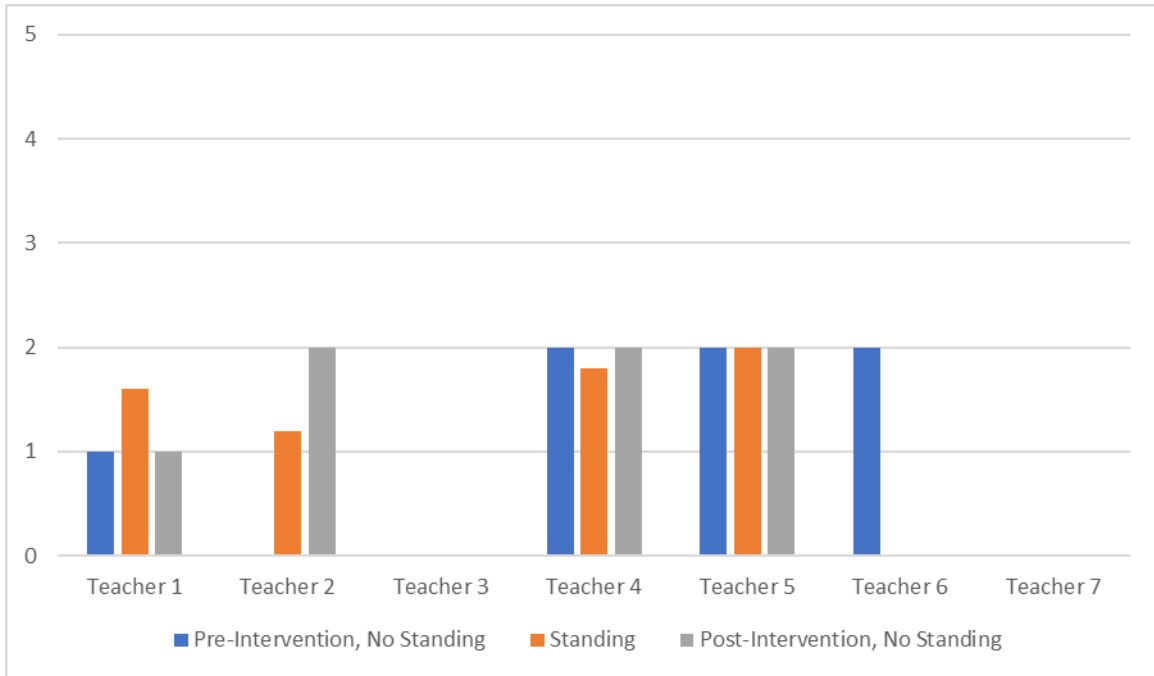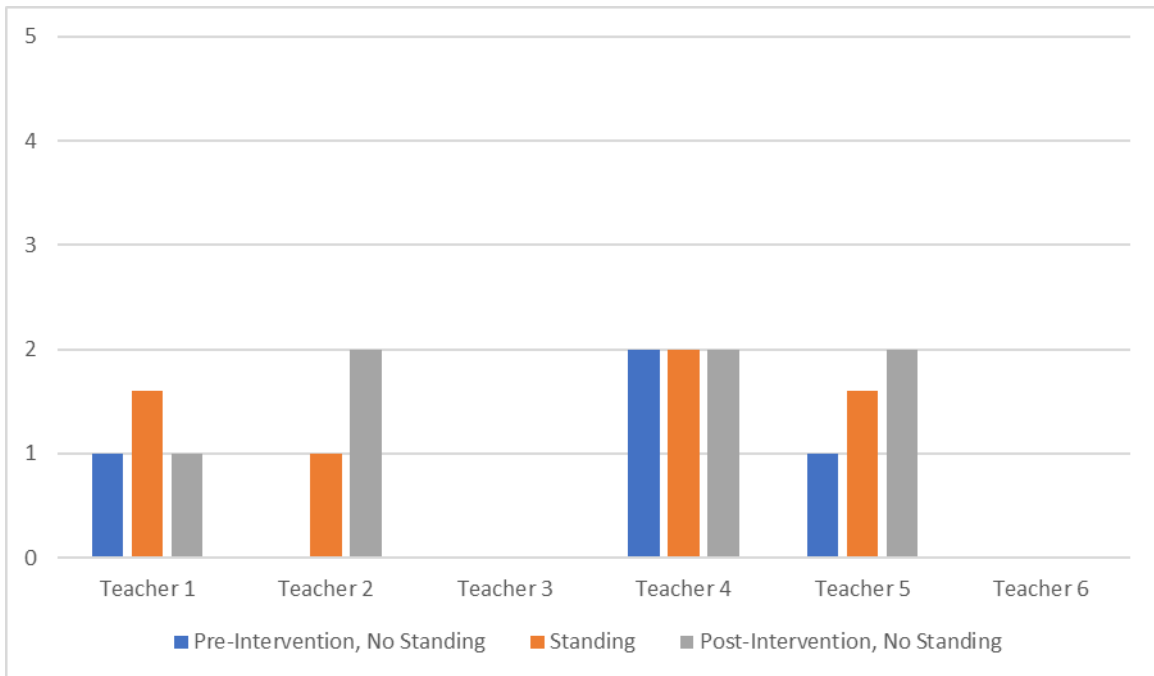**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 8. Group In-Class Activity Off-Task Behavior

Figure 9. Group In-Class Activity Students Who Left the Classroom

Figure 10. Game Off-Task Behavior

Figure 11. Game Students Who Left the Classroom

4.0   FINDINGS

The aim of this study was to determine middle school teacher perceptions of how standing for

instruction affects student off-task behavior in the middle school classroom. The teachers

involved in the study had students in each of their classes stand for a minimum of 15 minutes per

42-minute class period, a minimum of three days per week for five weeks in a variety of class

activities and instructional formats including lecture, in-class project/activity, group

project/activity, and games. The method of data collection used for this study was a survey of

middle school teachers who instruct students in grades 6 through 8. The findings presented in

this section are categorized first by teacher, then by instructional mode used in the classroom.

The researcher looked for a pattern of behaviors displayed by middle school students when asked

to stand for instruction. The analysis found that the behaviors varied by teacher, subject,

instructional technique, and classroom design. Each teacher's unique experience resulted in

different outcomes.

4.1   INDIVIDUAL TEACHER DATA

Each teacher's survey results for their perceptions of student off-task behavior by instructional

format are presented below. Each teacher answered for specific off-task behaviors including, but

not limited to, talking out, moving out of the "standing zone" (i.e., approximately 2 square feet

of space behind the student's desk where a chair would typically be placed), playing with objects, disruptive noises, talking to peers, tapping pens/pencils, visiting any unapproved sites or games on the iPad, reading a book unrelated to the lesson, sleeping, completing work for another class, looking at a phone or other non-approved electronic device, wearing headphones, daydreaming (i.e., averting eyes from instructional material), singing, humming, talking to self, or engaging in off-topic conversation with peers in a group. Teachers also reported on the number of students leaving the classroom, excused or unexcused, during the standing intervention.

4.1.1   Teacher 1 findings

The perceptions of Teacher 1 show that students were slightly more on task during all instructional formats (i.e., lecture, individual in-class activity, group in-class activity, and game) when they were asked to stand than when they were seated in a traditional classroom as shown in Figure 12.
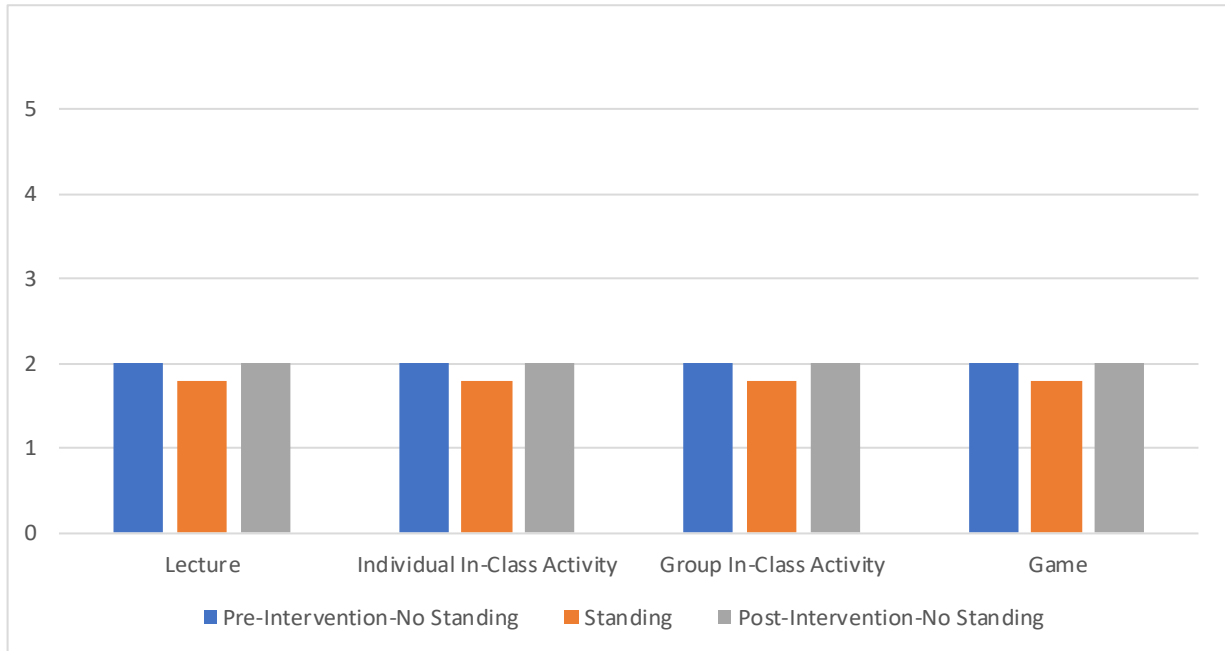
Figure 12. Teacher 1 – Off-Task Behavior

Teacher 1 reported that students enjoyed standing and were more attentive when standing during instruction, but that they did tend to lose eye contact and began to rock, shift, and lean after standing for longer than about 10 minutes. Teacher 1 also stated that since the standing intervention and data collection, the teacher now provides the students with an option to stand for instruction and about half of the students stand daily. It should be noted that the classroom is designed with four tables and the design of the other classroom furniture accommodates and encourages standing. Teacher 1 also noted that during the week 7 post-intervention when students were not asked to stand, about half of the class asked if they could stand.

While Teacher 1's data for students' off-task behavior were consistent for each instructional format, the number of students leaving the classroom was different as shown in Figure 13.

Figure 13. Teacher 1 – Students Who Left the Classroom

The number of students leaving the classroom during the instructional formats of lecture, individual in-class activity, and group in-class activity decreased; however, the number of students leaving the class during a game increased when standing for instruction.

4.1.2   Teacher 2 findings

The findings for Teacher 2 show a reduction in off-task behavior in the instructional modes of lecture, individual in-class activity, and group in-class activity when students were standing as shown in Figure 14.

Figure 14. Teacher 2 – Off Task Behavior

No pre-intervention data were collected in the game category for Teacher 2. During pre-intervention week, a game was not part of the lesson plan for any of her classes; however, when compared to the post-intervention week when students were seated in a traditional classroom, the data showed a reduction in off-task behavior when students engaged in a game while standing.

69

The data for students leaving the classroom varied by instructional format for Teacher 2. The individual in-class activity data showed that no students left the classroom while standing for instruction, but when seated, a few students left the classroom in both the pre- and post-intervention. No students left the room while standing for the lecture format, nor did they leave the room during the pre-intervention. During the post-intervention, however, data showed that a few students left the classroom during the lecture instructional format.
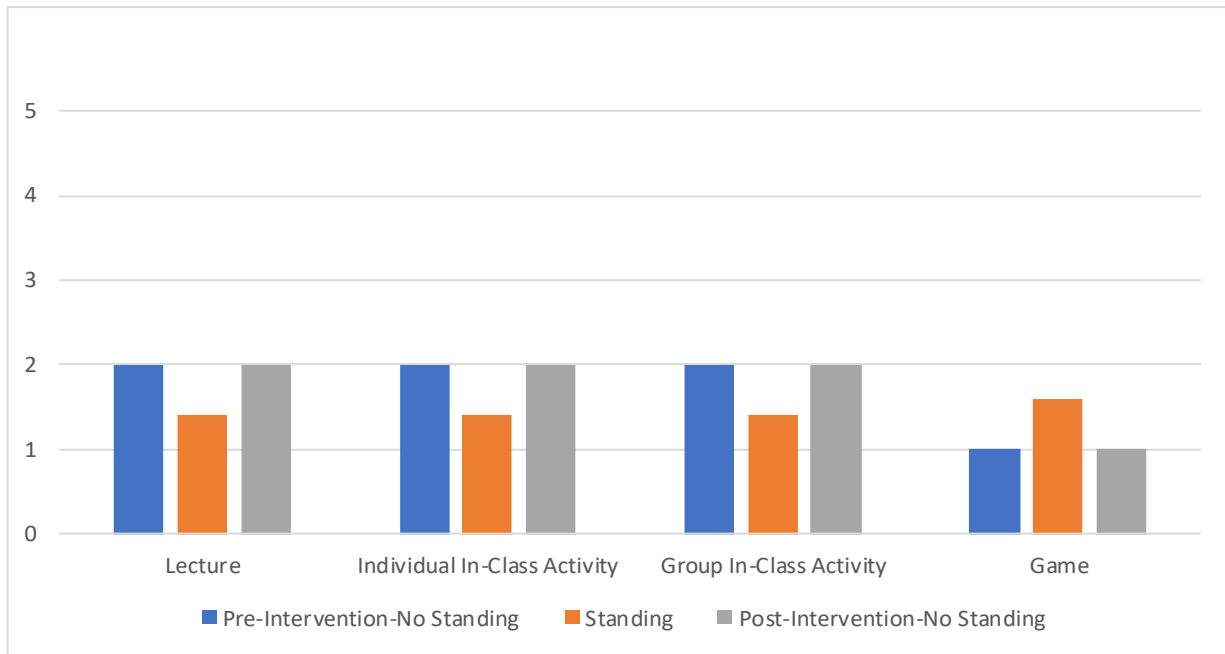

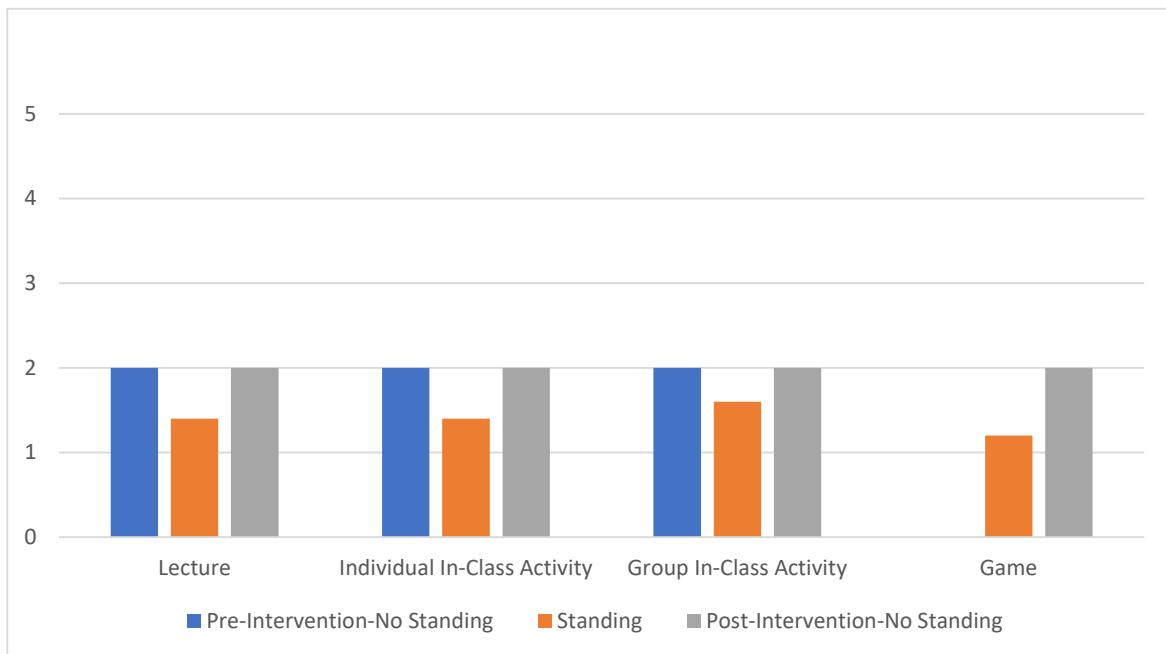**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 15. Teacher 2 – Students Who Left the Classroom

Teacher 2 data for the group in-class activity showed a gradual increase in students leaving the classroom before, during, and after the standing intervention. Though the increase in students leaving the classroom was small, it is notable. The standing intervention and post-

intervention data for the game format show an increase from no students leaving the room during the intervention to a few students leaving the room during the post-intervention week.

During the first week of the standing intervention, Teacher 2 reported that the student "standing area" (i.e., approximately 2 square feet of space behind the student's desk where a chair would typically be placed) was a challenge for the very active students in the class. In addition, the class excitement for standing was a bit of a challenge. During week 4, Teacher 2 reported that some of the taller students seated in the front became a problem for shorter students in the back of the room, but the teacher quickly addressed the issue. Teacher 2 also indicated some students slowly dropped to their knees as the standing duration became longer and that they were "thrilled" when they were permitted to sit after standing for 25 minutes. The teacher reported that the low tables in the classroom were uncomfortable for the students when asked to take notes, work, or read while standing. Teacher 2 stated, "If the tables/desks were higher, I think standing would be ideal."

Because of participation in this study, Teacher 2 reported working on flexible seating and standing options for students in their classroom. The teacher believes that the option of standing had a positive impact on student behavior in the class. Since the conclusion of the study, the teacher has been providing students with an option to stand if they so desire. Since the conclusion of the study, Teacher 2 reports fewer incidents of off-task behavior from the students who regularly opt to stand for instruction.

4.1.3 Teacher 3 findings

Teacher perception findings for Teacher 3 were available for lecture and individual in-class activity, but not for group in-class activity or game. Because of the nature of the discipline

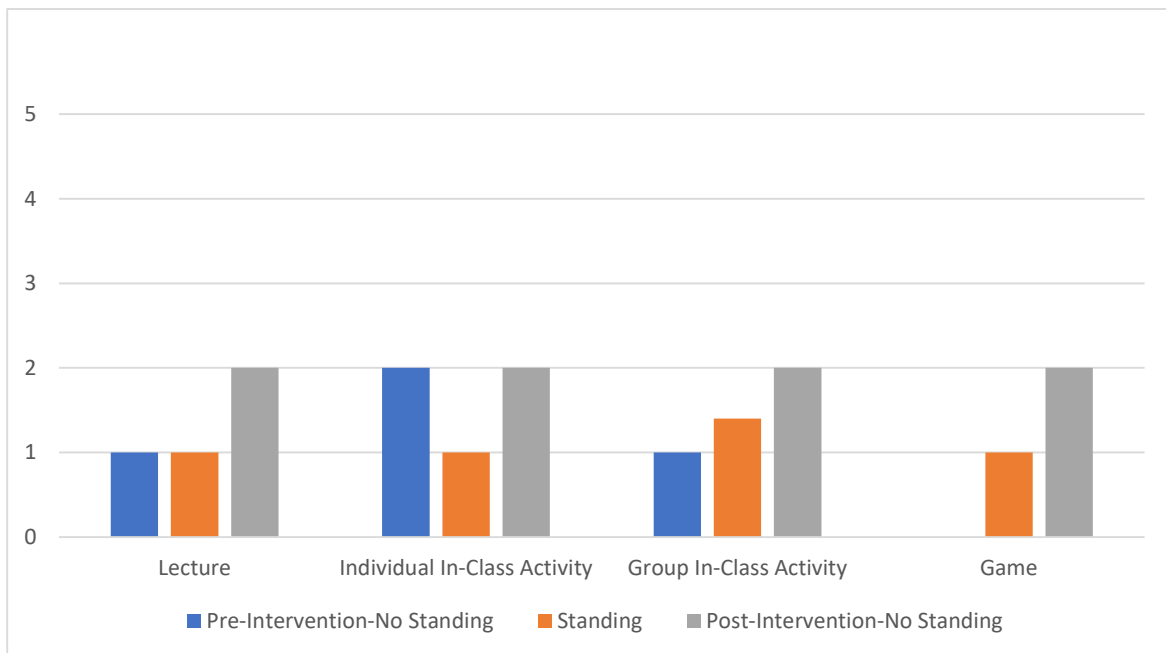Teacher 3 teaches, the teacher rarely uses the game or group in-class activity format as shown in

Figure 16.

Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class
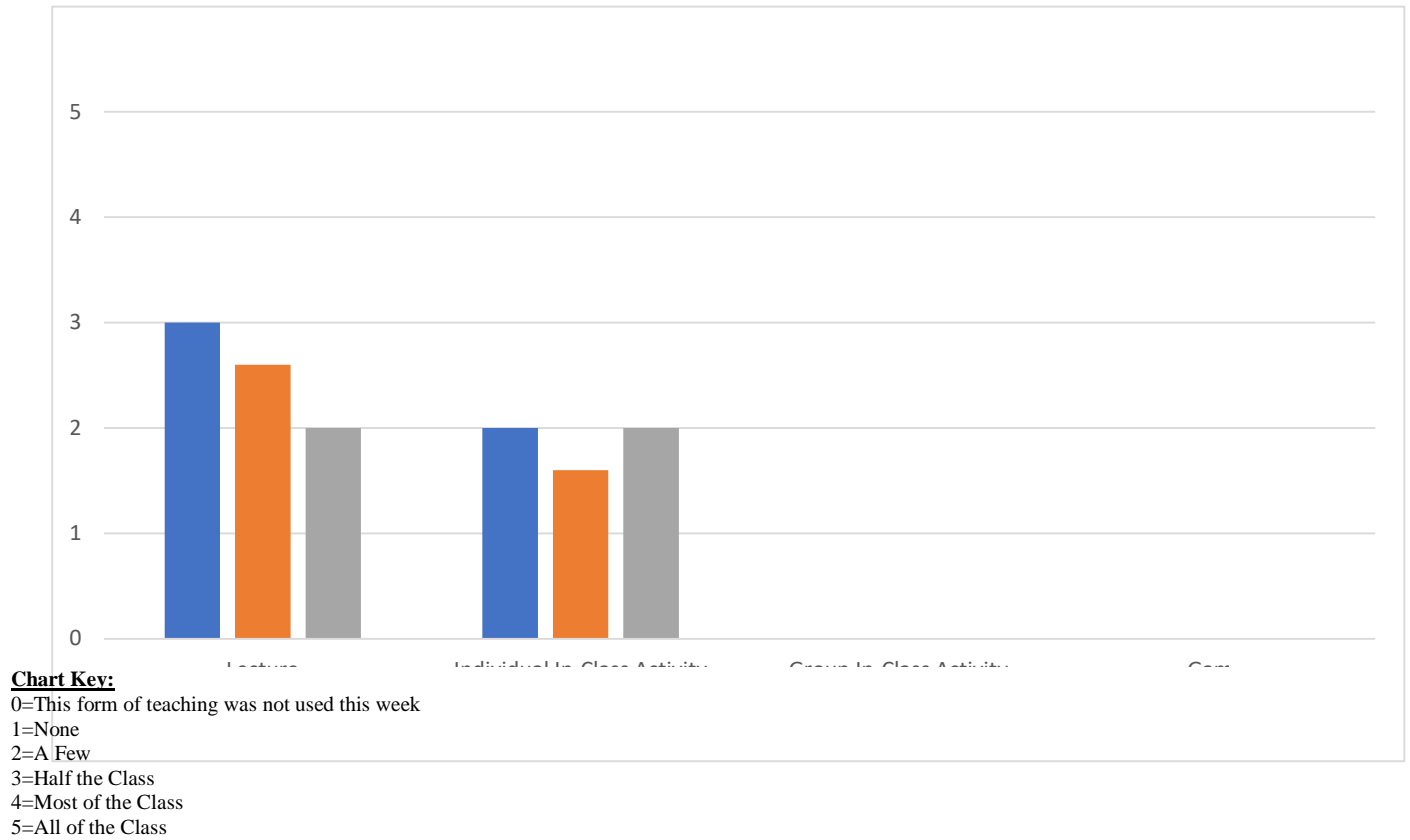
Figure 16. Teacher 3 – Off-Task Behavior

Teacher 3's perception of off-task behavior in the lecture format decreased from half the

class during the pre-intervention, to just over a few during the intervention period of standing,

then decreased to a few during the post-intervention. The off-task behavior during the individual

in-class activity decreased from a few students during the pre-intervention to no students off task

when they were engaged in the standing intervention. During the post-intervention, a few

students were reported as off task again.

Students leaving the classroom during the lecture format were reported as a few during the pre-intervention and none during the standing intervention as well as during the post-intervention week. For the individual in-class activity instructional format, no students left the classroom during the standing intervention; however, a few students left the classroom during the pre- and post-intervention weeks as shown in Figure 17.
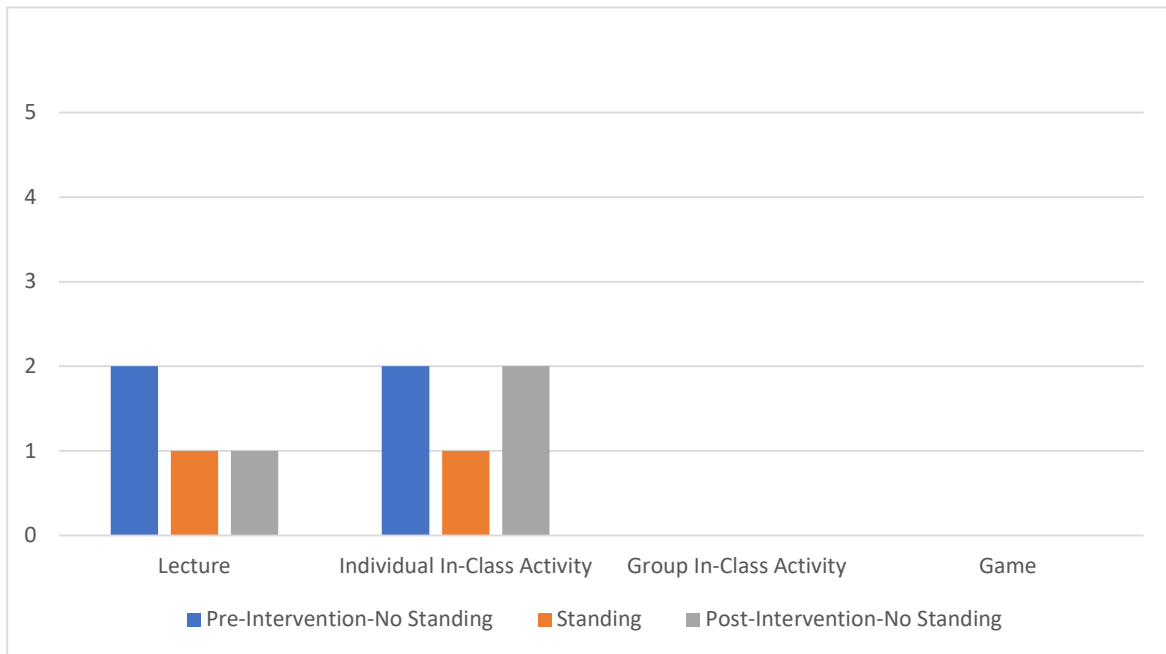
Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 17. Teacher 3 – Students Who Left the Classroom

During the pre-intervention, Teacher 3 stated, "I am hopeful that standing for a period of time will provide students with some sensory stimulation while increasing time on task for my students." During week 2, the first week of the standing intervention, Teacher 3 reported that standing would take some time with certain students who are easily distracted because they had a

hard time staying on task while standing. The hope during week 2 was that the standing would become "routine" and students would be more focused. During week 3, the teacher reported that having standing height tables or podiums would be helpful and more effective for students because many of them were placing a knee on the stools, leaning, and calling out. Teacher 3 reported frequent redirecting during week 3. As the study progressed into week 4, Teacher 3 reported students were complaining less and were "getting better standing unassisted." By week 5, Teacher 3 reported some students voluntarily standing while working. Teacher 3 also commented that standing during a lecture is challenging without desks at standing height because the students needed to bend down to complete notes and other written tasks.

4.1.4   Teacher 4 findings

Teacher 4 perceived no change in student off-task behavior during the instructional formats of lecture and individual in-class activity throughout the study. During the pre- and post-intervention as well as during the standing intervention, the data showed a few students were off task during lecture and individual in-class activity. The data for the instructional formats of group in-class activity and game for Teacher 4 indicated a slight drop in off-task behavior while students were engaged in the standing intervention. Figure 18 shows Teacher 4 perceptions of student off-task behavior.

Figure 18. Teacher 4 – Off-Task Behavior

Teacher 4 commented that the on-task and off-task behaviors for both standing and sitting were similar, but during the first week of the standing intervention, students were more off task than normal and, when asked to stand, the class was more "wound up" than normal. However, the teacher noted that the students who typically fidget when sitting were more on task and less "fidgety" when they stood for the intervention. Given the opportunity to stand, those who chose to stand were less off task than they were prior to the intervention. Teacher 4 also reported it was difficult for students to be bent over to write and suggested that if students had a desk where they could stand to complete the work there may have been fewer students declining to stand.

Since participating in the study, teacher 4 has provided students with an option to stand for instruction during all instructional formats. Teacher 4 reports that the students who "need it" stand and are less off task than they were prior to the study.

Figure 19 shows Teacher 4 data for students leaving the classroom.
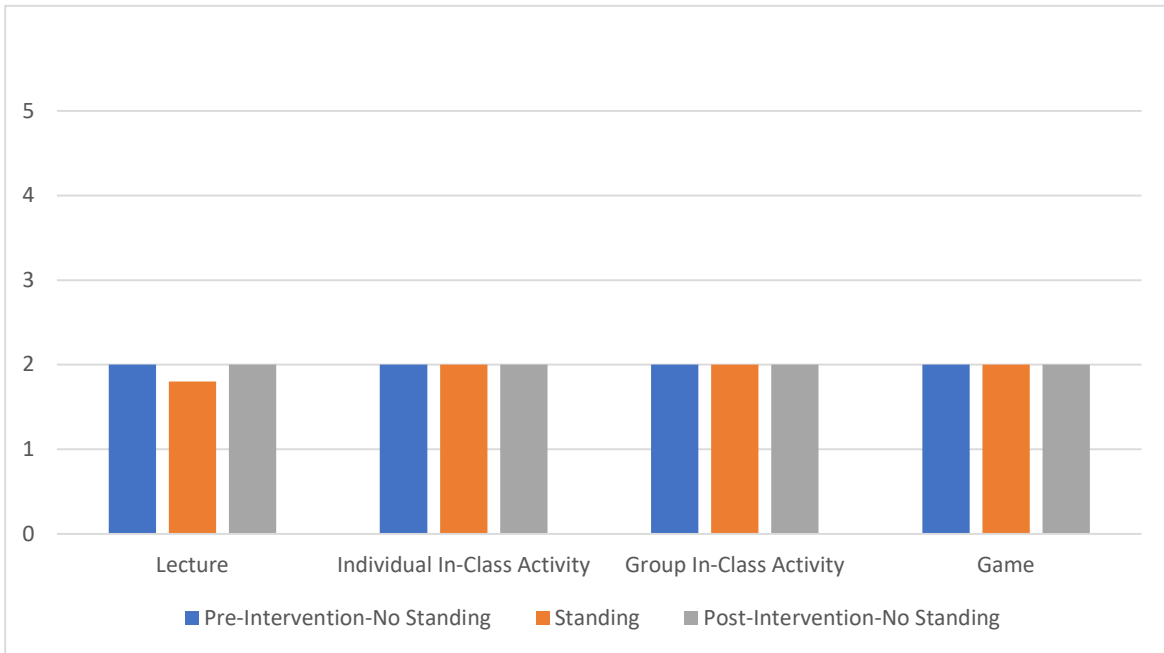
Figure 19. Teacher 4 – Students Who Left the Classroom

The data for Teacher 4 showed that during the instructional formats of individual in-class activity, group in-class activity, and game a few students left the classroom during the pre- and post-intervention as well as during the standing intervention. There was a slight drop in student hall pass use during the lecture instructional format as shown in Figure 19.

4.1.5 Teacher 5 findings

Data for Teacher 5 findings are shown in Figure 20.

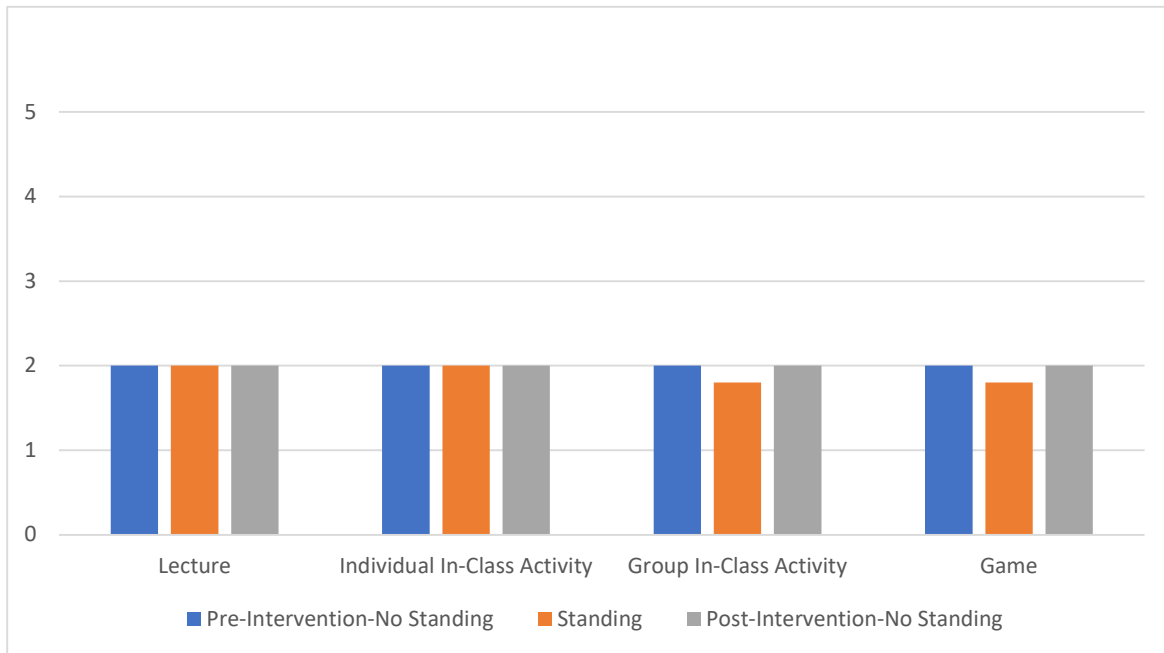**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 20. Teacher 5 – Off-Task Behavior

Teacher 5 data for the instructional formats of lecture, individual in-class activity, and group in-class activity, show a slight increase in off-task behavior during the standing intervention. The off-task behavior data for the game format prior to the intervention as well as during the intervention of standing were the same; a few students were off task. No data were collected during the post-intervention because the game instructional format was not used during week 7.

Teacher 5 reported some students complained when asked to stand, but others were happy to stand. The teacher also reported that some students were much more focused when standing and for a brief time after standing as well, but others were more off task when standing. Teacher 5 noted the desire for the classroom to have the capabilities for students to stand and work during different times of the day. Teacher 5 commented that some students could focus better on assignments and follow along during reading assignments when they were standing. For some students, standing improved their overall focus and behavior, but for others it was a distraction and off-task behaviors slightly increased. Finally, Teacher 5 noted that fewer students wanted to use the hall pass when standing for instruction.

Data for students leaving the class for Teacher 5 are shown below in Figure 21.
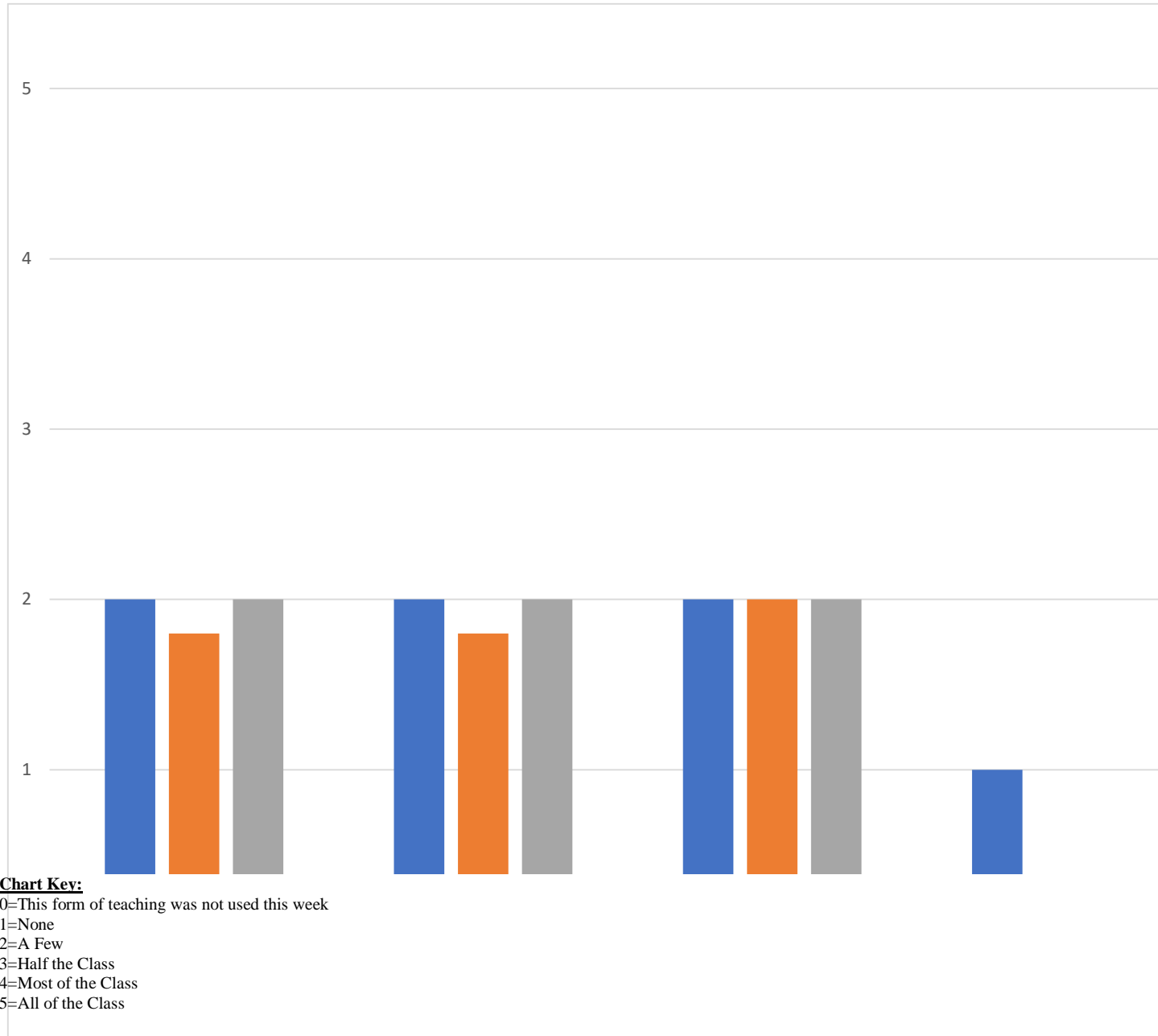
Figure 21. Teacher 5 – Students Who Left the Classroom

The number of students leaving the classroom decreased during the standing format for the instructional formats of lecture and individual in-class activity. A few students left the classroom during the pre- and post-intervention for lecture and individual in-class activity, but slightly fewer students left the classroom during standing intervention. The number of students

leaving the classroom during the group in-class activity stayed consistent at "a few" throughout the standing intervention as well as during the pre- and post-intervention. The number of students leaving the classroom during the game format increased during the standing intervention when compared with the pre-intervention week. The game format was not used in the post-intervention week.

4.1.6   Teacher 6 findings

Teacher 6 off-task behavior findings are illustrated in Figure 22.
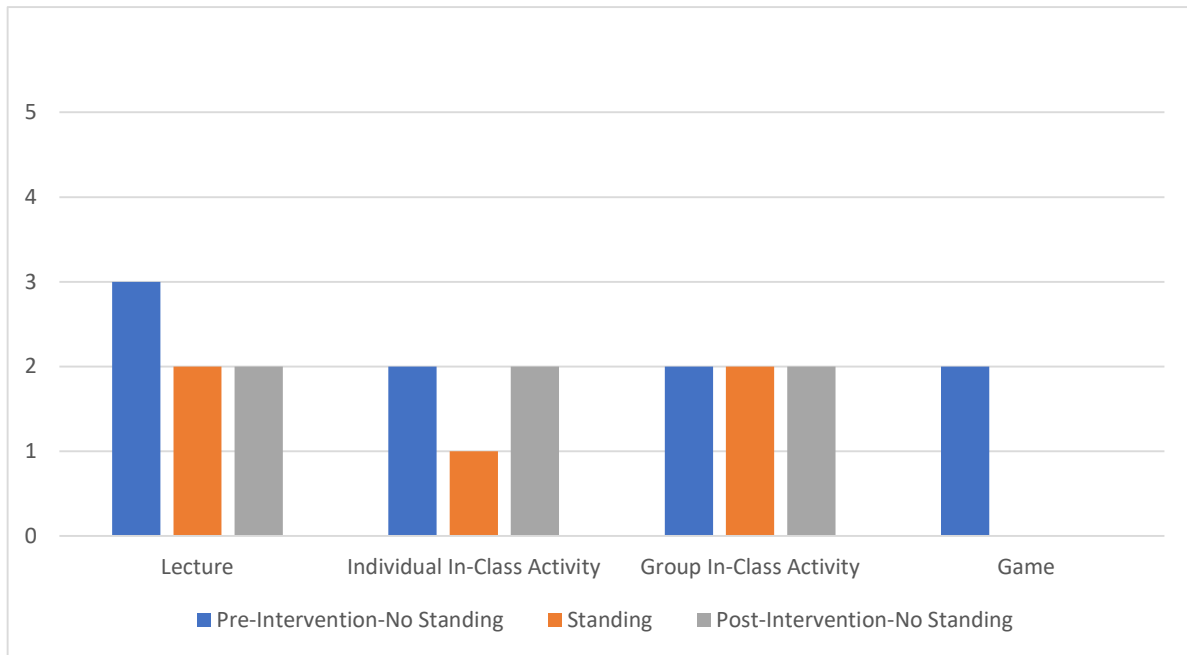
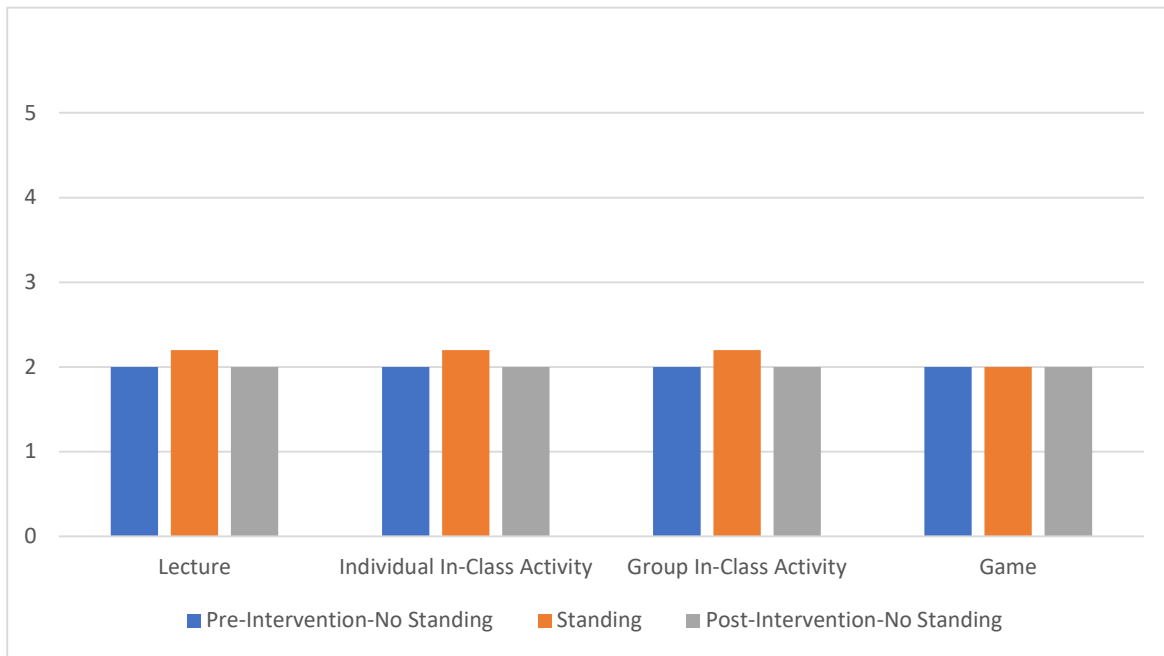**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 22. Teacher 6 – Off-Task Behavior

The data for Teacher 6 for the instructional format of lecture showed a decrease in off-task behavior from the pre-intervention week (where half of the class was off task) to a few students off task during the standing intervention and during the post-intervention week. The data showed a decrease in off-task behavior during individual in-class activities while students were standing for instruction. The pre- and post- intervention data showed a few students off task during individual in-class activities; however, no students were off task during the standing intervention. During the group in-class activity, a few students were consistently off task during the pre- and post-intervention weeks and during the standing intervention. The instructional format of a game was only used during the pre-intervention week; therefore, no data exists for the intervention or post-intervention weeks.

During week 3, Teacher 6 reported noticing that the morning classes were more focused and on task during the standing intervention and that her afternoon classes (after lunch) were more "silly" and "distracting" by asking a lot of "silly" questions while and about standing. During week 4, the teacher noted the students were more enthusiastic for right and wrong answers and showed more dramatic "whole body" reactions to excitement and disappointment while students were standing. Teacher 6 also reported that the actual implementation of standing in the classroom was easier for her during group activities than during lecture. Teacher 6 would love to see a combination of a seated desk and standing desk in the classroom; students have requested to stand because they found they were better able to focus when standing. However, Teacher 6 would like to have standing height desks.

At the end of week 6, Teacher 6 reported that the biggest obstacle to implementing the standing intervention was the physical environment of her classroom, specifically, the space between desks. The teacher noticed students would sway or "2-step" while standing and

sometimes would interfere with the personal space of their classmates. Teacher 6 noted that the physical makeup of the classroom (i.e., the absence of a standing desk) made it "tricky" to have students standing at times because they would try to balance their iPads in their hands or would "hunch over" at their desk to view the iPad or write answers. Teacher 6 reported that since the conclusion of the study, students have requested to stand during class.

The data collected by Teacher 6 regarding students leaving the class are shown in Figure 23.

Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 23. Teacher 6 – Students Who Left the Classroom

The number of students leaving the room during the standing intervention for the lecture instructional format was slightly lower than those who left the room during the pre- and post-

intervention weeks. The individual in-class activity format data showed a decrease in students leaving the classroom from a few during the pre-intervention to none during the standing intervention and post-intervention weeks. Students leaving the classroom data showed a few students leaving the classroom for the group in-class activity for the pre- and post-intervention, but no students leaving the classroom during the standing intervention. Data for the instructional format of a game were only collected during the pre-intervention week because the game format was not used during the intervention weeks nor was it used during the post-intervention weeks.

4.1.7   Teacher 7 findings

The off-task student data for Teacher 7 in the instructional formats of lecture, individual in-class activity, and group in-class activity are consistent for pre- and post-intervention as well as during the standing intervention. For all 7 weeks of the study, a few students were off task during Teacher 7's classes as shown in Figure 24. Teacher 7 does not use games as an instructional format due to the nature of the subject area.
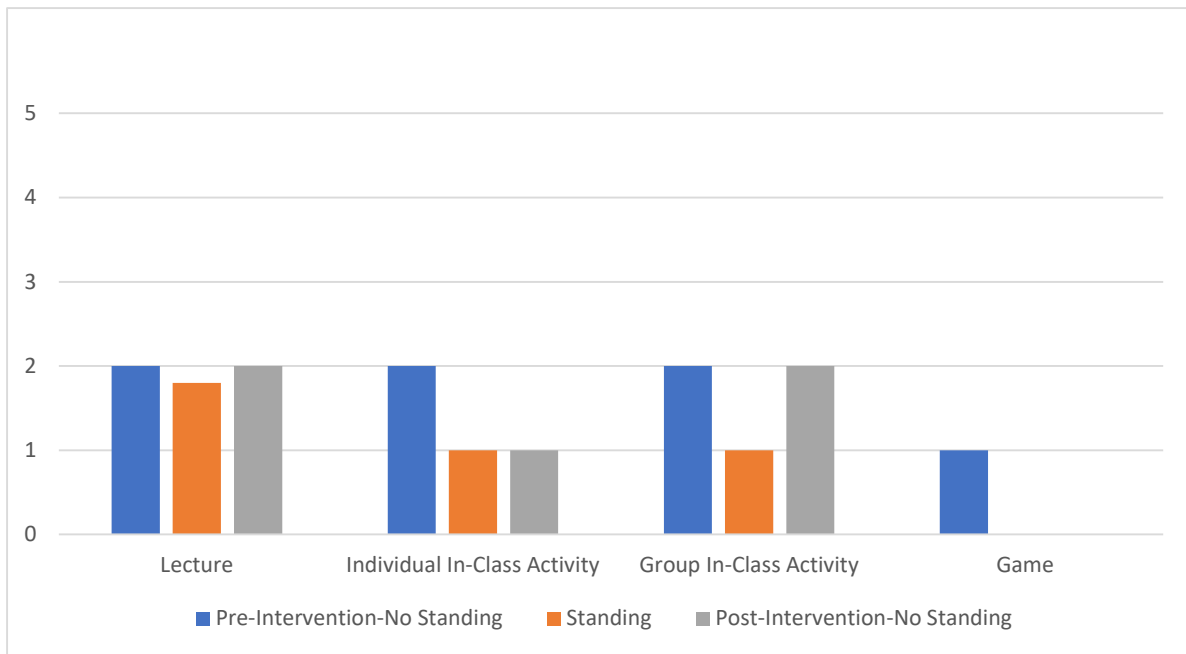
Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 24. Teacher 7 – Off-Task Behavior

Teacher 7 reported that standing caused a lot of fidgeting and may have caused students to lose focus; this was especially evident with the boys. The teacher also noted that the students, especially the boys, tended to look down, lose eye contact, and rock from side to side while they were standing. Other than the increase in hall pass usage, the teacher reported there were no issues with the standing intervention and that the students quickly adjusted to the change. Teacher 7 also noted that the first period class reacted best to the standing as it "seemed to wake them up" and there was an increase in effort. Teacher 7 believed a combination of sitting and standing served the students well.

Data collected by Teacher 7 concerning students leaving the classroom are illustrated in Figure 25.
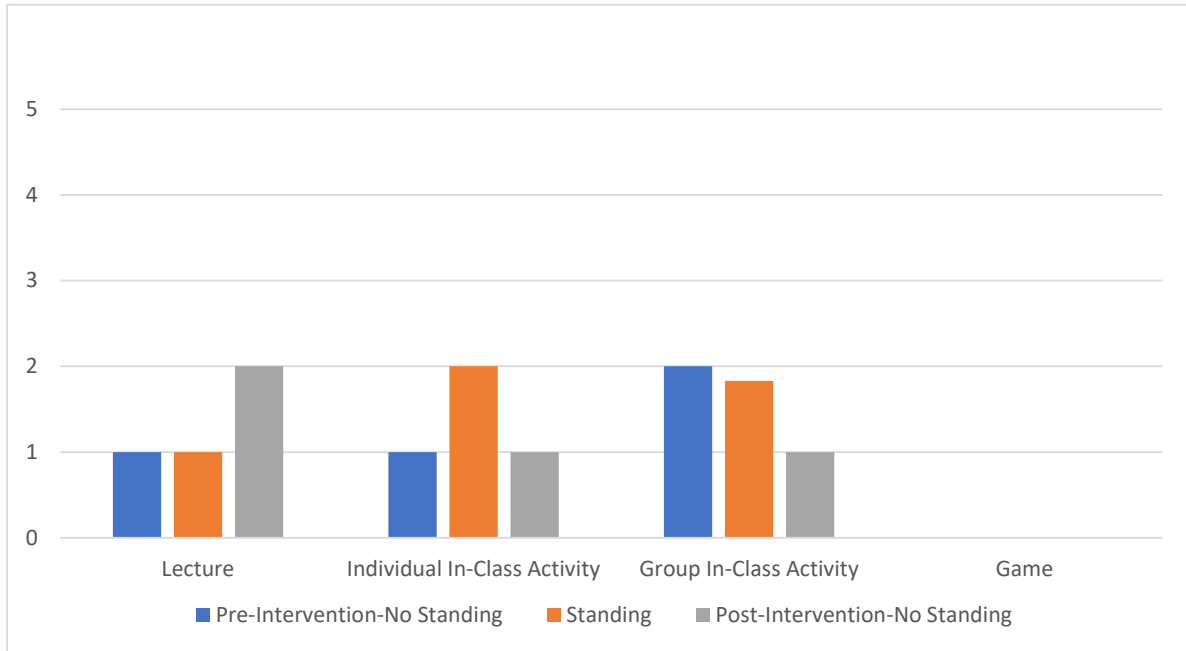
Figure 25. Teacher 7 – Students Who Left the Classroom

Teacher 7's data showed no students leaving the room during lecture during the pre-intervention week nor did students leave the room during the standing intervention. During the post-intervention week, the data showed a few students left the classroom. The data for the instructional format of individual in-class activity showed no students left the classroom during the pre- and post-intervention weeks; however, a few students left the classroom during the standing intervention. During the group in-class activity, close to half the class left the classroom during the standing intervention and only a few students left the classroom during the pre-intervention and no students left the classroom during the post-intervention week. Teacher 7 commented during week 2 that the amount of hall pass use increased dramatically during periods of standing.

4.2   SUMMARY OF SURVEY DATA

4.2.1   Off-task behavior group findings

The findings for the whole group teacher perception data for off-task behavior is shown for each instructional format below in Figures 26-29.

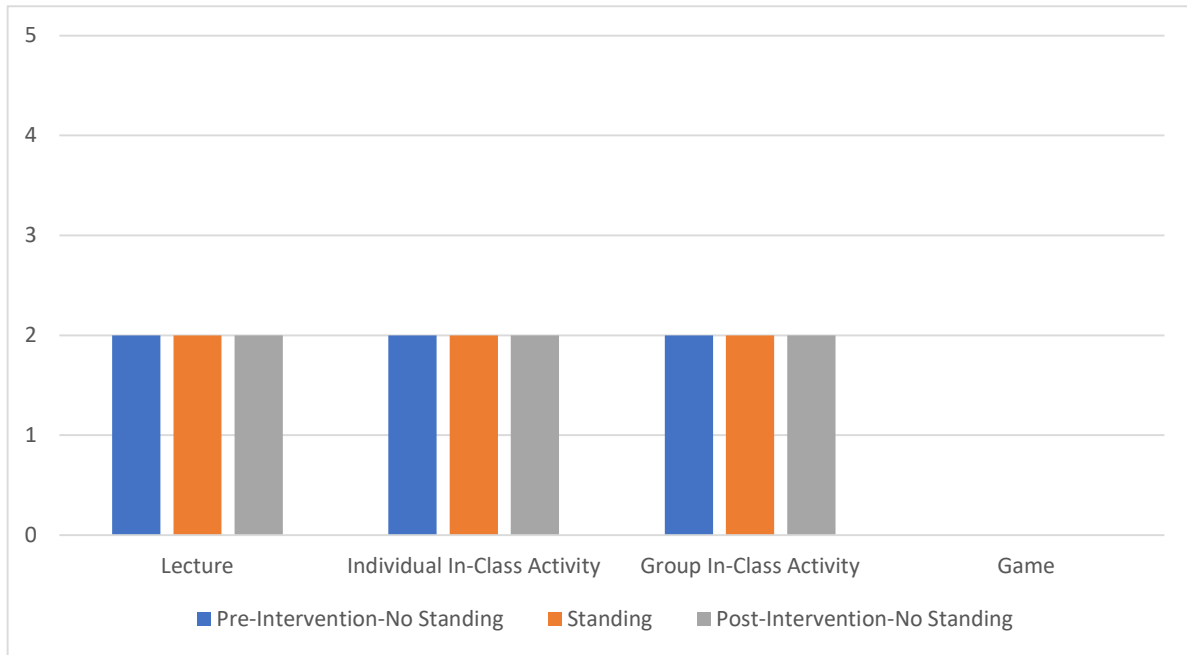**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 26. Lecture – Off-Task Behavior

During the instructional format of lecture, pre-intervention data showed five of the seven teachers perceived that a few students were off- task and two of the seven teachers perceive half

of the class as being off task. The intervention data show four of seven teachers perceive a few students were off task, two of seven teachers perceive slightly more than a few students were off task and one teacher perceived less than a few students were off task during the lecture instructional format.

Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 27. Individual In-Class Activity – Off-Task Behavior

Teacher perception data for student off-task behavior in the individual in-class activity instructional format showed that all teachers in the study perceived a few students were off task during the pre-intervention as well as during the post-intervention when students were seated

while completing the individual in-class activity. Three of the seven teachers surveyed perceived a few students off task during the intervention, three of the seven teachers perceived slightly less than a few students were off task during the intervention and one of the teacher's data showed slightly more than a few students were off task during the standing intervention for the individual in-class activity.

Figure 28. Group In-Class Activity – Off-Task Behavior

The instructional format of group in-class activity data showed teachers perceived a few students as off task during the pre-and post-intervention. One teacher did not use the group in-

class activity instructional format during the study. During the standing intervention, two of the six teachers perceived a few students as being off task, three of the six teachers perceived less than a few students as being off task and one of the six teachers reported slightly more than a few students as off task during the group in-class activity.
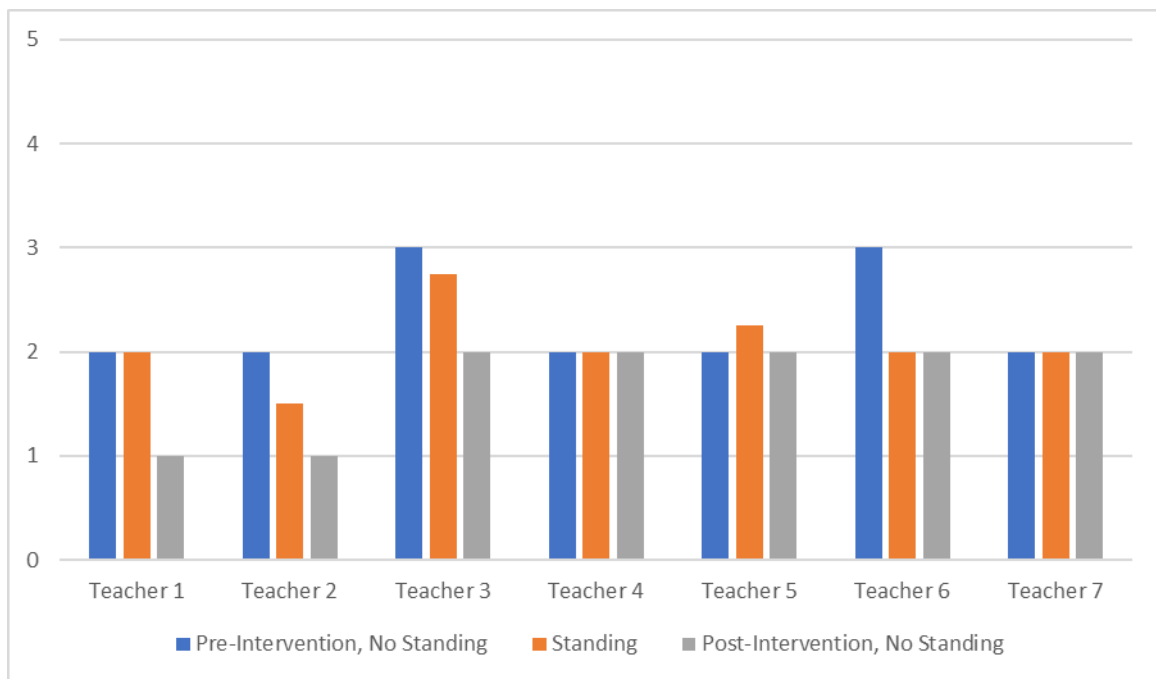

Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 29. Game – Off-Task Behavior

The data for the game instructional format showed teachers perceive a few students as off task during the pre-and post-intervention weeks. Of the four teachers who used the game format for the standing intervention weeks, one teacher perceived a few students off task and three of

the four teachers perceived less than a few students as off task during the game instructional format.

4.2.2 Students who left the room group data

Data for students leaving the classroom for each instructional format are shown in Figures 30-33. The group perception data for students leaving the room did not show a consistent pattern across teachers.
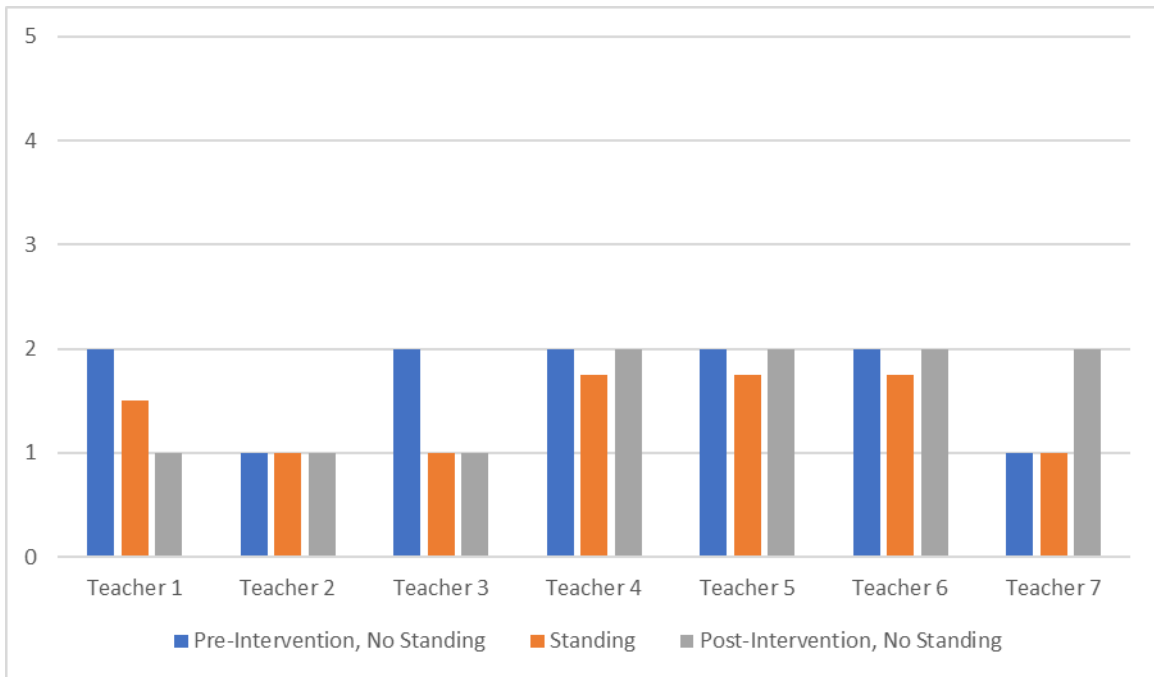
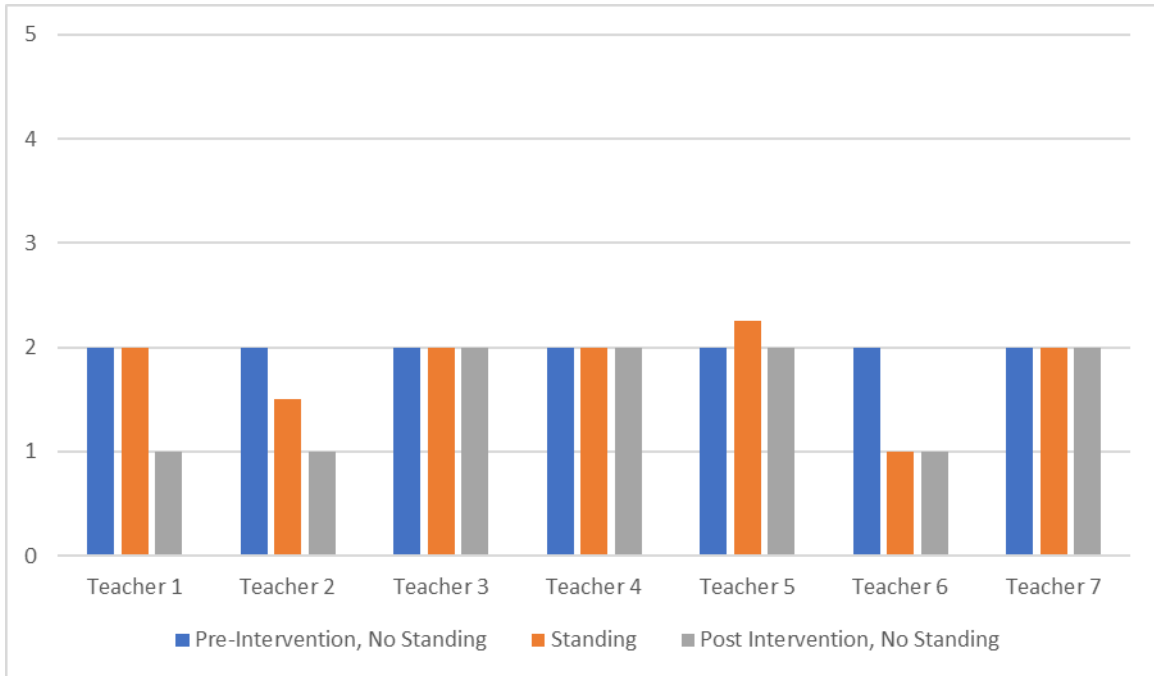**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 30. Lecture – Students Who Left the Classroom

For the lecture instructional format, five of seven teachers in the pre-intervention reported a few students left the room and two of the seven teachers reported no students left the room during the pre-intervention week. All seven teachers reported a few students left the room during the post-intervention week. During the standing intervention, three of seven teachers reported no students left the classroom and four of the seven teachers reported less than a few students left the room during the standing intervention.
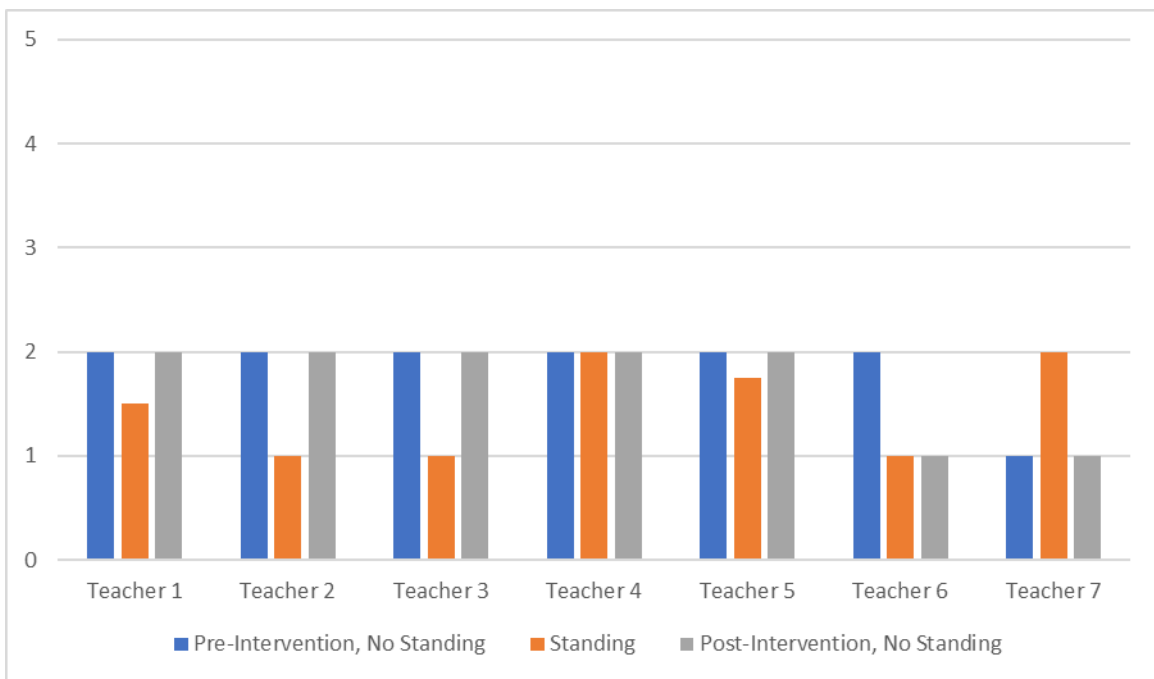
Chart Key:
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 31. Individual In-Class Activity – Students Who Left the Classroom

During the pre-intervention week of the individual in-class activity, six of seven teachers reported a few students left the classroom and one teacher reported none of the students left the classroom. For the post-intervention week, five of seven teachers showed a few students leaving the classroom and two of seven teachers showed none of the students left the classroom. During the standing intervention weeks, a few students leaving the classroom were reported by two of seven teachers; three of seven teachers reported no students left the classroom and two of the seven teachers reported slightly less than a few students left the classroom during the individual in-class activity instructional format.

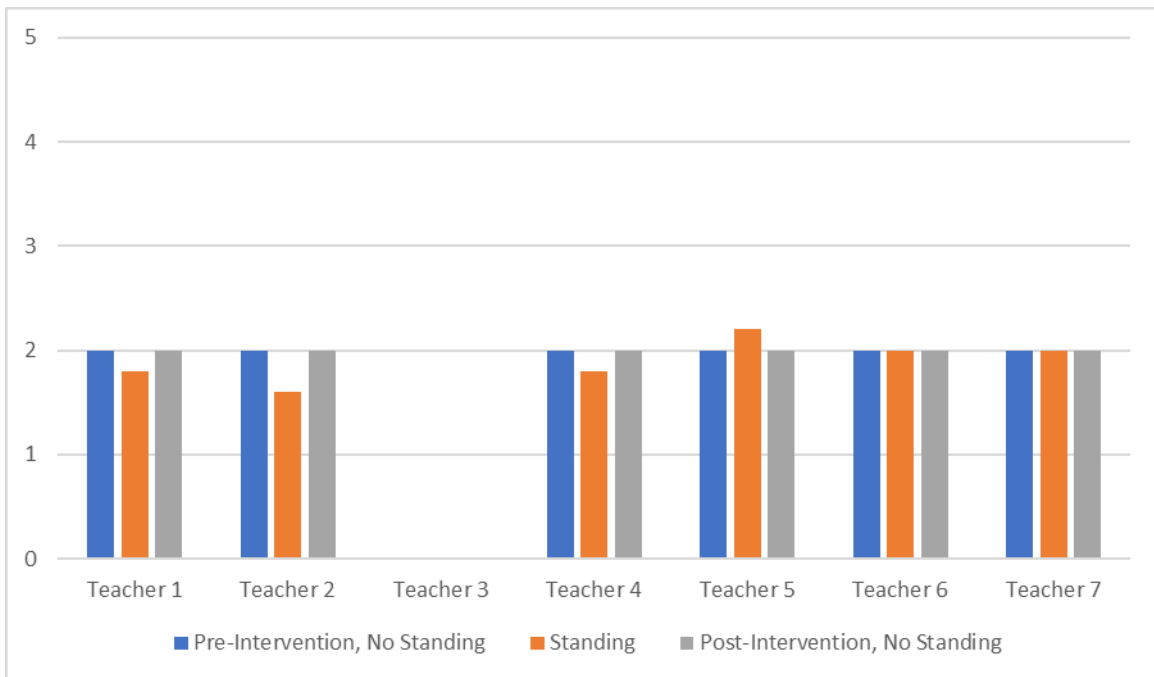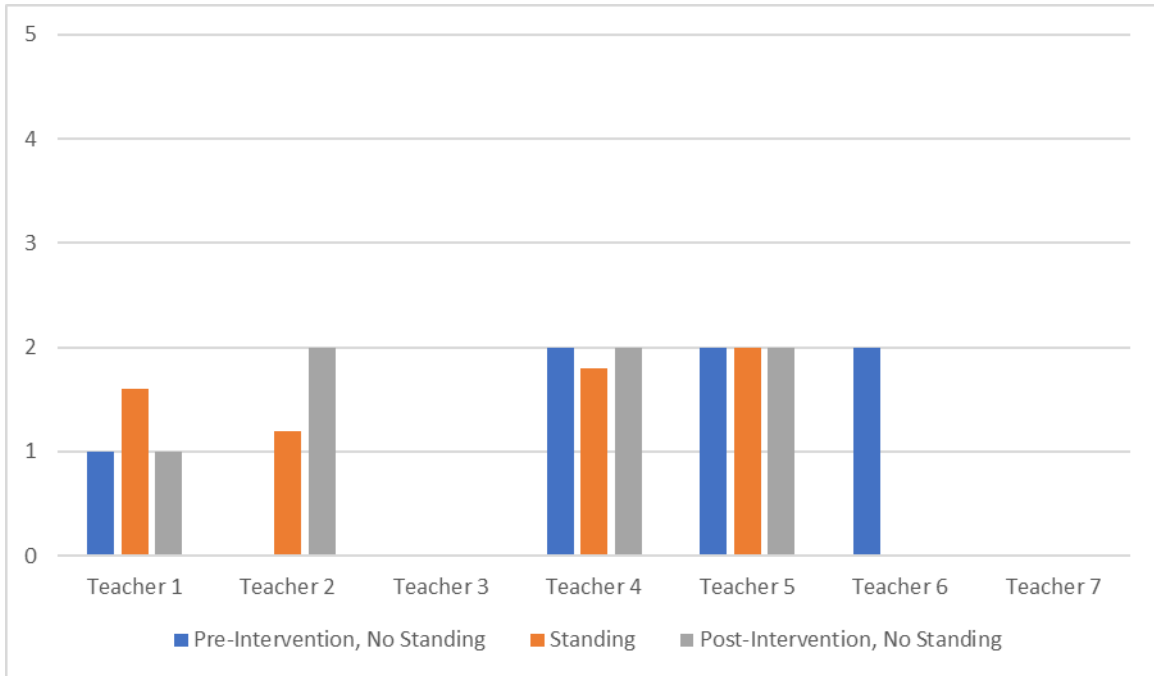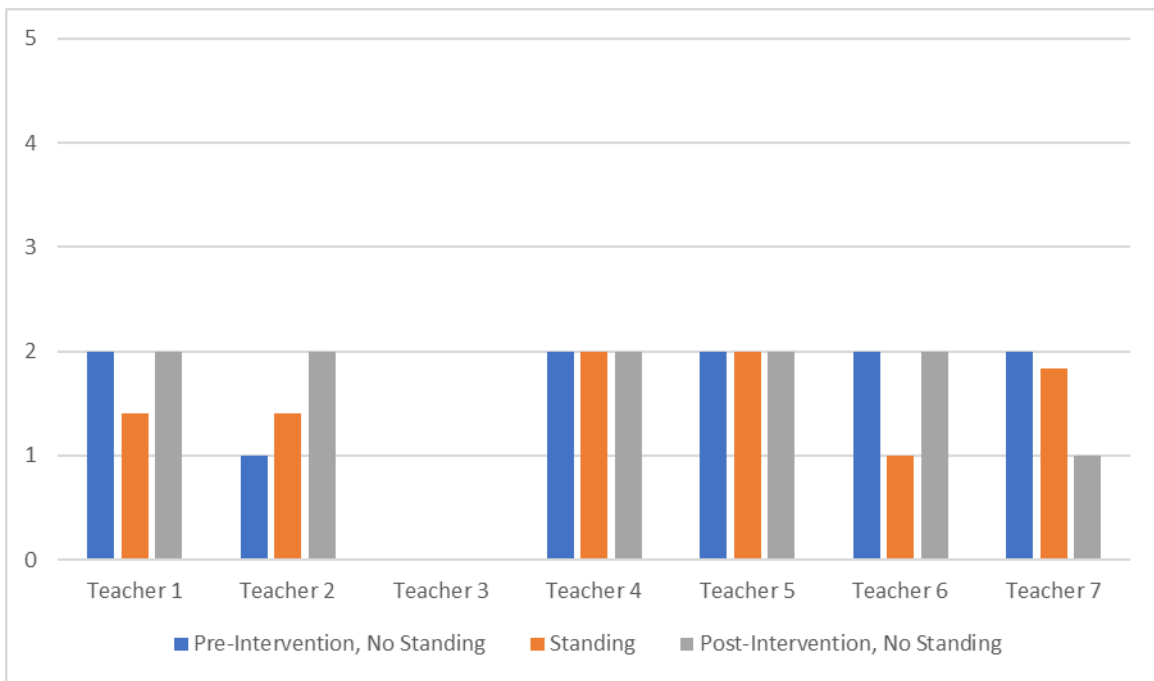**Chart Key:**
0=This form of teaching was not used this week
1=None
2=A Few
3=Half the Class
4=Most of the Class
5=All of the Class

Figure 32. Group In-Class Activity – Students Who Left the Classroom

Teacher data for the group in-class activity during the pre-intervention showed six of seven teachers reported a few students left the room, and one teacher reported none of the students left the room. The post-intervention week data showed six of seven teachers reported a few students left the room, and one teacher reported none of the students left the room. For the group in-class activity instructional format, two of seven teachers reported a few students left the room, two of seven teachers reported none of the students left the room, two of seven teachers reported less than a few students left the room, and one teacher reported slightly more than a few students left the room during the standing intervention.
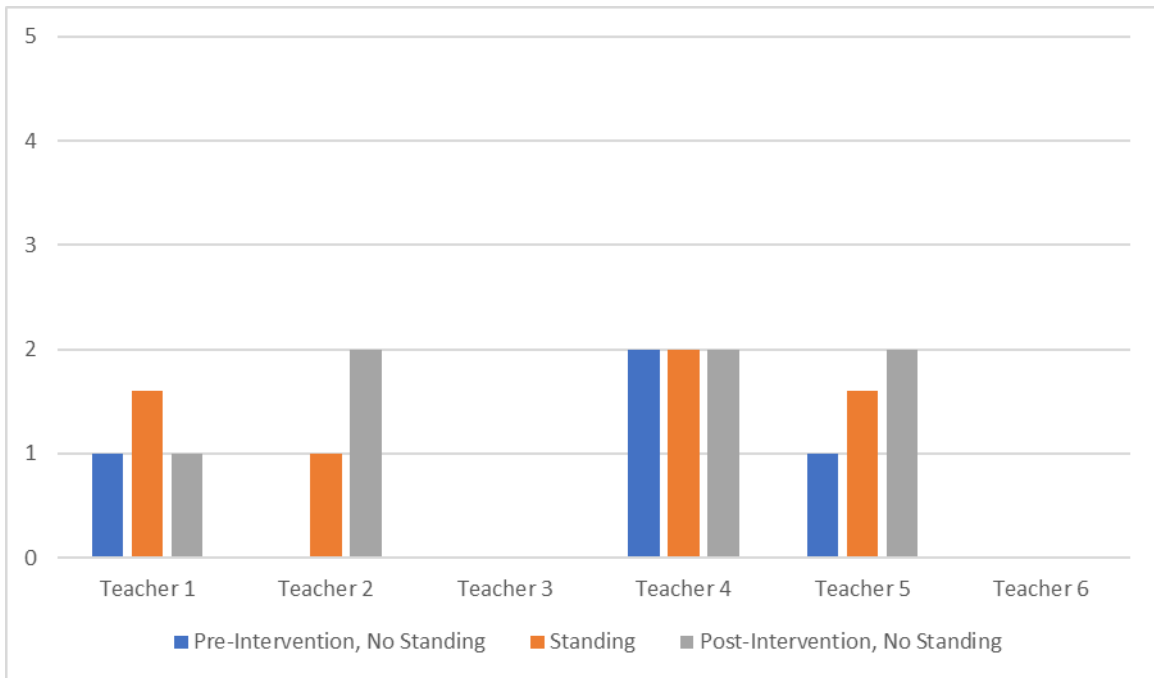
Figure 33. Game – Students Who Left the Classroom

Three of the seven teachers involved in the study used the game format during the pre-intervention week, and four of the teachers used the game format during the standing intervention as well as the post-intervention weeks. Of the three teachers using the game format for the pre-intervention, two of three reported none of the students left the classroom and one teacher reported a few students left the classroom. During the post-intervention week, three of four teachers reported a few students left the classroom, and one teacher reported none of the students left the room during the game instructional format. During the standing intervention weeks, one teacher reported a few students left the classroom, one teacher reported none of the

94

students left the classroom, and two of the four teachers reported less than a few students left the classroom during the game instructional format.

4.3   PERCEPTION DATA

This study began with the following question: What are teacher perceptions of how standing for 15 minutes of instruction in a variety of class activities including lecture, individual in-class activity, group in-class activity, and games affects student off-task behavior in the middle school classroom? The literature showed a positive relationship between standing and student behavior (Koepp et al., 2012), but the literature had not explored teacher perceptions of students standing for instruction. This pilot study revealed that standing is feasible and acceptable to teachers. Through the open-ended responses provided by teachers, it was shown that 54% of the comments regarding the standing intervention were positive, 12% of the comments were neutral, and 34% of comments were negative. Positive comments included statements such as "more on task," "more engaged in activity while standing," "positives with focus and attention," and "some students will now voluntarily stand while they are working." The comments categorized as neutral included statements primarily focused on the furniture in the room. These comments included statements such as "low table is uncomfortable to work/take notes/read" and "it was difficult for students to be bent over and writing." The negative comments included statements such as, "standing area was quite a challenge for a few of the very active students" and "the excitement of standing was a challenge."

The informative comments offered by the teachers fell into four themes: focus and attention, standing area, standing height desks, and student reactions. The following section describes the themes of the open-ended comments offered by teachers.

4.3.1 Focus and attention

Teachers' positive comments about student attention and focus make up 48% of the positive comments gathered from the open-ended data. Teachers reported students as being more on task and focused during the standing intervention. Acceptability statements included the following comments:

- "more on task"

- "more engaged in activity while standing"

- "students should be asked to stand more often during the school day to improve overall focus"

- "I did see it help with the focus"

- "much more focused when standing, and for a brief time after standing as well"

- "they tend to focus more when they stand during my lectures"

- "less off-task"

- "I really think standing pulled them back into the lesson"

- "they do seem more focused!"

Teachers also reported that when they saw students "glazing over" or when they could see students looking tired, they implemented the standing intervention. They reported that students seemed to re-focus when they were asked to stand when teachers saw a loss of focus.

Teachers' open-ended comments also described that students with attention issues and who are typically "fidgety" benefitted from standing for instruction. One teacher reported, "kids that truly want to stand during the lesson are now standing." The feasibility and acceptability of standing for instruction is documented by the teachers' positive comments.

4.3.2 Standing area

Teacher open-ended comments regarding standing area are important because they address challenges and successes of space during the standing intervention. Teachers report some students needed to be reminded how to stand because they were pacing, infringing on another student's space, dropping to their knees, doing a "two-step," or rocking. Teachers who have many students in a small classroom found the standing area to be a challenge because of differences in how students stand. One teacher reported that when a tall student stood in the front of the room it blocked the view of some of the other standing students, so the teacher resolved the issue to minimize the distraction.

4.3.3 Standing height desks

The most frequent suggestion and comment by teachers was to provide students with a standing height desk. All the neutral comments, 25% of the negative comments, and 53% of the suggestions provided by teachers were about providing students with standing height desks. The comments included the following statements:

- "I would love to see a combination of seated desks and standing only desks in the classroom"

- "having standing height tables or podiums would be helpful"

- "I think if the students had a desk where they could stand and complete work from there would have been more participants"

- "if tables/desks were higher I think standing would be ideal"

- "if I had standing stations created, it might have been easier for students"

- "it would have been more effective if all students had standing height desks"

4.3.4   Student reactions

The final emerging theme from the teacher open-ended responses were their report of student reactions to the standing intervention.   Teachers reported that students seemed to be more enthusiastic while standing and that their reactions were "more dramatic" while standing. They also reported how students seemed excited about the opportunity to stand for instruction and enjoyed the activities while standing. Teachers reported that by about week three students who benefited from the standing intervention were choosing to stand.   They also reported, "the students who don't want to stand and were off task while standing are now choosing to just remain seated" and "the students that seemed to enjoy standing participated in this intervention the entire time. The students that weren't interested stopped standing after the first two weeks." During the post-intervention week, one teacher reported, "It seems as if some students prefer standing and some prefer sitting. If given the option, it seems that about 30-40% of the class will stand." Another teacher reported, "Students have been asking to stand during instruction," after

the intervention. Since the conclusion of the study, teachers have reported students regularly asking to stand for instruction.

5.0   DISCUSSION, LIMITATIONS, IMPLICATIONS, AND CONCLUSIONS

5.1   DISCUSSION

Teacher perceptions showed that standing for instruction is feasible and acceptable for a minimum of 15 minutes per day a minimum of 3 days per week. Since the conclusion of the study, teachers who participated now regularly give students the option to stand for instruction. Teachers have noted a positive change in the behavior of students who choose to stand for instruction when provided with the choice. Teachers also noted that students have taken initiative to ask if they can stand for instruction. The students who benefitted from standing during the study regularly choose to stand for instruction post intervention. The positive change in behavior also correlates to greater focus, which could impact student achievement. Teachers also reported that students who stand for instruction seem to have more energy and appear to be more "awake" than students who choose to sit for an entire class period.

Beyond the teachers in the study, the feasibility of the study is evident because other teachers in the building have now begun to give students the option to stand for a variety of class activities and instructional formats. While many of the teachers would like students to have a standing height desk, others have made "makeshift" desks by piling books or boxes on the desks of students choosing to stand, or by allowing students to use a podium, bookshelf, windowsill, or high table for comfort while standing and completing writing tasks and some tasks on the iPads.

Teachers in the building who allow students to stand report an improvement in behavior and less "fidgeting" from students who, while seated, had previously caused distractions in the classroom. Teachers do note, however, that the first few times they gave the option to stand, nearly all the class chose to stand and some off-task behaviors increased. When the "novelty" of standing wore off (i.e., after about 2-3 class periods for most), those who benefitted the most from standing did, and others chose to sit or to occasionally stand. These anecdotal reports by staff members who were curious about the standing intervention but did not want to commit to participating in the study, imply that allowing students to stand for instruction is feasible and accepted not just by teachers who participated in the study, but also by other teachers in the building.

The study shows the feasibility and acceptability of standing for instruction in the middle school classroom, but it could also be a part of the elementary and high school program. Teachers who have implemented the intervention and have given the students a choice to stand have determined when it is appropriate for their students. The open-ended responses by teachers imply the teachers know their students, classroom expectations, and activities well enough to determine when it is appropriate to implement with teachers. Teachers implemented the standing intervention when they would see students "glazing over," when teachers could perceive "students weren't focused," or when students were outwardly off-task or fidgety. Teachers reported that standing helped to "pull them [students] back into the lesson." The physiological signals from the students cued middle school teachers to implement the standing intervention, and these types of cues are applicable to elementary and high school students as well. Though this study only focused on middle school, the standing intervention could look similar at both the high school and elementary school levels.

5.2   LIMITATIONS

The greatest limitation of the research was the lack of generalizability of the findings. The research was limited by the small sample size of teachers, one school district, one site for collection of data, and the relatively short period (i.e., 7 weeks) of data collection. The sample size of teachers was not inclusive of all middle school subjects and disciplines, and not all grade levels were represented in the sample size. The data were also based solely upon the perspective and perception of the teachers. No students were consulted for an explanation of off-task behaviors or for reasons why they left the classroom. The instructional format was not consistent from week to week or from teacher to teacher, therefore making comparisons between teacher perceptions difficult.   Within-teacher comparisons also have limitations because of the assignment of different individual and group in-class activities and variations in lecture time and content from week to week. Additionally, the survey was distributed at the end of each week, so it was dependent upon teacher recall and anecdotal evidence.

Another limitation was that there were no measures of physical activity. Students were not asked to wear heart rate trackers, FitBits, MET measures, or any other devices to measure physical activity. Therefore, it is difficult to attribute any behaviors to physical activity or lack thereof. There was also no measurement of academic achievement during the study.

Additionally, not having desks at standing height was a major limitation of the study. While standing without standing desks is more cost effective and more practical, it limits the amount of time students can stand and the activities in which they can engage while standing.

5.3   IMPLICATIONS FOR RESEARCH

Past research has explored physical activity breaks tied to achievement (Hinckson et al., 2013), function-based interventions to student behavior with behavior modifications (Schumate & Wills, 2010), off-task behavior prompting (Faul, Stepensky, & Simonsen, 2012), sit-stand desks linked to academic achievement, mental health, and physical health (Benden et al., 2011), and attention, focus, and cognitive performance linked to physical activity (Metha, 2015). However, this may be the first study to shed light on teacher acceptability of students standing for instruction

Therefore, this study opens the door for further research.

Future researchers may want to expand the sample size of teachers to include a large sample of teachers from every discipline/subject taught in middle school. Including all disciplines will allow for comparisons across grade levels and disciplines. Future research should also include time of day comparisons across disciplines, as a few anecdotal reports from the teachers in this study showed a difference in student behavior when standing for instruction in the morning compared with standing for instruction in the afternoon.

Future researchers may want to consider classroom observations of student behavior as well as gathering student input regarding how standing for instruction affects behavior. Along with observations and student input, future research may consider comparing academic achievement data for students who stand for instruction.

Another consideration for future research is to study whether choosing to stand for instruction impacts students' physical activity outside of the classroom. Researchers may want to consider using physical activity trackers or student surveys to determine if LMPA (e.g.,

standing) in the classroom influences physical activity outside of the classroom. Researching this correlation could lead to further studies to combat childhood obesity.

Future research may want to consider incorporating MVPA into the standing intervention to determine if MVPA in the classroom impacts student behavior. Currently standing is considered LMPA, but future research may want to measure the effect MVPA while standing has on student behavior.

Finally, future research may want to explore whether more teacher training on how to implement standing interventions would make the intervention more effective.

5.4 IMPLICATIONS FOR PRACTICE

For teachers in all grade levels and disciplines, allowing students a choice to stand is a viable classroom management technique. While forcing an entire class to stand for any length of time does not appear to deter off-task behavior, providing students with the choice to stand may positively impact behavior, focus, and energy. It may be especially relevant to have students stand in the morning classes as a means of "waking up" and "energizing."

The teacher reflections are important to consider for implications for practice. Two teachers reported standing area as a challenge for active students to stand. Teacher classroom should be taken into consideration. Were the classrooms of these teachers too small? Were there desks or long tables? Were there a large number of students in the class? Would this issue be resolved with standing height desks to "anchor" students to their standing location?

Another wondering for implications for practice is one teacher who indicates that students would benefit from a mixture of sitting and standing. Is this because the content of the

teachers' class already requires some standing, so implementing a standing intervention has dramatically increased standing time for students? Is it because the classes were more focused when there was a mixture of standing and sitting as opposed to standing the entire class or sitting the entire class? In addition, this teacher, along with one other teacher, reported students starting to rock, sway, and lose eye contact while standing. Is this because of the nature of the content of the class; were their items in the room or visuals to cause them to lose focus on the teacher? Was the swaying because they were standing for a very long time and were getting tired? Were the students rocking or swaying to try to see a demonstration in the front of the room?

An implication for practice coming from the teacher responses is that the intervention may be more effective in the morning than it is after lunch. Teachers reported students were "more awake" in their morning classes during the intervention. Conversely, two teachers reported when implementing the intervention after lunch students seemed more "wound up."

While all teachers found the standing intervention feasible, two teachers reported it took students approximately three weeks to adapt to the intervention and benefit from it. Is this because of the student makeup in the classroom? Are the students less pliable? Do they take longer to process a new concept? Do they have limitations making it difficult to change routine? The implication for practice is that teachers need to know their students' abilities (and disabilities) prior to implementing a standing intervention.

Another implication of the study is that the LMPA of standing combats sedentary behavior; this can positively influence student health, though it should not be considered a means for combatting obesity. However, the LMPA for students choosing to stand could be a factor in the reduction of off-task behavior and positive change in focus.

Administrators should consider encouraging teachers to allow students the choice to stand for instruction because of the acceptability reported by teachers who were a part of the study. Administrators should provide professional development as guidance for incorporating the practice and regularly follow-up with teachers regarding how it is working and how it looks in all different classrooms.

To assist administrators and teachers with professional development for implementation of the standing intervention, a compilation of "Lessons Learned" along with a list of "Frequently Asked Questions" can be accessed in Appendices E and F.

5.5   CONCLUSIONS

As I began the research for this study, my concern was that students spend far too much time sitting in the classroom. The concern stemmed from my observations of middle school students in classrooms and my own personal experiences with sitting in meetings that typically last about one hour, but at times, have lasted upwards of 4-5 hours. My own off-task behaviors (e.g., checking email, writing a to-do list, reading articles online), fidgeting, and need to stand and move made me even more interested in how students must feel when they are forced to sit for up to six hours per day. Literature supports the positive relationship between standing and student behavior (Koepp et al., 2012) as well as function-based behavior interventions (Schumate & Wills, 2010) and behavior differences according to instructional format (Godwin et al., 2016). Now the results of this study show teacher support of students standing for instruction; the intervention is both feasible and acceptable.

The teacher feedback about standing height desks is an important component for students choosing to stand for instruction. A future budgetary consideration at the building level may be to purchase some standing desks or height adjustable desks for each classroom. Another practical consideration is to provide classrooms with old textbooks that could be stacked on the desks of students who choose to stand. Instead of throwing old textbooks away, they could be used to create a standing desk.

It is my hope that the information gathered in this study as well as the implications for practice and professional development will be shared with teachers at all levels of instruction and across disciplines. The findings of this study will be presented to every administrator, principal, assistant principal, and support staff K-12 as well as central office administration in the large school district in which the study was conducted. Findings of this study will also be presented at the University of Pittsburgh Council of Graduate Students in Education Conference as a research talk for educators.

It is important to note that the standing intervention is not a way to cure childhood obesity, but it is a step toward providing students with an opportunity for LMPA to reduce the amount of sedentary time while in school. Because of the study's conclusion of general teacher acceptability of students standing for instruction, it is my hope that more educators will consider allowing students the choice to stand. Because nearly all the teachers in the study indicated it would be beneficial, it is my wish that future classrooms will provide height adjustable desks for all students.

APPENDIX A

RECRUITMENT SCRIPT

The script below was used to recruit teachers to participate in the study. Participation in the study is completely voluntary; no teacher is required to participate.

"As many of you know, I am a doctoral student at the University of Pittsburgh and I have been conducting research on how sedentary behavior affects students. Because students spend approximately 1,080 hours per year sitting in school, I decided to see what would happen if we eliminated some sitting and implemented standing during instruction. The purpose of this study is to determine middle school teachers' perceptions of student off-task behavior when students stand during instruction in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games. I will be surveying middle school teachers who have adopted student standing during instruction in a variety of class activities and instructional formats including lecture, in-class project/activity, group project/activity, and games. The frequency of standing during instruction will occur for a minimum of 15 minutes per class period, a minimum of three days per week for four weeks. If you are willing to participate in the study, you will be provided with a link of survey questions once a week for six

weeks. There are no foreseeable risks associated with this project nor are there any direct benefits to you. All responses are confidential and will be protected through a login and password of the researcher through the University of Pittsburgh's Qualtrics program. Your participation is voluntary and you may withdraw from this project at any time. The study is being conducted by Erin Crimone who can be reached at if you have any questions."

STANDING HANDOUT

Standing and Off-Task Behavior—A Guide for Participation

Thank you for agreeing to participate in my study, "Middle School Teacher Perceptions of Standing for Instruction." To be sure, the data collected through the surveys are accurate and consistent I created this guide to help clarify any potential questions about "What is Standing?" and "What is Off Task Behavior?"

What is Standing for Purposes of this Study?

- To support oneself on the feet in an erect position.
- To have or maintain an upright position supported by one's feet.
- Any student who is in an upright or erect position supported by their feet.
- **Leaning:** To incline, deviate, or bend from a vertical position or to be in or move into a sloping position.
  - *If students are leaning, they are still qualified as standing as long as their feet are still on the floor.*

When students are standing, they may engage in movements such as:

- Stretching
- Shifting from side to side
- Swaying back and forth
- Fidgeting
  - Fidgeting is defined as to move or act restlessly or nervously (Webster, 2017). If students remain in an upright or leaning position while engaging in these behaviors, they still qualify as standing.

An important note about standing: stretching, swaying, shifting from side to side, and fidgeting are natural and permitted; however, if it turns into rhythmic or structured/repeated

movement then the activity has gone beyond standing and into a higher intensity which may have a different influence on off-task behavior.

Students are expected to stay within the defined "standing zone" (unless otherwise directed by the teacher) which is approximately 2 square feet of space behind the student's desk where a chair would typically be placed.

What does NOT qualify as Standing?

Students who are kneeling or sitting are not considered to be standing.

Kneeling: to be in or assume a position in which the body is supported by a knee or the knees (2017).

Sitting: to adopt or be in a position in which one's weight is supported by one's buttocks rather than one's feet and one's back is upright.

What is Off-Task Behavior?

Off-task behavior, for the purposes of this study, is defined as any inattentive behavior not attending to or participating in the instructional activities taking place in the class (Dadakhodjaeva, 2017; Faul, Stepensky, & Simonsen, 2011; Schumate & Wills, 2010).

Off-task behaviors include, but are not limited to:

- talking out

- moving out of the "standing zone"

- playing with objects

- disruptive noises

- talking to peers

- tapping pens/pencils

- visiting any unapproved sites or games on the iPad
- reading a book unrelated to the lesson

- sleeping

- completing work for another class

- looking at a phone or other non-approved electronic device

- wearing headphones
- daydreaming (averting eyes from instructional material)

- singing, humming, talking to self

- engaging in off-topic conversation with peers in a group

APPENDIX C

SURVEY QUESTIONS

Teachers participating in the study were given the survey questions a total of six times. The

survey was given once prior to the intervention, four times during the intervention, and one time

after the cessation of the intervention of standing during instruction. Survey questions are listed

below.

Q1: The first question helps me understand your perception of students' off-task behavior during the past week.
Off-task behavior refers to behaviors such as: talking to other students, tapping pens/pencils, leaning back in seats, visiting an unapproved site or game on the iPad, reading a book unrelated to the lesson, sleeping, completing work for another class, looking at their phone or other electronic device, wearing headphones, daydreaming, etc. Please estimate about how many students were off-task during the past week's classes.

As you will see, there is an opportunity for you to answer the questions as you reflect on all of the instructional formats you may have used in the past week.
If you used an instructional format not listed below, there will be an opportunity to add it in the comments at the end of the survey.

As you think back on the past week, please do not include any atypical classes such as those interrupted by a fire drill, special schedules, assemblies, etc.

Thank you for your insights!

	LECTURE is the primary mode of instruction. Lecture refers to classes during which you gave a lecture (including Nearpod activities) is the primary mode of instruction.					INDIVIDUAL IN-CLASS ACTIVITY is the primary mode of instruction. Individual in-class activity refers to classes during which students are working independently on an assigned project. The activity may be on their iPads, paper/pencil, individual meeting with teacher, presenting to the class, etc.					GROUP IN-CLASS ACTIVITY is the primary mode of instruction. Group in-class activity refers to classes during which students are working within a group on an assigned project. A group in-class activity is constituted by having more than one student working on a project/class activity. Group activities may include Keva Kits, Spheros, Google Doc collaboration, Think-Pair-Share lessons, partner reading, group presentations, etc.					GAME is the primary mode of instruction. Games refer to classes during which the teacher is using a competition to assess student learning, review for a test, introduce a topic, etc. Games may include Kahoot, Quizlet Live, Jeopardy, etc.				
	None	A Few	Half of the Class	Most of the Class	All of the Class	None	A Few	Half of the Class	Most of the Class	All of the Class	None	A Few	Half of the Class	Most of the Class	All of the Class	None	A few	Half of the Class	Most of the Class	All of the Class
In the past week about how many students were off-task during this instructional format?	☐	☐	☐	☐	☐	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
In the past week about how many students left the classroom (excused or unexcused)?	☐	☐	☐	☐	☐	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Q2: Please share any other comments you may have about students' behavior during the past week.

Q3: Please provide any additional perceptions you have regarding student behaviors over the past week. Feel free to share anything else about your experience of having students stand for instruction this past week.

Q4: In the past week, how many total class periods were students asked to stand? (Count each individual class period. Most teachers teach 5 class periods per day).

○ 0

○ 1-5

○ 6-10

○ 11-15

○ 16-20

○ 21-24

○ 25

Q5: In the past week, about how many minutes per class period were students asked to stand?

○ 15 (1)

○ 16-25 (2)

○ 26-35 (3)

○ More than 35 (4)

Q6: In the past week, how many days were students asked to stand for instruction?

○ 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

Q7: Thinking again about the past week, how many students declined to stand for instruction when asked?

○ None (1)

○ 1-5 (2)

○ 6-10 (3)

○ 11-15 (4)

○ 16-20 (5)

○ More than 20 (6)

OPEN-ENDED QUESTIONS

Open-Ended Question #9: Please provide any additional perceptions you have regarding student behaviors over the past week. Feel free to share anything else about your experience of having students stand for instruction this past week.

	Positive Comments	Negative Comments	Time of Day Comments	Suggestions
Week 1	- I typically have the students stand 1-2 times per week to regain focus and attention. - One student really benefited from standing and he joined in the lesson a little more than usual. Another student really needed to be told how to stand because he was pacing. If he can follow the directions, I think it would benefit him. - I am hopeful that standing for a period of time will provide the students with some sensory stimulation while			

	increasing time on task for my students - My 9th period class requires more redirection than any of my other classes. I am very curious to see the results from having standing blocks. :-)			
Week 2	- More on task!	-My 7th grade English class is still a tough time of day. I have 12 kids in here and no amount of standing is going to help! Too many kids in that setting tends to make them more unfocused. - 'Standing area' was quite a challenge for a few of the very active students. - This will take some time with particular students.	- First period classes reacted the best to standing. It helped them wake up and engage. Their effort increased.	
Week 3		-They fidget far more standing than sitting, especially the boys. Less eye contact occurs while standing as they tend to look down. - afternoon classes were more tired and some asked to sit.	- The morning classes were very focused	- I would love to see a combination of a seated desks and standing only desks in a classroom. Everything is good in moderation. :-) - Having standing height tables or podiums would be helpful
Week 4	- Were more engaged in activity while standing - The enthusiasm for the right/wrong answers were more dramatic when they were standing. The	- I still have use the standing strategy for my large class; they get more wound up because they don't have their own spaces to stand		

	whole body played into the success or disappointment. :-) That was interesting to see!			
Week 5	- I do think it is a healthy mindset to adopt. - While the stand may initially increase alertness, it includes negative aspects - I love this! I think students should be asked to stand more often during the school day to improve overall focus! - They seem to like the change of pace/ standing offers	- It was much more challenging to implement than I anticipated. - While the stand may initially increase alertness, it includes negative aspects - When all were asked to stand, many slowly dropped to their knees. Once I asked them to sit they were thrilled to sit - Having the low tables is uncomfortable to work/take notes/ read. - It was difficult for students to be bent over and writing.		- I would love to see a classroom that already has standing desk stations. - Reflecting on it, if I had standing stations created, it might have been easier for students to flow. - I think a combination of sitting and standing might serve them well. - I think if the students had a desk where they could stand and complete work from there would have been more participants. - If the tables/desks were higher I think standing would be ideal.
Week 6	- I had a student as me today (12/6/2017) if she could stand during the lesson. I did see it help with the focus once the first wave of sillies out worked out. - I did see positives with focus and attention. Cool study! - I feel as though they are much more focused when standing, and for a brief time after	-Implementing the standing was a little tricky at times. The students either use their iPad or paper copies for the lesson. They were either hunched over the desk or balancing the iPads on their hands while standing -It was more challenging to implement than I expected. The biggest obstacle was the physical environment: space between desks, posture when recording responses/participating	- I wish that my classroom had the capabilities for the students to stand at work during different times of the day.	- I would love to see flexible seating and have an assortment of traditional desks, standing desks, and maybe even some desks with stability balls as chairs. - The biggest obstacle was the physical environment: space between desks, posture when recording responses/participating in the lesson, physical equipment - Maybe there is a grant out there where I can

	standing as well.	in the lesson, physical equipment. - I noticed some students would have the sway or two-step.		explore classroom furniture options.
Week 7	-It seems as if some students prefer standing and some prefer sitting. If given the option, it seems that about 30-40% of the class will stand.	-Since sitting in the class is the "normal" routine, I felt as though they were more on task as compared to standing		-The on-task and off-task behaviors for both standing and sitting were very similar. A few students were off task when standing and a few were off task when sitting

Open-Ended Question #19: Please share any other comments you may have about students' behavior during the past week.

	Positive Comments	Negative Comments	Time of Day Comments	Hall Pass Comments	General Comments and Suggestions
Week 1	- We played one review game this past week where students in the back row were permitted to stand so that they could see the front board better. They seemed excited about this opportunity			-I allow students to use the restroom whenever they need to; I put an emphasis for more the start or end of class unless it is an emergency. I have one student (to my knowledge) with digestive issues, and I do not want him/her to ever feel like the spotlight is on him/her. I probably have on average 1-3 students use	- Student in my period 1 Math class have a variety of special needs. Autism, ADHD, Vision limitations, and toileting issues. -The size of some of my groups, along with the small size of my room can impact behavior. -The past week students' behaviors were typical as usual. -The level of students' participation in the lesson affects students being on task, their behavior, and the number of requests to leave the classroom.

				the pass, but there is not a trend on the same students always going.	
Week 2	- Students enjoyed the activity while standing - Some students continue to complain when asked to stand up, others are happy to stand! - The standing is going better! They understand that I have them stand when I see them "glazing over." I think they tend to focus more when they stand during my lectures.	- The excitement of standing was a challenge this week. I believe that will wear off this next week -On the first day of standing during instruction, the students were very off task. It improved by the end of the week, but they still seemed more off task than usual - The kids were more distracted when they had to stand than sit. This is most likely because the standing was new. -Students had a hard time staying on task while standing. Many tried to sit back down or kneel on their chair, which then cause others to call out the behavior. Hoping as this becomes more of a routine they will be less off task and more focused. - The standing causes lots of fidgeting. I am not		-Amount of hall pass use increased dramatically during periods of standing.	

		certain if they are losing focus at this time as well.			
Week 3	-Given the opportunity to stand, less students are choosing to stand for the lesson. They have been less off-task when standing because I think the kids that truly want to stand during the lesson are now standing. The students who don't want to stand and were off-task while standing are now choosing to just remain seated. - No problems other than one standing blocking the view of another...It was resolved but did create a distraction for a short period of time.	- Students are having a hard time not leaning on the desk/tables, or placing a knee on the stools. lots of redirection and students calling other out	- The first period classes like standing the most saying that it helps to wake them. - I have noticed that my morning classes are more focused and on-task. My periods 7/8 (right after lunch) and especially 9 get silly with questions about standing and distracting.	- There has been a dramatic increase in hall pass use.	
Week 4	- I had students stand when I saw they were tired and could see they weren't focused. I really think that standing pulled them back into the lesson. -Students are getting better at standing unassisted with	- The standing continues to cause an increase in fidgeting behavior and decreases eye contact. While hall pass use has decrease some, it is still higher than when seated			

	less complaining.				
Week 5	- It was easier to implement standing during group time vs. lecture - The students that seemed to enjoy standing participated in this intervention the entire time. The students that weren't interested stopped standing after the first two weeks - They do seem more focused! - Behavior was fine all week- actually seemed a bit sluggish. -Some students will now voluntarily stand while they are working!! -Students seem to enjoy standing.	- Some students continue to moan and groan when asked to stand. - Sometimes their eye contact/ attention doesn't remain focused if for more than 5-10 mins. They begin shifting/ rocking/ leaning during a demo.		- Increase hall pass use and fidgeting continues	
Week 6	-Students have continued to adjust to standing for instruction.	- Eye contact and movement continues to be an issue, especially with the boys. -Some of the students are still hesitant to stand when asked. - Standing seemed like it was more of a disruption for the students in my class. They were		- Hall pass use is still well above normal levels.	-If students would have had a standing work desk this might have helped with the off-task behaviors. I also think if standing during class was something they did since kindergarten this would also be more normal for them. - Those that loved to stand... slowly

123

		more active while standing which caused for off-task behaviors --Standing during a lecture is challenging without the desks being at standing height. Students needed to keep bending down to write. -Some students are able to focus better on assignments and follow along during reading assignments when they are standing.			wanted to sit- again if the tables were higher I think they would have continued to stand. -It would be more effective if all students had standing height desks
Week 7	-It seems as if some students prefer standing and some prefer sitting. If given the option, it seems that about 30-40% of the class will stand. -Students have been asking to stand during instruction	-Since sitting in the class is the "normal" routine, I felt as though they were more on task as compared to standing			-The on-task and off-task behaviors for both standing and sitting were very similar. A few students were off task when standing and a few were off task when sitting -A desk or something to lean on when standing

PROFESSIONAL DEVELOPMENT: LESSONS LEARNED FROM A PILOT STUDY

OF TEACHER PERCEPTIONS OF STANDING FOR INSTRUCTION IN A MIDDLE

SCHOOL CLASSROOM

Physical Make-Up of the Classroom and Standing Space

- Some students rocked, swayed, and shifted more than others; a defined "standing area" may help
  - Tape on floor
  - Height adjustable desk for leaning
  - Placement near other standing students
- Implementing the intervention in small classrooms with many students was difficult because of space issues
  - It was also difficult in small classrooms with long tables as opposed to individual desks
- When tall students chose to stand while other students were sitting, they needed to be moved to a space either off to the side or in the back of the room
- Height adjustable desks would have been very helpful because:
  - Students had to bend over to take notes
  - Students had a hard time typing on their iPads while standing
  - Students had difficulty balancing books, notebooks, iPads, etc. while standing

Teacher Observations of Student Reactions

- Some students quickly adjusted to the standing intervention, others took longer to adjust

- On the first day of the intervention, more students than normal were off task.
  - Teachers believe this is because standing was new and a different from the typical routine
- The longest reported adjustment period was 3 weeks at 15 minutes per period, 3 days per week
- Students who stood during the class period after lunch were more "silly and distracting"
- Students preferred to stand for 25 minutes or less per class period
- Students "seemed to like the change of pace standing offers"

Teacher Insights

- Students in their morning classes were "more awake" during the standing intervention
- There was a decrease or no change in students leaving the classroom during the standing intervention
- Students who are typically "fidgety" benefitted the most from the standing intervention
- Students who "needed it" opted to stand during and after the intervention
- Some students who chose to stand, then sit for a portion of the class were more focused when standing and for a brief time after standing as well
- Standing helped students who were off task to regain focus
- Students were more engaged with in-class activities while standing
- Students' reactions to games were more animated and enthusiastic when standing
- A combination of standing and sitting within the class period helped with student focus and attention
- Students who did not want to stand were more off-task when teachers required them to stand

When to Implement and Post-Study Information

- Teachers in the building who did not participate in the study are eager to try the standing intervention.
  - Since the conclusion of the study, non-participant teachers have implemented the standing intervention in their classes
- Teachers needed to know their students' abilities and challenges, class makeup, and class "personality" to determine the most effective way to implement the standing intervention
- About 30-40% of students who were a part of the study continued to choose to stand for instruction after the study concluded
- Teachers implemented the standing intervention when students were "glazing over" or when students appeared to be tired

APPENDIX F

**PROFESSIONAL DEVELOPMENT: FREQUENTLY ASKED QUESTIONS ABOUT
IMPLEMENTING A STANDING INTERVENTION**

When should I implement a standing intervention?

There are a few different scenarios when teachers have had success with the implementation of a steading intervention.

1. In the morning. Teachers reported students seemed to "wake up" and engage more in the morning; students' effort increased and they were more focused
2. When the students appeared to be tired or had a "glazed over" look. Standing re-focused students and engaged them in the lesson
3. When students were "fidgety". Teachers asked "fidgety" students to stand and saw an increase in focus and decrease in off-task behavior
4. When they knew their students well; knowing students' limitations and abilities was an important factor in implementing a standing intervention.

How long should students stand for instruction?

Standing time can vary by teacher, student, and instructional format. A standing time of 15 minutes per class period, 3 days per week is feasible and acceptable. Teachers report standing more than 25 minutes may result in fatigue and loss of focus.

Why should I implement a standing intervention?

There are potential health and educational benefits to implementing a standing intervention in the classroom.

1. To combat sedentary behavior:
    a. Students may spend up to six hours sitting during a middle school day (NCES, 2018) and sedentary behavior— primarily sitting—negatively affects health (Cardon, De Clercq, De Bourdeaudhuij, & Breithecker, 2004; Grunseit et al., 2013).
2. To combat off-task behavior:
    a. Off-task student behavior can negatively impact achievement (Schumate & Wills, 2010)
3. Teachers who have successfully implemented the intervention report the following:
    a. Students were more on task
    b. Students' off-task behavior and fidgeting decreased
    c. Students were more engaged in the class activity
    d. Students were more excited about the lesson
    e. Students' overall focus and attention improved
    f. Students were focused for a brief time after standing as well as while standing
    g. Students were excited about the opportunity to stand
    h. Some students preferred to stand; about 30-40% of the class

What are the possible drawbacks of implementing a standing intervention?

Teachers have reported the following issues with a standing intervention:

1. Tall students assigned to the front of the room blocked the view of other students; consider an alternative placement
2. The first day of standing teachers reported an increase in off-task behavior, presumably because of a change in the normal routine
3. Some students did not want to stand and complained about standing
4. Some students rocked, swayed, and shifted more than others; a defined "standing area" may help
5. Classes after lunch were more "wound up" when standing; consideration should be given to time of day
6. Standing without a standing height desk was a challenge for some class activities such as writing, typing, and notetaking.

What are some strategies for implementing a standing intervention with a standing height desk without small budget?

Here are some budget friendly options for creating standing height desks for students:

1. Pile textbooks on the desks to make them height adjustable for each student (many buildings have old textbooks in storage, ask for them!)
2. Place boxes (think copy paper boxes) flat side up on student desks
3. Allow students to use a podium, bookshelf, or window sill as a work station
4. Laptop tray tables (can be purchased for about $15 each) to place on student desks
5. Adjustable bed risers placed under student desks to raise the height (can be purchased for about $10 for a set of 4)
6. Some other options to consider (an internet search will show more than those listed below):
   a. Writing a grant for "Stand Up Kids"
   b. Creating a "Donor's Choose" page
   c. Applying for funds from "Fund for Teachers"

BIBLIOGRAPHY

Australian Government Department of Health. (2017). *Sedentary behaviour.* Retrieved from http://www.health.gov.au/internet/main/publishing.nsf/content/sbehaviour

Benden, M. E., Wendel, M. L., Jeffrey, C. E., Zhao, H., & Morales, M. L. (2011). Within-subjects analysis of the effects of a stand-biased classroom intervention on energy expenditure. *Journal of Exercise Physiology Online, 15*(2), 9.

Benden, M. E., Mancuso, L., & Hongweizhao, Pickins, A. (2016). The ability of the SenseWear[R] armband to assess a change in energy expenditure in children while sitting and standing. *Journal of Exercise Physiology Online, 14*(3), 1.

Benden, M. E., Zhao, H., Jeffrey, C. E., Wendel, M. L., & Blake, J. J. (2014). The evaluation of the impact of a stand-biased desk on energy expenditure and physical activity for elementary school students. *International Journal of Environmental Research and Public Health, 11*(9), 9361-9375. doi:10.3390/ijerph110909361

Biddle, S. J., & Asare, M. (2011). Physical activity and mental health in children and adolescents: A review of reviews. *British Journal of Sports Medicine, 45*(11), 886-895. doi:10.1136/bjsports-2011-090185

Cardon, G., De Clercq, D., De Bourdeaudhuij, I., & Breithecker, D. (2004). Sitting habits in elementary schoolchildren: A traditional versus a "moving school". *Patient Education and Counseling, 54*(2), 133-142. doi:10.1016/S0738-3991(03)00215-5

Centers for Disease Control (CDC). (2016). *Physical activity facts*. Retrieved from https://www.cdc.gov/healthyschools/physicalactivity/facts.htm

Chau, J. Y., Daley, M., Srinivasan, A., Dunn, S., Bauman, A. E., & van der Ploeg, H. P. (2014). Desk-based workers' perspectives on using sit-stand workstations: A qualitative analysis of the Stand@Work study. *BMC Public Health, 14*(1), 752. doi:10.1186/1471-2458-14-752

Chau, J. Y., Sukala, W., Fedel, K., Do, A., Engelen, L., Kingham, M., & Bauman, A. E. (2016). More standing and just as productive: Effects of a sit-stand desk intervention on call center workers' sitting, standing, and productivity at work in the Opt to Stand pilot study. *Preventive Medicine Reports, 3*, 68-74. doi: 10.1016/j.pmedr.2015.12.003

Check J., & Schutt R. K. (2012). *Research methods in education.* Thousand Oaks, CA: Sage Publications.

Chen, J., McCray, J., Adams, M., & Leow, C. (2014). A survey study of early childhood teachers' beliefs and confidence about teaching early math. *Early Childhood Education Journal, 42*(6), 367-377.

Dadakhodjaeva, K. (2017). *The good behavior game: Effects on maintenance of behavior in middle-school classrooms using class dojo* (Doctoral dissertation). The University of Southern Mississippi, Hattiesburg, MS.

Donnelly, J. E., & Lambourne, K. (2011). Classroom-based physical activity, cognition, and Academic achievement. *Preventive Medicine, 52*, S36-S42. doi: 10.1016/j.ypmed.2011.01.021

Drza-Grabiec, J., Snela, S., Rykała, J., Podgórska, J., & Rachwal, M. (2015). Effects of the sitting position on the body posture of children aged 11 to 13 years. *Work, 51*(4), 855.

Fanning, J., Porter, G., Awick, E. A., Ehlers, D. K., Roberts, S. A., Cooke, G., … & McAuley, E. (2017). Replacing sedentary time with sleep, light, or moderate-to-vigorous physical activity: Effects on self-regulation and executive functioning. *Journal of Behavioral Medicine, 40*(2), 332-342. doi: 10.1007/s10865-016-9788-9

Faul, A., Stepensky, K., & Simonsen, B. (2012). The effects of prompting appropriate behavior on the off-task behavior of two middle school students. *Journal of Positive Behavior Interventions, 14*(1), 47. doi: 10.1177/1098300711410702

Godwin, K. E., Almeda, M. V., Seltman, H., Kai, S., Skerbetz, M. D., Baker, R. S., & Fisher, A. V. (2016). Off-task behavior in elementary school children. *Learning and Instruction, 44*, 128-143. Retrieved from http://dx.doi.org/10.1016/j.learninstruc.2016.04.003

Graham, C., Richardson, A., King, S., & Chiera, B. (2014). An initial exploration of the association between psychological distress and sedentary behavior in first year undergraduates: A practice report. *The International Journal of the First Year in Higher Education, 5*(2), 95-101.

Greico, L. A., Jowers, E. M., Errisuriz, & J. B., Bartholomew, J. B. (2016). Physically active vs. sedentary academic lessons: A dose response study for elementary student time on task. *Preventative Medicine, 89*, 98-103. Retrieved from http://dx.doi.org/10.1016/j.ypmed.2016.05/021

Grunseit, A. C., Yuk-Yin Chau, J., van der Ploeg, H. P., & Bauman, A. (2013). "Thinking on your feet": A qualitative evaluation of sit-stand desks in an Australian workplace. *BMC Public Health, 13*, 365.

Hadgraft, N., & Owen, N. (2017). Sedentary behavior and health: Broadening the knowledge base and strengthening the science. *Research Quarterly for Exercise and Sport, 88*(2), 123. doi: 10.1080/02701367.2017.1305257

Harrison, F., & Jones, A. P. (2012). A framework for understanding school based physical environmental influences on childhood obesity. *Health & Place, 18*(3), 639. doi: 10.1016/j.healthplace.2011.12.009

Harvard, TH Chan School of Public Health. (2018). *Nutrition source.* Retrieved from https://www.hsph.harvard.edu/nutritionsource/mets-activity-table/

Hinckson, E. A., Aminian, S., Ikeda, E., Stewart, T., Oliver, M., Duncan, S., & Schofield, G. (2013). Acceptability of standing work stations in elementary schools: A pilot study. *Preventative Medicine, 56* (1), 82-85. Retrieved from http://dx.doi.org/10.1016/j.ypmed.2012.10.014. che.addthiscdn

Howie, E. K., & Pate, R. R. (2012). Physical activity and academic achievement in children: A historical perspective. *Journal of Sport and Health Science, 1*(3), 160-169. doi: 10.1016/j.jshs.2012.09.003

Jarrett, O. S., Maxwell, D. M., Dickerson, C., Hoge, P., Davies, G., & Yetley, A. (1998). Impact of recess on classroom behavior: Group effects and individual differences. *The Journal of Educational Research, 92*(2), 121-126.

Joshi, P., Howat, H., Bryan, C., & Dick, S. (2011). Relationship between fitness levels and academic performance. *Journal of Physical Education and Sport, 11*(4), 376.

Kilian, B., Hofer, M., & Kuhnle, C. (2010). Value orientations as determinants and outcomes of conflicts between on-task and off-task actions in the classroom. *Learning and Individual Differences, 20*, 501. doi: 10.1016/j.lindif.2010.03.003

Kilian, B., Hofer, M., Fries, S., & Kuhnle, C. (2010). The conflict between on-task and off-task actions in the classroom and its consequences for motivation and achievement. *European Journal of Psychology in Education, 25*(1), 67-85. doi 10.1007/s10212-009-0007-8

Koepp, G. A., Snedden, B. J., Flynn, L., Puccinelli, D., Huntsman, B., & Levine, J. A. (2012). Feasibility analysis of standing desks for sixth graders. *ICAN: Infant, Child, & Adolescent Nutrition, 4*(2), 89-92.

Leflot, G., van Lier, P., Onghena, P., & Colpin, H. (2010). The role of teacher behavior management in the development of disruptive behaviors: An intervention study with the good behavior game. *Journal of Abnormal Child Psychology, 38*, 869-882. doi: 10.1007/s10802-010-9411-4

Lizandra, J., Devís-Devís, J., Pérez-Gimeno, E., Valencia-Peris, A., & Peiró-Velert, C. (2016). Does sedentary behavior predict academic performance in adolescents or the other way round?: A longitudinal path analysis. *PLOS One, 11*(4). doi: 10.1371/journal.pone.0153272

MacEwen, B. T., MacDonald, D. J., & Burr, J. F. (2015). A systematic review of standing and treadmill desks in the workplace. *Preventive Medicine, 70*, 50-58. doi: 10.1016/j.ypmed.2014.11.011

Malina, R., Cumming, S., & Coelho-e-Silva, M., (2016). Physical activity and inactivity among children and adolescents: Assessment, trends, and correlates. *Biological Measures of Human Experience across the Lifespan: Making Visible the Invisible, 5*, 57. DOI 10.1007/978-3-319-44103-0_5

Mehta, R., Shortz, A., & Benden, M. (2015). Standing up for learning: A pilot investigation on the neurocognitive benefits of stand-biased school desks. *International Journal of Environmental Research and Public Health, 13*(1), 59. doi:10.3390/ijerph13010059

Mertens, D. M. (2015). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods* (4th ed.). Los Angeles, CA: SAGE.

Mid-Atlantic School District. (2015). *Student wellness policy #3441*.

Minges, K. E., Chao, A. M., Irwin, M. L., Owen, N., Park, C., Whittemore, R., & Salmon, J. (2016). Classroom standing desks and sedentary behavior: A systematic review. *Pediatrics, 137*(2), 1-18. doi:10.1542/peds.2015-3087

Morita, N., Nakajima, T., Okita, K., Ishihara, T., Sagawa, M., & Yamatsu, K. (2016). Relationships among fitness, obesity, screen time and academic achievement in Japanese adolescents. *Physiology & Behavior, 163*, 161. doi: 10.1016/j.physbeh.2016.04.055

National Center for Educational Statistics (NCES). (2018). Retrieved from https://nces.ed.gov

Prosch, N. (2013). Light, moderate, and vigorous activity. *iGrow: A Service of SDSU Extension.* Retrieved from http://igrow.org/healthy-families/health-and-wellness/light-moderate-and-vigorous-activity/

Rasberry, C. N., Lee, S. M., Robin, L., Laris, B. A., Russell, L. A., Coyle, K. K., & Nihiser, A. J. (2011). The association between school-based physical activity, including physical education, and academic performance: A systematic review of the literature. *Preventive Medicine, 52*(1), S10-20. doi: 10.1016/j.ypmed.2011.01.027

Robbins, L. B., Pfeiffer, K. A., Maier, K. S., Lo, Y., & Wesolek, S. M. (2012). Pilot intervention to increase physical activity among sedentary urban middle school girls: A two-group

pretest-posttest quasi-experimental design. *The Journal of School Nursing, 28*(4), 302-315. doi: 10.1177/1059840512438777

Sherry, A. P., Pearson, N., & Clemes, S. A. (2016). The effects of standing desks within the school classroom: A systematic review. *Preventive Medicine Reports, 3*, 338-347.

Schumate, E., & Wills, H. (2010). Classroom-based functional analysis and intervention for disruptive behaviors and off-task behaviors. *Education and Treatment of Children, 33*(1), 23.

Stylianou, M., Kulinna, P. H., van der Mars, H., Mahar, M. T., Adams, M. A., & Amazeen, E. (2016). Before-school running/walking club: Effects on student on-task behavior. *Preventive Medicine Reports, 3*, 196-202. doi: 10.1016/j.pmedr.2016.01.010

Sudholz, B., Timperio, A., Rodgers, N., Dunstan, D., Baldock, R., Holland, B., Salmon, J. (2016). The impact and feasibility of introducing height-adjustable desks on adolescents' sitting in a secondary school classroom. *AIMS Public Health, 3*(2), 274-287. doi: 10.3934/publichealth.2016.2.274

Thosar, S., Bielko, S., Mather, K., Johnston, J., & Wallace, J. (2015). Effect of prolonged sitting and breaks in sitting time on endothelial function. *Medicine & Science in Sports & Exercise, 47*(4), 843-849. doi:10.1249/MSS.0000000000000479

Torbeyns, T., Bailey, S., Bos, I., & Meeusen, R. (2014). Active workstations to fight sedentary behaviour. *Sports Medicine, 44*(9), 1261-1273. doi:10.1007/s40279-014-0202-x

Torrijos-Niño, C., Martínez-Vizcaíno, V., Pardo-Guijarro, M. J., García-Prieto, J. C., Arias-Palencia, N. M., & Sánchez-López, M. (2014). Physical fitness, obesity, and academic achievement in schoolchildren. *The Journal of Pediatrics, 165*(1), 104. doi: 10.1016/j.jpeds.2014.02.041

Totura, C., Figueroa, H. L., Wharton, C., & Flavio, M. F. (2015). Assessing implementation of evidence-based childhood obesity prevention strategies in schools. *Preventive Medicine Reports, 2*, 347-354.

Trilk, J. L., Pate, R. R., Pfeiffer, K. A., Dowda, M., Addy, C. L., Ribisl, K. M., … Lytle, L. A. (2011). A cluster analysis of physical activity and sedentary behavior patterns in middle school girls. *Journal of Adolescent Health, 51*(3), 292-298. doi: 10.1016/j.jadohealth.2011.12.021

Trust for America's Health and the Robert Wood Johnson Foundation (2018). The state of childhood obesity. *Better Policies for a Healthier America.* Retrieved from https://stateofobesity.org/childhood-obesity-trends/

Van Dusen, D. P., Kelder, S. H., Kohl, H. W., Ranjit, N., & Perry, C. L. (2011). Associations of physical fitness and academic performance among schoolchildren. *Journal of School Health, 81*, 733-740.

Wang, X., Hui, Z., Terry, P. D., Ma, M., Cheng, L., Deng, F., Zhang, B. (2016). Correlates of insufficient physical activity among junior high school students: A cross-sectional study in Xi'an, China. *International Journal of Environmental Research and Public Health, 13*(4), 397. doi:10.3390/ijerph13040397

World Health Organization. (2016). *World health statistics 2016: Monitoring health for the SDGs, sustainable development goals*. Retrieved from: http://www.who.int/dietphysicalactivity/factsheet_young_people/en/

Zenzen, W., & Kridli, S. (2009). Integrative review of school-based childhood obesity prevention programs. *Journal of Pediatric Health Care, 23*(4), 242-258. doi: 10.1016/j.pedhc.2008.04.008