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The Impact of Combining Sensory Based Activities into Physical Education Classes with
Adolescents Diagnosed with Autism Spectrum Disorder

Shelby Hale

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A capstone project submitted in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree from the University of Indianapolis, School of Occupational Therapy.

Under the direction of the faculty capstone advisor:

Taylor McGann, OTD

A Capstone Project Entitled

The Impact of Combining Sensory Based Activities into Physical Education Classes with Adolescents Diagnosed with Autism Spectrum Disorder

Submitted to the School of Occupational Therapy at University of Indianapolis in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree.

By

Shelby Hale

OTS

Approved by:

Faculty Capstone Advisor

Date

Doctoral Capstone Coordinator

Date

Accepted on this date by the Chair of the School of Occupational Therapy:

Chair, School of Occupational Therapy

Date

Abstract

This Doctoral Capstone Project explored the benefit of adding sensory based activities to physical education (PE) classes at DAMAR with students diagnosed with Autism Spectrum Disorder (ASD). This project aimed to increase the participation of the students during PE classes, as well as educate the staff on the importance of physical activity participation for the students. All six ASD classes from DAMAR participated in this project with a total of 93 students. Outcomes of this project were an increase in participation in students during sensory based gym activities. Post-satisfaction surveys indicated teacher satisfaction with the PE activities, improvements in sensory behaviors in the classroom after PE, and satisfaction with the increase of student participation. Staff education and resources were provided to DAMAR staff to further educate on the importance of continuation of sensory based gym activities during PE time, as well as importance of encouraging student participation during PE. Outcomes of this project were affected by the number of student absences week by week and limited staff participation.

Literature Review

Autism Spectrum Disorder (ASD) is defined as persons having significant difficulties in social communication and reciprocity, developing and maintaining relationships, restricted and repetitive patterns or behavior, and deficits in non-verbal communication (Guest, Balogh, Dogra, & Lloyd, 2017). Occupational Therapy's (OT) role with treating children with ASD, based on the PEO theory, is enhancing participation in performance of activities of daily living (ADLs), instrumental activities of daily living (IADLs), education, work, leisure, play, and social participation (American Occupational Therapy Association, 2010). For an individual with ASD, occupational therapy services are defined according to the person's needs and priorities for participation. Throughout the OT process, collaboration with the child with ASD, caregivers, teachers, and other supporters are essential to understanding the daily life experiences of the individual. OT services can focus on personal development, quality of life, and needs of the family (American Occupational Therapy Association, 2010). OTs can also help children with ASD adjust to tasks and conditions to match their needs and abilities by adapting the environment to minimize external distraction or identifying skills that are needed to accomplish ADL and or IADL tasks (American Occupational Therapy Association, 2010). Mische and Foster (2018) concluded that "occupational therapy practitioners can partner with recreation and exercise professionals to increase physical activity among children with ASD by developing programs that meet the needs of the clients, matching clients with existing programs, and teaching clients underlying skills to succeed in preferred activities." Based on the ideas of Mische and Foster (2018) the purpose of this doctoral capstone project examined the impact of combining sensory based activities into physical education classes with adolescents diagnosed with ASD.

Sensory Benefits

OT practitioners have been using the sensory integration theory since it was introduced in 1963 by Jean Ayers. This theory postulates that learning occurs when the child has the ability to “receive accurate sensory information, process it, use it to organize behaviors, and adapt responses (Matsushima & Kato, 2013).” Sensory processing disorders are sensory processing challenges and deficiencies that continually interfere with higher levels of function and social participation. Matsushima and Kato (2013) reported that the symptoms of SPDs are common with children with ASD with incidence rates up to 95%. Children with ASD that exhibit SPD symptoms have trouble modulating their responses to various types of sensory input such as vestibular, tactile, and proprioceptive. Matsushima and Kato (2013) examined the association between SPD and social interaction deficits in Japanese students with ASD. Their study consisted of 84 children ranging from 4-6 years old with and without ASD. A likert scale questionnaire and standardized test was filled out by the caregivers to compare behavioral responses of the children to different sensory stimuli.. Their results concluded that there is a patterns of sensory processing deficits in children with ASD that are impacting their social interaction (Matsushuma & Kato, 2013).

Mische and Foster (2018) recruited participants from a sensory enhanced aquatics program for children with ASD 4-17 years of age seeking to find a relationship between sensory processing patterns, obesity, engagement in physical activity, and body mass index. The researchers collected data from caregivers through a demographic form, recreation participation log, and the Sensory Profile-2. After analysis of the data, researchers found that low sensory profile scores show that children with greater sensory seeking behaviors participate in more physical activities and children with avoiding sensory patterns have a higher BMI (Mische

&Foster, 2018). These results suggested that sensory patterns may be related to increased obesity rates in children with ASD and that sensory avoiding negativity affects daily living skills (Mische & Foster, 2018). With the knowledge that sensory processing patterns influence participation in physical activity, OTs are able to understand the influence of sensory processing patterns on physical activity. This allows OTs to design and structure environments with various levels of sensory stimuli to provide a better fit for children who display SPD behaviors with ASD (Mische &Foster, 2018).

Benefits of Participation

Participation in physical activity is crucial to one's physical, emotional, and cognitive health, and is associated with greater health for all population (Lawson & Little, 2017). Participation in physical activity for children with ASD has been shown to improve maladaptive and repetitive behaviors (Lawson and Little, 2017; Taliaferro, Rienzo, & Donovan, 2010), but there is an observed lack of participation in physical activity in children with ASD (Ninot, Bilard, & Delignieres, 2005). Participation in physical activity can also provide numerous benefits including increased physical conditioning, decline in isolation, improved psychosocial health, enhanced independence and self-efficacy, autonomy, and overall enjoyment (Guest, Balogh, Dogra, & Lloyyd, 2017).

Fundamental motor skills (FMS) are essential skills that develop throughout childhood and can enable participation in sport, recreation, and leisure activities (Guest et al., 2017). These skills include locomotor and object control skills and they contribute to physical, cognitive, and social development. Delays in FMS have been strongly correlated with children with ASD and become more prominent with age (Guest et al., 2017). Children with ASD are seen to have significant motor delays compared to their peers which can influence their participation in

physical activities. Guest et al. (2017) designed a five-day multi-sport camp for 13 girls ages 8-11 with ASD. The skills that were taught at the camp were locomotor and object control that progressed in difficulty throughout the camp. At the beginning of the research, participants were measured to have very poor or below average gross motor skills. At the end of the five-day camp there was significant improvements in all motor skills (Guest et al, 2017). The authors concluded that the improvements made will lead to functional gains, improved self-confidence, and increased physical abilities that encourage further participation (Guest et al, 2017).

Participation in physical activities has been shown to improve self-efficacy and self-perceptions among children with ASD and other developmental coordination disorders (Guest et al., 2017). Oladunni, Lyoka, and Goon (2015) found that students were more motivated to participate in sports because of several factors: enjoyment, competency, need to socialize, and health and psychological benefits. The researchers looked at 120 different schools and questionnaires that were completed by the students or their caregivers about the students' motivational factors influencing students with disabilities to participate in physical activities. The researchers also conducted interviews with teachers of the students interviewed and were asked about the benefits they see in participation in physical activities. The teachers reported that they noticed greater development of social skills, better attention span, and more productivity in the classroom when the students participated in physical activity (Oladunni et al., 2015).

Benefits to Socialization

Hand in hand with participation, greater motor skills and physical function have been linked with greater social skills and behavioral outcomes that are all beneficial for learning daily living skills (Guest et al., 2017). The ability to move with competence is required in structured

and unstructured recreational activities. For children of all ages, these skills are important for social scenarios that children with ASD may miss out on due to lack of skill (Guest et al., 2017). Research has shown that children with ASD that have made improvements in motor skills have also had a positive effect on social skills including a reduction in maladaptive behaviors and improvements with peer engagement (Guest et al., 2017). In the study by Guest et al. (2017), the researchers also found that with the use of the sport camp the participants showed significant improvements among the social skills domains including interpersonal adaptive levels of coping. Guest et al. (2017) also concluded that there was a small increase in social skills, cooperation, empathy, and self-control. Greater perceptions of having the skills to participate is also a contributing factor in order to engage in physical activities in a social setting and this may translate into more engagement with peers, providing more opportunities for these kids to interact socially (Guest et al., 2017).

Screening and Evaluation

Problems in Occupational Performance

DAMAR is a non-for-profit organization with a mission to integrate academic instructional techniques with life skills education, to ensure a better future for children facing life's greatest developmental and behavioral challenges. DAMAR Services' has put together a wellness program that has a mission to "encourage and enhance a healthy lifestyle by creating opportunities to educate and support each individual's lifelong wellness practices (DAMAR employee, personal communication, February 2018)." The fitness goal for this wellness program is to "provide opportunities for every client to develop the knowledge and skills for specific physical activities, maintain physical fitness, and regularly participate in physical activity (DAMAR employee, personal communication, February 2018)". With this goal, the wellness

program has objectives that incorporate development of motor skills and social skills through each students' participation in physical activity offered during PE/recreation times (DAMAR employee, personal communication, February 2018).

After completion of a four week needs assessment and observation in the recreational department, it was observed that the goals and objectives made through DAMAR Services were not being addressed. There was limited participation by the students in PE and there were limited opportunities for the students to develop knowledge and skills. With the limited participation and limited creativity in PE activities, motor and social skills were not being developed during PE times. Aligned with meeting the goals and objectives that was set by the DAMAR Services wellness program as well as evidence based ideas, this capstone project was created. The findings of Mische and Foster (2018) supported the problems that were found at DAMAR by concluding that OTs can partner with recreational staff to increase the physical activity participation among children with ASD by developing supporting sensory based program during physical education/recreation times.

Process

As stated above, the screening and evaluation processes for this Doctoral Capstone project started with a needs assessment done at DAMAR during physical education (PE) classes offered during the school day on the DAMAR campus. Classes from both the public off campus DAMAR Charter Academy (DCA) and private on campus DAMAR Freeway Academy (DFA) both take part in PE 1-3 times per week. Three DCA and three DFA classes were chose to be the focus for this project with a total of 93 students. The students in the 6 classes that were chosen, have a diagnosis of ASD. Students are enrolled in an Autism class at DCA and or are residents

on either the Autism Transition Residential Unit (ATU) or the Autism Service Residential Unit (ASU) on the DAMAR campus. Students' ages ranged from 7 to 21 years of age.

The information gained from the four week needs assessment and observation period was used to guide planning of best fit activities to create and increase student participation in PE. The Pittsburg Rehabilitation Participation Scale (PRPS) was used to track the participation of the students in gym class each week for seven weeks after the needs observation was completed. According to Lenze et al. (2004) the PRPS can be easily and reliably measured and the scores can predict functional outcomes. The PRPS also was found to have clinical and research outcome measurements (Lenze et al., 2004). Each participant was given a rating from 1-6 based on their performance in the activities. With 1 being no participation and 6 being full participation of the student with maximal effort. Refer to Table 1 for detailed PRPS and scoring information. Anonymity of the students was preserved during collection of PRS scores by assigning initials to each student. Teachers gave approval for the doctoral capstone student to participate in activity planning and implementation of activities during gym times once per week. Staff was informed their help would be needed to aid the students in participation in the structured gym activities.

Comparison to Practice Areas

The American Occupational Therapy Association (AOTA) identified Health and Wellness as a practice area of importance in the 21st century (American Occupational Therapy Association, 2018). According to AOTA, the factors that drive an increase need for wellness-related services are the ideas that an individual's health is directly related to physical as well as emotional well-being. AOTA states that factors that increase the need for health and wellness services are: a growing aging population, increased focus on health care disparities, rising rates

of obesity, and technology and imbalances in life roles (American Occupational Therapy Association, 2018). Some of the strategies that AOTA suggests for OT's to promote wellness and prevention are bullying education, obesity prevention, afterschool groups, and support of education programs (American Occupational Therapy Association, 2017). With this information stated this project can be considered a support of education programs, due to the support gave to the recreational staff at DAMAR when planning activities, as well as an obesity prevention due to its focus on increasing participation in physical activity among the children with ASD. Combing the ideas of AOTA's health and wellness strategies with the ideas from Mische and Foster (2018) this project is supporting the idea that occupational therapists should partner with recreational staff to be an additional resource to the staff, increase physical activity participation, and decrease obesity rates in children with ASD.

Implementation Phase

After completion of a four-week needs assessment, a seven-week intervention was designed to address the needs in the PE classes. The biggest need to address was the unstructured atmosphere of the autism PE classes. One teacher's assistant said it best when she asked, "Why can't our class do structured activities like the other classes (DAMAR employee, personal communication, January 2018)?" The next need that arose during the needs assessment phase was the unwillingness of staff to encourage the kids to participate. "How can we get the kids to participate when the staff just sits on the bleachers and refuse to get up (DAMAR employee, personal communication January 2018)," commented one DAMAR employee. After observing the staff, this second problem arose for lack of staff education and lack of staff expectations. Some of the staff comments were "the kids can't do that (DAMAR employee, personal communication, January 2018)," "you won't be able to get them to do that(DAMAR employee,

personal communication, January 2018),” or “the gym time isn’t for the kids it is for us[staff] (DAMAR employee, personal communication, February 2018).”

The seven-week interventions were designed to increase the structured atmosphere in the gym classes while increasing student participation. As a doctoral student, I worked closely with the recreation manager to design activities that would increase participation as well as add sensory components. Activities were combined into two different units to cover 7 weeks: The DAMAR Winter Olympics and DAMAR Ninja Warrior. To increase student and staff participation, awards were presented to winning classes/individuals after completion of both units.

The first unit that was implemented was the DAMAR Winter Olympics. This unit was completed by each class over the course of four weeks. Activities that were completed were similar to the Olympic games: hockey, biathlon, bobsled, figure skating, skiing, and snowboarding. All activities were completed in the gym during PE class times. Gym equipment such as scooters, mats, trikes, and bean bags were used to adapt each activity. I assigned rules to each game and decided the scoring qualification per day. Each class participated and a running total of class points were posted in the gym each day.

The second unit that was implemented was DAMAR Ninja Warrior. This unit was completed by each class over the course of three weeks. The obstacle course was broken up into three sections, with a new section added every week. Gym equipment such as mats, hula-hoops, climbing ropes, scooters, mini hurdles, and cones. During PE, the classes took turns practicing the different obstacles and completing the course for time.

Leadership

As a Doctoral student and a soon to be graduate, I understand the importance of continuous improvements in leadership skills. I have found that through this project, I was given a task that challenged both my advocacy and leadership skills. Through this project, I was able to collaborate with multiple disciplines and the many kids that are served at DAMAR that were not aware of the OTs role or job responsibilities. I created this project because of its relevance to the emerging health and wellness area of OT practice (American Occupational Therapy Association, 2018). I had to start my project by describing what role an OT can play in this setting and what I could bring being an OT Doctoral student. For the first few weeks I assumed the role of advocate and educator to the recreation and school staff along with the students on what my role was as a doctoral capstone student. Also the first few weeks of my project, I was using the time to observe and get to know clinical operations at DAMAR to get an idea of what was needed using a consultative model. The consultative model focuses on meeting all individuals needs that are involved, and with consulting with staff members I was able to pinpoint problem areas that I would later address as my project (Dreiling & Brudy, 2003). I brought these problem areas to my supervisor and the rest of the recreation team and advocated on why there was a need for OT intervention. This brought me out of my comfort zone, because I was not used to providing constructive criticism on how an individual can enhance their job performance. This made me grow in my leadership and advocacy skills to create the best atmosphere for the DAMAR clients during their PE times.

Staff Development

Based on the observations that were found, staff education was provided during the four-week needs assessment to educate on the role of OT, during the seven-week intervention phase

to educate on the importance of participation, and after completion of the project to educate staff on data that was collected and importance of continuation of similar interventions to promote health benefits for the kids with ASD.

Information on ASD interventions were provided to the recreational staff that were involved in this project. I used evidence-based literature to create a handout of what ASD is, the importance of recreation participation for this participation, and tips to increase participation with activities and interventions that they will enjoy (Tomchek, Koenig, Arbesman, & Lieberman, 2017). This handout also addressed tips on how to properly handle sensory seeking and sensory avoidant children (Kuhaneck & Watling, 2018) .

Discontinuation Phase

Quality Improvement

Quality improvement is best defined as using current professional knowledge to address a clinical problem by increasing the likelihood of the desired outcome to improve quality of care (Mainz, 2003). Having noticed the need to structure the PE classes for the students with ASD, I made the intent of my capstone project creating activities that are both achievable for the students and simple for the recreational staff to implement. After determining the need, I used evidence-based techniques and ideas to structure and plan the activities. The activities I implemented brought more structure to the DAMAR PE classes and an increase in student participation. While using a structured sensory-based approach to the DAMAR PE classes, the students' participation increased, their negative behavior tendencies decreased, and staff reported satisfaction in the project.

Data Collection

The outcome measures that were used to assess the effectiveness of my project was a post intervention satisfaction survey and the average change in PRPS scores. Each of the six classes had an increase in PRPS scores when comparing pre-intervention PRPS scores to week seven PRPS scores. (Figure 1). Limitations caused by holidays, school functions, and classroom activities affected PE attendance week by week. Even with changes in attendance, there was still an overall increase in PRPS scores from pre-intervention to week seven (Figure 2 and Figure 3). Classes 6 and 4 had the greatest improvements in participation during this doctoral capstone project, with PRPS improvements of 4.250 and 4.000.

The post survey was completed by the teachers. Results of the survey showed satisfaction with the doctoral capstone project. The teachers reported that the gym activities were fun, high quality, useful, and unique. Eighty percent of the teachers reported that the sensory based gym activities met the sensory needs of the students as well as increased student participation. One hundred percent of the teachers noted that they did see benefits in the classroom after the students participated in the sensory based gym activities.

The above data was collected and presented to the recreation staff as well as were used to create staff resources. The information and resources provided to that staff was used to increase advocacy for occupational therapy services in recreation (Mische & Foster, 2018) as well as to increase staff education on the importance of participation in gym and sensory activities for the students with autism (Kuhaneck & Watling, 2018).

Discontinuation

Lovarini, Clemson and Dean (2013) identified factors that can better sustain a program: financial support, participation, planning, training, and collaboration. This program's financial

support is strong since DAMAR receives funding for its recreation equipment through generous grants and donations from various organizations. These funds allow for equipment to be purchased for the gym and/or other activities when it is needed. These funds supplied the equipment needed for the Olympic unit as well as the ninja warrior unit that I implemented for this capstone project.

To support planning, training, collaboration and staff participation the recreational staff were provided resources for future use. These resources consisted of planned activities that they can do with the students. Staff received an informative handout regarding sensory needs in children that includes tips on how to appropriately address these needs.

Lastly, for discontinuation of this project, I began a collaboration process for the OT and the recreation staff at DAMAR to continue sensory based PE activities. This collaboration opportunity provided the recreation staff with a resource for answering questions and generating ideas. Creating an atmosphere of collaboration and educating the staff, will hopefully sustain the use of sensory-based PE activities for the students with ASD in the future.

Professional Development

My project strived to improve the professional development of the staff at DAMAR. I worked regularly with the recreation staff, the teaching staff, and other support staff to educate them on the role of OT and the importance of student participation in PE. Daily, I explained to all staff the reason for each activity and how to appropriately encourage student participation. For the activities I implemented, I led by example through modeling to teach staff how to continue similar activities after the completion of my project.

Outcome

The goal of this doctoral capstone project aimed to increase staff education on the importance of student participation in PE activities as well as planning structured, sensory-based activities for the ASD classes. This project promoted both staff and student productivity in the school setting while hoping to influence other societal roles. 1.5 million Americans with ASD are learning how and adapting to functioning in society as they are growing older every day. With the help of projects in the school system like this one, students will learn ways of coping with sensory needs as well as participating in group activities. These learned skills as well as peer interaction will benefit the individuals with ASD as they become functional members of society.

Regarding the students, this project facilitated participation in sensory-based PE activities that also promoted refining gross motor movements. These activities aided in social engagement with peers, following simple and complex directions, and decreasing the tendency of maladaptive behaviors. Before my interventions, ASD classes came to the gym, and there were no activities planned. If the students did not want to or know how to shoot basketballs or ride a tricycle, they sat in the bleachers. After my interventions, ASD classes came to class with an expectation of and a desire to participate in the various structured, sensory-based activities. This project outcome is consistent with current ASD research findings that participation in physical activity has shown an improvement in behavior outcomes (Lawson and Little, 2017; Taliaferro et al., 2010; Guest et al., 2017; Oladunni et al., 2015).

Regarding the staff, this project encouraged staff participation in helping the students complete the activities. Before my intervention, staff used the PE classes as their own recreation time and would not encourage student participation. This led to students sitting in the bleachers

and staff participating in recreational activities of their choosing. After my intervention, the majority of the staff are now encouraging student participation and helping guide them in the activities. This project has taught the staff the importance of PE participation for the ASD classes as well as the role of OT. In addition to the staff encouraging the students in the PE atmosphere, staff are now educated on activities that they can implement now and in the future.

Overall Learning

Communication Skills

During this doctoral capstone review I increased my OT knowledge and my interpersonal and professional skills. Partnering with the recreation department at DAMAR presented many challenges that I had to overcome. I was working with a population that was unfamiliar with both the role of OT and the role that I was playing. During my project, I had to explain the reasoning underlining my presence at DAMAR, what OT is, and the importance of my role in the recreation department. I was asked questions such as, “Why are you doing this?” or “Why are you in the gym?” frequently, so I learned to clarify my reasoning so that staff would easily understand. To increase staff support, I had to justify the importance of student participation in gym and describe the benefits they would see from it. Due to the nature of the recreation department, I worked daily with a majority of the staff at DAMAR using verbal interactions as the primary method of communication. As a result of this project, my confidence in defending myself and my profession grew.

This project also required me to demonstrate suitable written communication skills. These skills were necessary when writing emails and creating staff resources. I had to ensure these were written in a professional manner and could be easily understood by the staff. The resources created were instructions and tips that the staff could use to maintain my project. These

instructions had to be articulated in a way that was simple for the staff to interpret in order to increase the chances that they would put into practice my advice and activities. This project developed my written communication skills by requiring my writing to be both professional and easily understood by the staff at DAMAR.

Future Practice

I have learned many skills that will benefit my future career as an OT during this doctoral capstone project. I practiced my clinical knowledge by creating and implementing sensory-based activities during gym time for the DAMAR students. This will apply to my future in pediatrics during which I will use sensory-integration techniques with clients. Another skill that I gained was how to better lead a group session. Kessler, Momich and Perel (1990) stated that occupational therapists have used groups as their preferred modality in psychosocial settings since the beginning of the profession. I gained experience with this since all classes were conducted in a group setting. This increased my knowledge about conducting group therapy that I will be able to implement in the future.

Lastly, during my time at DAMAR, my professional skills developed. These skills included communicating, advocating, and educating. While I took on many roles during my time at DAMAR, the role I played the most was as an educator to the staff and an advocate for the students. I learned how to effectively articulate the importance of physical activity for the students with ASD and disruptive behaviors to the staff. In the future, this project will aid in my ability to connect with my clients' families and educate them on the importance of home programs and of interventions that I implement. Through educating the staff, I learned how best to advocate for the students in order to secure the services that they needed and better treatment from the staff. This built my confidence in defending the students and upholding what I believed

was right; this increased confidence will be used to pursue the best treatment for all my future clients. In closing, my time at DAMAR has helped me grow as an occupational therapist, and I will implement the knowledge and skills I have learned in my future career.

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Table 1: *Pittsburg Rehabilitation Participation Scale*

<i>Score</i>	<i>Justification</i>
1	None: Student refused entire session or did not participate in exercise session
2	Poor: Student refused or did not participate in at least half of session
3	Fair: Student participated in most of all exercise with less than maximum effort
4	Good: Student participated in all exercises with good effort and passively followed directions
5	Very Good: Student participated in all exercise with maximal effort and finished all tasks
6	Excellent: Student participated in all exercises with maximal effort, finishes all tasks, and actively took interest in session.

Note: Adapted from sralab.org for use with student population.

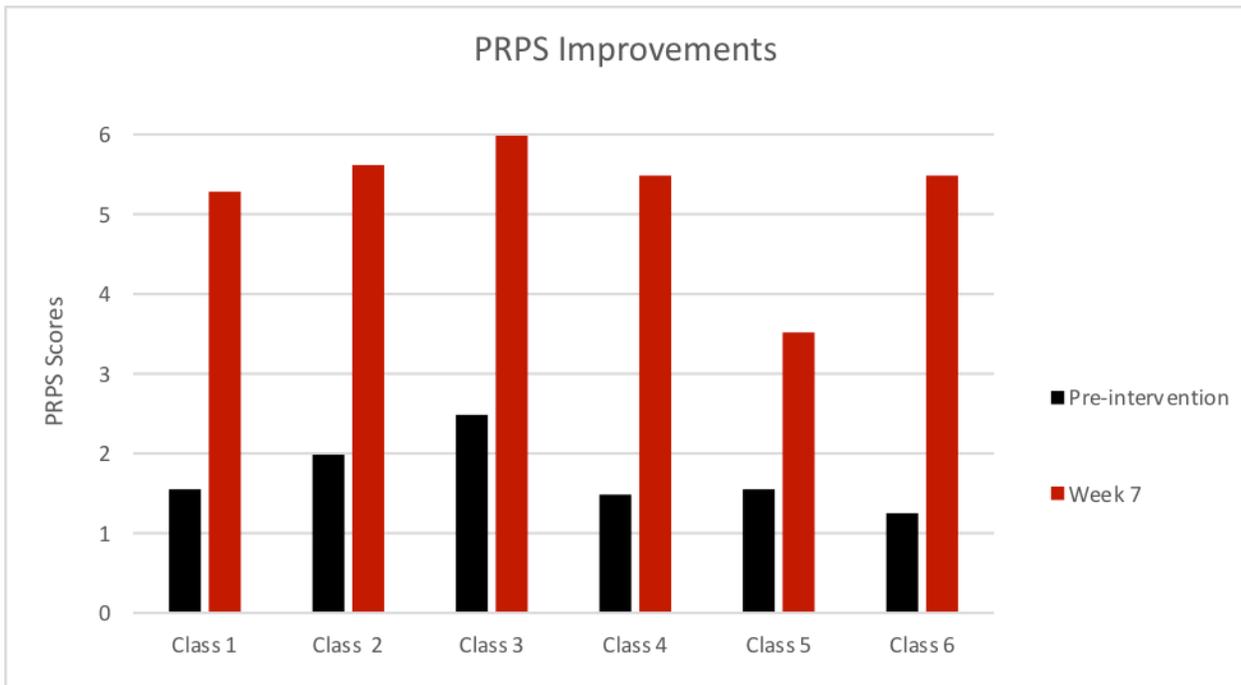


Figure 1. PRPS scores recorded for pre-intervention week and week 7 showing an increase in participation after completion of this doctoral capstone project in all six classes.

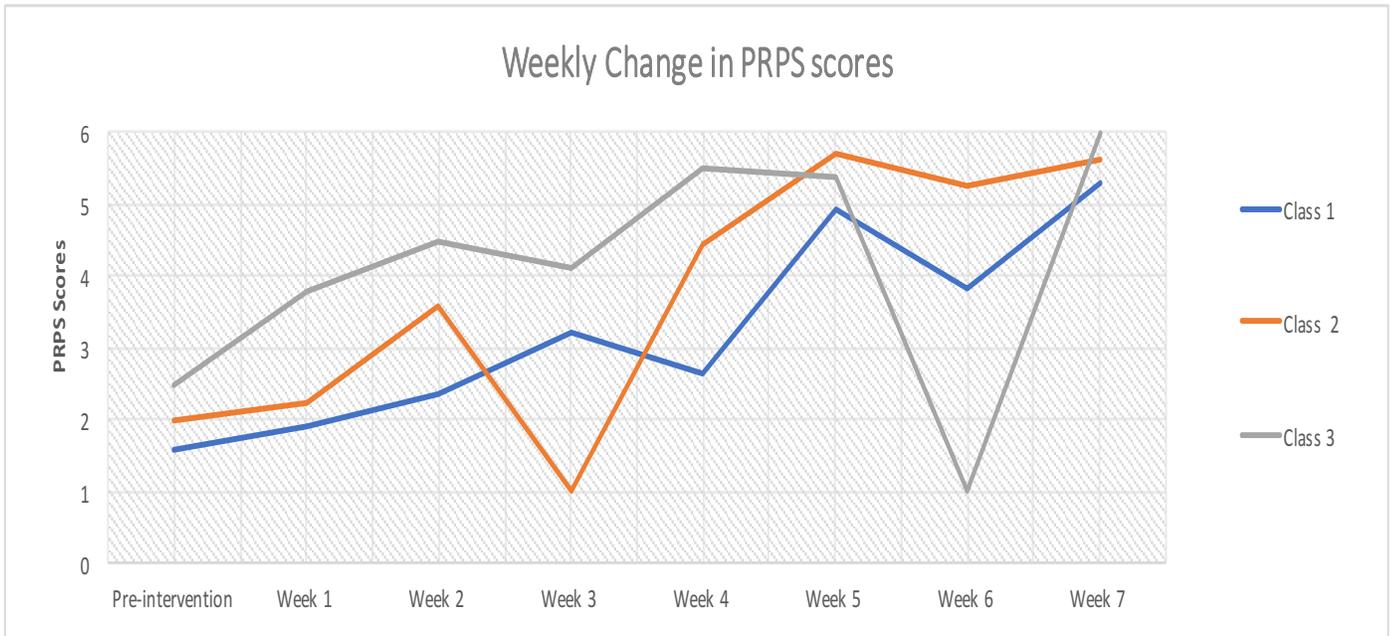


Figure 2. PRPS score fluctuation for classes 1-3 over the 7 week project intervention showing overall increase in scores. Dips in scores to 1 for class 2 and 3 show no participation from class due to classroom/holiday activities that did not allow time for PE that week.

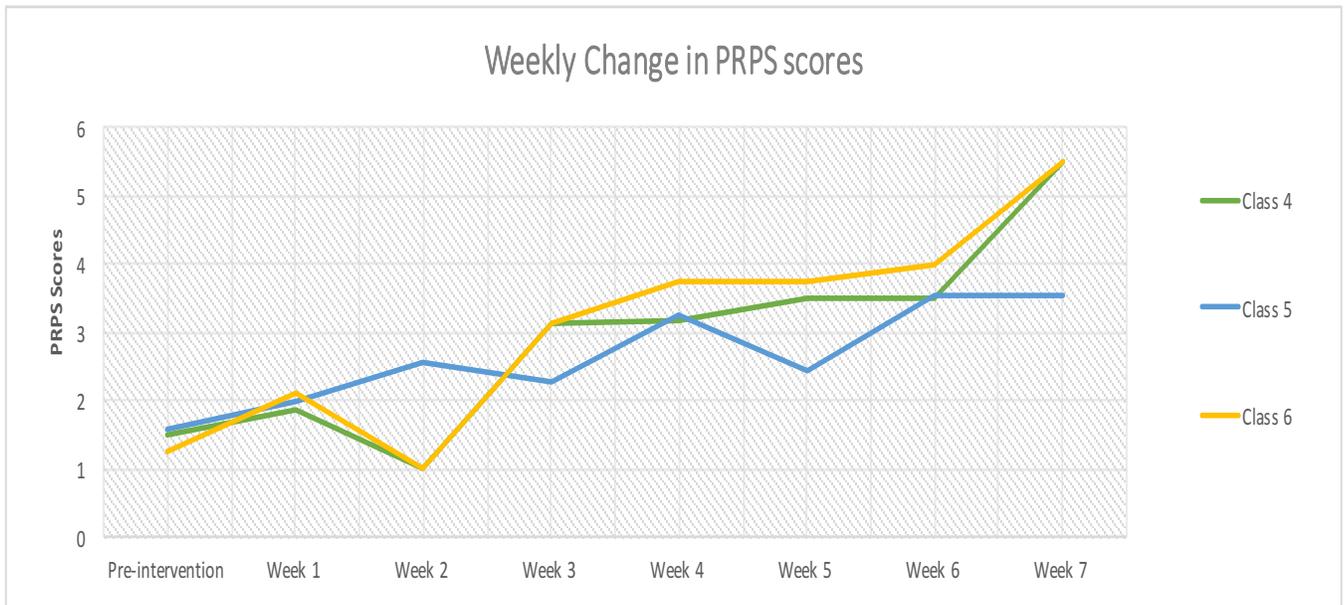


Figure 3. PRPS score fluctuation for classes 4-6 over the 7 week project intervention showing overall increase in scores. Dips in scores to 1 for class 4 and 6 show no participation from class due to classroom/holiday activities that did not allow time for PE that week.