Displacement Patterns Between Children with and without Disabilities in an Inclusive Playgroup Setting

by
Tess Maureen Mayer

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Psychology

(Honors Associate)

Presented May 13, 2019

Commencement June 2019

AN ABSTRACT OF THE THESIS OF

Tess Maureen Mayer for the degree of Honors Baccalaureate of Science in Psychology presented May 13, 2019. Title: Displacement Patterns Between Children with and without Disabilities in an Inclusive Playgroup Setting.

Abstract approved: _____
Sam Logan

Purpose: The purposes of this study are to determine the within subject and between subject effects of play markings, gross motor toys, and a larger play space on the physical activity of children with and without disabilities. *Method:* A group comparison design was implemented and a total of 12 children participated in a weekly inclusive playgroup. Nine of the children were considered to be without a disability, while 3 children were diagnosed with varying disabilities. The children participated in two phases, A and B, with the A phase consisting of stationary toys and a smaller play space and the B phase encouraging physical activity with play markings, gross motor toys, and a larger play space. Weekly playgroup sessions were video recorded using a modified Go-Pro and the movement of each child was tracked using momentary time sampling, with a 5-second interval. *Results:* Differences were visually observed between the A phase and B phase, suggesting that incorporating play markings, gross motor toys, and a larger play space has potential in increasing physical activity for both children with and without disabilities. However, differences in displacement were not found between children with and without disabilities, as the children with disabilities had a higher average displacement. Suggestions for future research are provided, including replication of the study with a larger sample size of children with and without disabilities and a narrower age range.

Key Words: disability, physical activity, displacement

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Honors Baccalaureate of Science in Psychology project of Tess Maureen Mayer presented on May 13, 2019.

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

Tess Maureen Mayer, Author

Displacement Patterns Between Children with and without Disabilities in an Inclusive Playgroup Setting

Introduction

Physical activity results in positive health outcomes for children (Strong, et al., 2005). A review indicates that child participation in physical activity is associated with reduced body fat, increased cardiovascular fitness, positive gains in academic performance, and positive influences on anxiety and depression symptoms (Strong, et al., 2005). While the positive effects of exercise on the general population of children is evident, less is known about the benefits of physical activity among individuals with disabilities. A large gap exists in understanding how to improve the physical activity patterns of individuals with disabilities. Today, people with disabilities make up the largest minority group in the United States, at approximately 19% of the population (Institute on Disability, 2011). Considering the large number of individuals with disabilities, it is important to ensure equal access to the positive effects of physical activity and to understand how levels of activity can be improved. This leads to opportunities for observation and data collection between children with and without disabilities in an attempt to encourage the beneficial outcomes of physical activity from a young age. Particularly of interest is the difference in displacement (average distance travelled in feet) between the two groups of children in order to further research necessary techniques to increase physical activity.

Physical Activity and Children without Disabilities.

Physical activity is important for the general health of childhood development; however, children are not receiving enough physical activity (Cardon & De Bourdeaudhuij, 2008). Past researchers have found that children should be participating in approximately 60 minutes or more of physical activity daily, however, children are only engaging in 30 to 45 minutes daily

(Strong, et al., 2005). Specifically, Cardon & De Bourdeaudhuji's study examined the physical activity levels of preschool children and found that sedentary activity levels were high and physical activity levels were below the recommended levels needed (Cardon & De Bourdeaudhuij, 2008). Furthermore, this same study found that levels of physical activity are higher during weekdays, when the child is at preschool with periods of unstructured play, compared to the weekends (Cardon & De Bourdeaudhuij, 2008). These findings suggest there is both a need to increase the physical activity level of children without disabilities, as well as to promote physical activity at home on the weekends by creating replicable environments to increase physical activity levels.

Physical Activity and Children with Disabilities.

Research suggests that children with disabilities are engaged in less physical activity than children without disabilities, demonstrating overall lower levels of fitness and higher levels of obesity (Murphy, et al., 2008). Pilot studies have also found that levels of physical activity for children with disabilities, regardless of their impairment, was lower for younger children (Logan, et al., 2015). As a result, children with disabilities often experience limited access to typical childhood activities due to their limited mobility (Ross, et al, 2017). The inability to participate in various physical activities leads to a decrease in social play experiences, which are an integral component to childhood development (Logan, et al., 2015). Increasing the physical activity of children with disabilities would increase the psychological health of the child, by allowing them to create friendships and develop a sense of identity (Murphy, et al., 2008). Some efforts have been made to increase levels of physical activity of children with disabilities with events like the Special Olympics. However, a gap exists in promoting these recreational activities in daily life, suggesting a need to encourage physical activity of children with disabilities in settings they

might actively encounter every day, including in physical education classes and recess. (Murphy, et al., 2008).

Additionally, children with disabilities tend to demonstrate lower levels of enjoyment than children without disabilities (King, et al., 2010). Previous research has found that children with disabilities reported less enjoyment in physical activities than their peers, generally preferring social physical activities with a parent (King, et al., 2010). Lower levels of enjoyment have been shown to negatively impact both the recreational and leisure participation of children with disabilities (King, et al., 2010). As a result, it is clear that there is a need to create a physically engaging play environment for this population in order to increase enjoyment and overall physical activity levels.

Strategies to Improve Physical Activity

There are several strategies that could be employed to increase physical activity for both children with and without disabilities, including play markings, gross motor toys, and a larger play space. One strategy for increasing physical activity in children is through the use of play markings and playground designs. A systematic review demonstrated that increased physical activity levels for children during recess were potentially related to playground markings, game equipment, playground markings combined with physical structures, and playground markings combined with game equipment (Escalante, et al., 2014). Further analysis indicates that incorporating playground markings combined with physical structures show an increase of physical activity for preschool and school-aged children, while playground markings, game equipment, or the two together, do not increase movement (Escalante, et al., 2014). The review does not focus on the effects of these interventions on children with disabilities, indicating a further need for the current study.

However, the conclusions of other studies conflict with the positive effect of playground markings, suggesting that the markings do not influence physical activity levels (Cardon, et al., 2009). Past research found that providing playground equipment and markings were not sufficient to increase time spent engaging in physical activity (Cardon, et al., 2009). This study provided children with trails, rivers and flower-shaped hopscotch games, however, access to these play markings were not controlled, as any child, even those not participating in the study, could engage with the markings (Cardon, et al., 2009). The conflicting results of the influence of the play markings suggests the need for further research to understand the effectiveness of physical activity interventions. The current study aims to further study the effects of playground markings.

Another strategy to increase physical activity for children with and without disabilities is through the use of gross motor toys. A recent study examined the effects of adaptive toys on children with moderate to severe physical disabilities and on children with some level of intellectual disabilities (Hsieh, 2007). These adaptive toys included electronic toys with switches and blocks with Velcro, which required less physical demand and hand movement (Hsieh, 2007). By concluding that there were higher levels of play behavior throughout the population with adaptive toys, this demonstrates the effectiveness of providing toys in a play environment for children with disabilities. However, there is a lack of understanding in how these toys could contribute to the physical activity levels of children with disabilities, showing the need for the current study.

A third strategy for increasing physical activity in children with and without disabilities is through the use of a larger play space. Past research has found that a critical component related to physical activity is the environment with which a child interacts (Wolf, 2010). Individuals

who use larger spaces, such as parks and open areas, are three times more likely to have higher levels of physical activity (Wolf, 2010). With the decline of physical activity levels seen in children with and without disabilities, it is critical to improve the quantity and quality of the physical space to encourage exercise (Wolf, 2010). However, there is no previous research studying the effects of larger spaces specifically on the physical activity for children with disabilities, suggesting the need for the current study.

Purpose of Study

The purposes of the current study are to determine the within subject and between subject effects of play markings, gross motor toys, and a larger play space on the physical activity of children with and without disabilities. Physical activity will be measured by displacement (distance traveled in feet). For the purposes of this study, children will be defined as being between the ages of 1 and 5 years old (12 months to 63 months). **Within subject effects.** There are two hypotheses when analyzing the within subject effects: (1) Children with disabilities will have a higher displacement in the B phase (intervention) compared to the A phase (baseline); (2) Children without disabilities will also have a higher displacement in the B phase (intervention) compared to the A phase (baseline). **Between subject effects.** There are two additional hypotheses when analyzing the between subject effects: (3) During the A phase (baseline), children without disabilities will have a higher displacement than children with disabilities; (4) During the B phase (intervention), children without disabilities will continue to have a higher displacement than children with disabilities.

Methods

A group design was implemented to determine changes in displacement of both children with and without disabilities during the two phases. Data were gathered, analyzed, and

interpreted using the two groups of children as separate units of analysis for comparison. This design combines the displacement of each child in their respective groups to allow for more generalizable results of the study and to help determine the effectiveness of the play markings, gross motor toys, and larger play space.

Participants

A total of 18 children participated in the study, but the final sample included 12 children, as six were not included in the analyses due to lack of attendance. Nine children (four boys and five girls) did not have disabilities (mean age = 32.75 months, SD = 20.44 months).[*] All parents of children without disabilities reported their ethnicities as Caucasian.

Participants also included 3 children with disabilities. They will be referred to as "Child X," "Child Y," and "Child Z." Cognitive function of each of these children was not measured and cannot be ruled out as a cause for the child's behaviors observed in this study. Each of these children were capable of walking, crawling, and running at the time of this study.

Child X was a Caucasian girl (age = 63 months). This child's primary diagnosis was Attention Deficit Hyperactivity Disorder (ADHD) and her secondary being Adjustment Disorder with disturbance of conduct. Her parent described her to have fine and gross motor coordination delays as a result of her disability and had undergone occupational therapy for two months.

Child Y was a Caucasian boy (age = 41 months). His diagnosis is Down Syndrome and his parent described him to have delays in several motor functioning including, walking, crawling, running, jumping, and coloring. In addition to these developmental delays, this child was also described as having significant language delays. At the time of this study, he had participated in physical therapy for six months and swimming for six months.

[*] One of the demographic forms was lost, so this mean and standard deviation value does not include the age for this child.

Child Z was a Caucasian boy (age = 60 months). His primary diagnosis was Developmental Coordination Disorder and his secondary diagnosis was Language Disorder. His parent described him to have experienced delays in both fine and gross motor skills, as well as having a speech delay and Expressive and Receptive Disorder. At the time of this study, he had participated in physical therapy and occupational therapy for one year.

Procedure

Approval from Oregon State University's Institutional Review Board and written parent/guardian consent were obtained prior to data collection.

12 children were video recorded for 30 minutes in two different, randomly assigned phases – A phase and B phase. A total of 6 sessions were recorded, but only 4 sessions were included in the current study because the other 2 sessions did not meet the 30-minute limit due to Go-Pro recording failure. The 4 sessions included 2 A phase sessions and 2 B phase sessions.

The A phase of the inclusive playgroup consisted of a smaller 16 x 14 play mat area, composed of 2-feet wide squares, as well as stationary toys that did not require significant movement. The following toys were included: a kitchen set with toy food, kinetic sand box, 2 medium slides, small bean bags, a net designed to catch the bean bags, 1 large hoop, 1 small hoop, 2 balls to throw through the hoop, 1 small tunnel, 1 bean bag chair, stackable rings, 1 wagon, 1 baby music table, 1 bouncy ball, and 1 Toddler Tumble n' Roll.

The B phase of the playgroup was on a larger 20 x 15 play mat, composed of 2-feet wide squares, allowing a larger space for more movement. This play space provided more toys that promoted physical activity, including 2 medium slides, 1 small slide, a kitchen set with toy food, small bean bags, a net designed to catch the bean bags, 1 small basketball hoop, 2 basketballs, 2 foam balls, 2 Ride-On scooters, 1 foam pogo stick jumper, stackable rings, 1 baby music table, 1

wagon, 1 bean bag chair, 1 bouncy ball, 1 Toddler Tumble n' Roll, 1 Pop Up Child Play Tent House with 4 tunnels and 3 tents, and colorful ball pit balls. Portions of the mats were also painted with play markings to create scenery and to promote active play. **Figures 1 and 2** below illustrate the four different play markings that were incorporated during the B phase, which includes several corresponding games. Children were taught the various games only if they showed interest in the play markings, as to not affect their varying levels of participation in the inclusive playgroup.

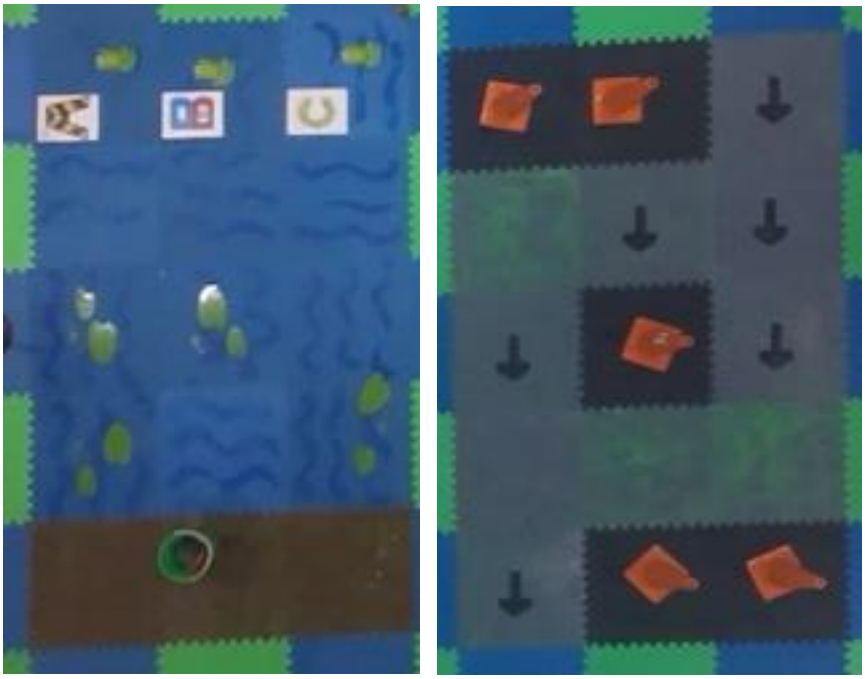

Figure 1. (Left) was a painted river with lily pads and frogs, along with a bucket of bean bags, which were to encourage the children to throw the bean bags towards the labeled "A," "B," and "C" letters. (Right) shows the driving course that was designed for children to run or drive their toy cars around the cones.

Figure 2. (Left) was a game to play with multiple children. The letters represent spaces that can be called out and the paw prints represent whether the child stands in the square with two feet or one, encouraging both interactive play and higher levels of movement. (Right) illustrates a painted farm, with grass and a bridge over a river. Pictures of animals were provided to encourage the children to move them from one side of the grass to the other.

Data coding was performed for each child in each video using momentary time sampling, which allowed for obtaining large and detailed samples of data for each child's displacement. This method has been shown to be reliable in previous studies in which it was used to track children's play behaviors in a consistent manner, so this method was continued to be used to provide regularity among results (Ross et al., 2017). Momentary time sample is a process in which the video is stopped on a 5-second interval, providing the opportunity to track each child's movements consecutively every 5-seconds for the whole 30-minute session. A trained coder tracked the child's movement every 5-seconds by clicking the top of the child's head. The program would then track the child's placement every time the child's head was identified and clicked. If the child went out of the camera's view, the coders were instructed to click in the direction the child went off the screen and in the same spot until the child returned to the mat,

allowing for the maintenance of play throughout the study without skewing results with unknown movement that occurred outside the mat.

All 6 coders were trained using video from the first week of the study, which acted more as a way to get the children familiarized with the playgroup setting and was not included in the data presented. Inter-rater reliability was established by requiring each coder to practice with this video, under supervision, before being officially selected as a coder for this study.

Data Analysis

Visual analysis will be used to describe data trends for both the within subject and between subject effects. **Within subject effects.** Wilcoxon signed-rank tests will be performed to determine the significance of within subject effects because of the small sample size. The Wilcoxon signed-rank test will be used to test the significance of the displacement for children with disabilities between the A phase and B phase, and the significance of the displacement for children without disabilities between the A phase and B phase. **Between subject effects.** Mann-Whitney U tests will be performed to determine the significance of between subject effects because of the small sample size. The Mann-Whitney U test was used to determine the significance of the displacement for children with and without disabilities during the A phase, and the significance of the displacement for children with and without disabilities during the B phase.

Since two tests will be performed, both within and between subjects, on a single data set, the Bonferroni correction was used to adjust the P-values. The statistical power of the current study was based on 0.025, to reduce the chances of obtaining type I errors.

Results

Figure 3 below shows the individual differences among the children without disabilities compared to the children with disabilities, illustrating the differences in displacement between the two groups.

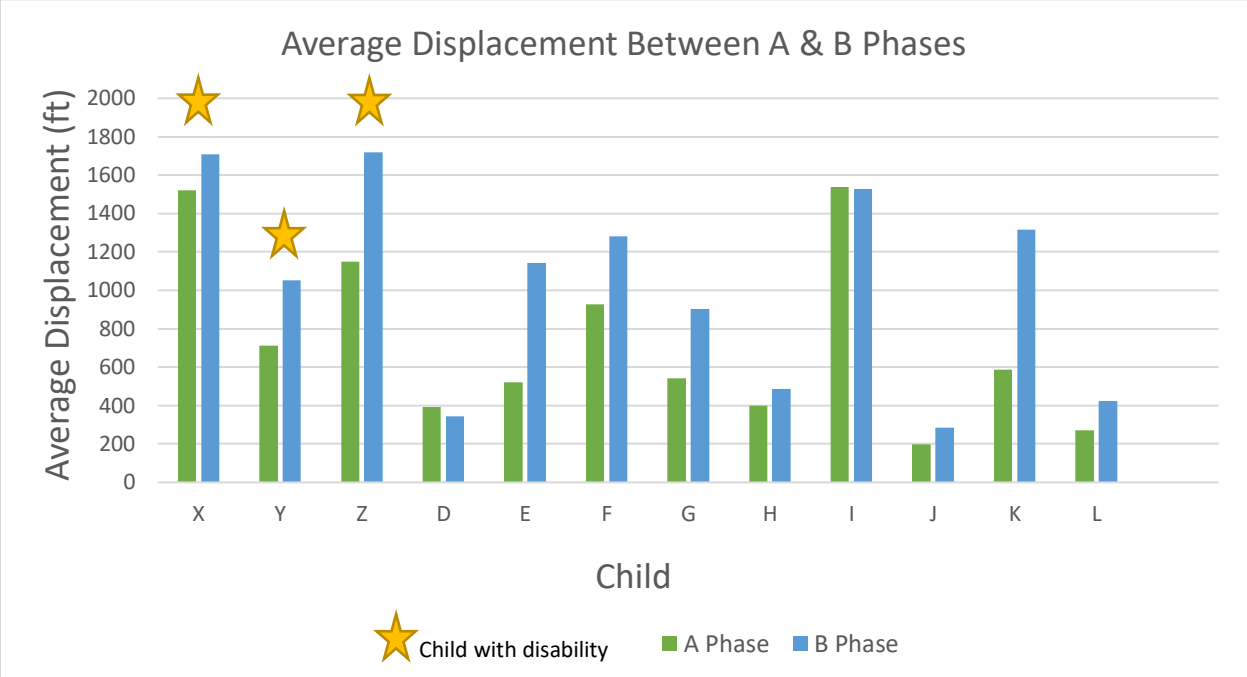

Figure 3. The average displacement (ft) between the A phase and B phase for each of the 12 children involved in the study, with the children with disabilities marked with a star.

Within subject effects. Visually, there is an increase in displacement for children with disabilities during the B phase (Mean = 1492.94 ft, SD = 382.61 ft) compared to the A phase (Mean = 1128.56 ft, SD = 404.77 ft). There was also an increase in displacement for children without disabilities during the B phase (Mean = 856.02 ft, SD = 479.91 ft) compared to the A phase (Mean = 597.86 ft, SD = 411.17 ft). As seen in the **Figure 4** below, the average displacement in the B phase is visually higher than the A phase for these two groups. The Wilcoxon signed-rank test showed that the average displacement of children with disabilities was

not statistically significant between the A phase and B phase (Z = -1.604, p = 0.109). The second Wilcoxon signed-rank test, however, showed that the average displacement of children without disabilities was statistically significant change between the A phase and the B phase (Z = -2.310, p = 0.021). The bracket and * on **Figure 4** below indicate the significance between the A phase and B phase for the children without disabilities.

Between subject effects. Visual analysis shows that children with disabilities showed an overall higher displacement for the A phase (Mean = 1128.56 ft, SD = 404.77 ft) compared to children without disabilities who showed a lower displacement for the A phase (Mean = 597.86 ft, SD = 411.17 ft). Children with disabilities also showed a higher displacement for the B phase (Mean = 1492.94 ft, SD = 382.61) compared to children without disabilities who showed a lower displacement for the B phase (Mean = 856.02 ft, SD = 479.91 ft) of the inclusive playgroup. The Mann-Whitney U test showed that the average displacement during the A phase of the inclusive playgroup was not statistically significant between the children with and without disabilities (Z = -1.757, p = 0.100). The Mann-Whitney U test also showed that the average displacement during the B phase of the inclusive playgroup was not statistically significant between the children with and without disabilities (Z = -1.757, p = 0.100).

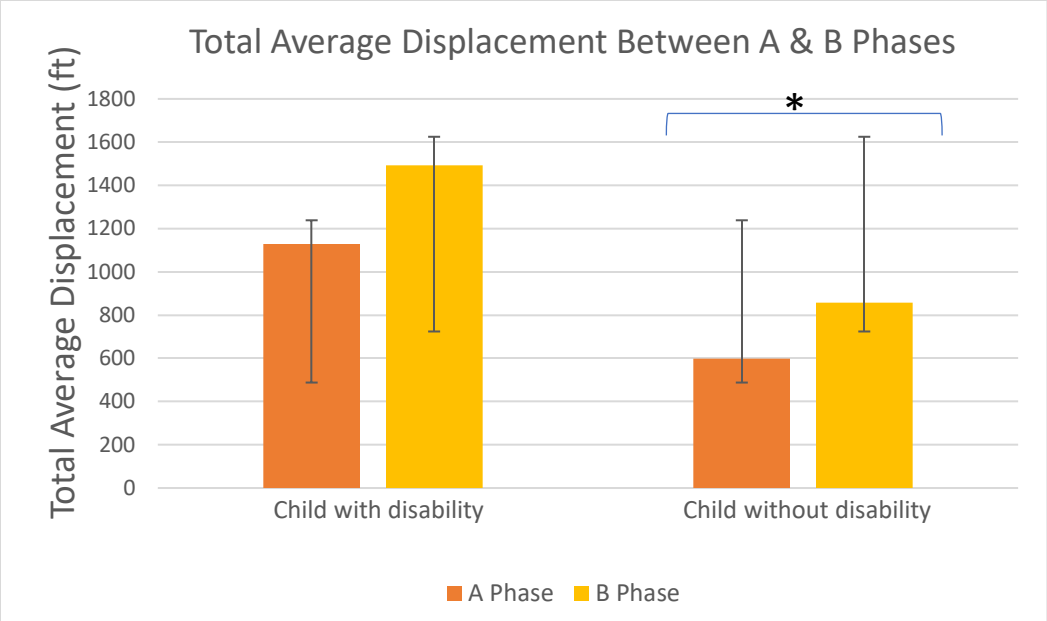

Figure 4. The total average displacement (ft) between both the A phase and the B phase between the children with disabilities and the children without disabilities.

Discussion

Within subject effects. The first hypothesis was that children with disabilities will have a higher displacement in the B phase (intervention) compared to the A phase (baseline). The second hypothesis was that children without disabilities will also have a higher displacement in the B phase (intervention), compared to the A phase (baseline). Results did not support the first hypothesis; however, significant results supported the second hypothesis. Visual analysis indicated differences between the A phase and B phase of the inclusive playgroup and suggests promising results of an increase in physical activity when children are introduced to play markings, gross motor toys, and a larger play space. The value of this information is to demonstrate the usefulness of a certain play environment to increase the physical activity of both children with and without disabilities. Similar play spaces can be easily replicated in playground settings (see Cardon, et al., 2009) to benefit both of these populations.

The statistical results, however, suggest similarities to the Cardon and colleagues (2009) study in that providing playground markings were not enough to increase children's physical activity levels. The play markings in this study were similar to the present study, as there were paintings of trails, rivers and similar hopscotch type games, however, more research is needed to determine whether the current study's addition of the gross motor toys and larger play space along with the play markings could influence children's physical activity levels. Visual analysis indicated that our results parallel findings of previous studies (see Escalante, et al., 2014), as there was an increase in average displacement for both children with and without disabilities when the children were introduced to an environment with play markings, gross motor toys, and a larger play space. These conflicting differences between the statistical and visual support suggest that further research is needed to contribute to an understanding of effective physical activity intervention methods.

Between subject effects. The third hypothesis was that during the A phase (baseline), children without disabilities will have a higher displacement than children with disabilities. The fourth hypothesis was that during the B phase (intervention), children without disabilities will continue to have a higher displacement than children with disabilities. Visual analysis indicated support in the opposite direction, as the average displacement of the children with disabilities was higher than the children without disabilities during both the A phase and the B phase. This visual analysis can also be explained by the lack of statistical significance of between subject tests.

Limitations

There were several limitations of the current study. Limitations include the small sample size, disability type, age of children, familiarity with inclusive playgroup, and lack of enjoyment

measured. The conflicting results of this study could be the result of small sample size, having only 3 children with various disabilities. The disabilities of our participants also may not have resulted in physical activity differences in comparison to other types of physical disabilities, contributing to the misrepresentation of the overall results. For example, Child X has a primary diagnosis of ADHD, which is characterized by hyperactivity and a constant state of motion (Harvey, et al., 2009). This participant had the highest displacement, as seen in **Figure 3** above, which may have contributed to the overall higher average displacement for children with disabilities.

The three children with disabilities in this study were notably older than some of the children without disabilities. For example, one of the children without disabilities was 12 months old at the time of the study, which may have contributed to lower displacement and consisted mostly of stationary play. Previous research has determined that as a child ages, there is more variability in physical activity as the age of children observed increase, and includes self-directed locomotion (Logan, et al., 2016). From these past findings, older children generally participate in a higher percentage of self-directed locomotion, suggesting that older children may also have a higher average displacement (Logan, et al., 2016).

Some of the children are also more familiar with the inclusive playgroup environment because they have previously participated in similar studies. Child Y is an example of this and could help explain the higher displacement levels seen, as familiarity with the play space could increase physical activity because the child is more comfortable than the other children.

Previous studies have stressed the importance of enjoyment when attempting to increase physical activity levels in children (see King, et al., 2010), however, enjoyment was not measured in the current study. It is difficult to conclude whether or not the children in the study

enjoyed the inclusive playgroup environment, and it is unknown if this impacted physical activity levels.

Future Directions

Future research could include a larger sample size for both children with and without disabilities, the use of more strenuous research designs (e.g., longitudinal design), children in similar age groups, and the measurement of child enjoyment. Naturalistic observations of children in a play setting, like a recess environment, might be also beneficial. Future research might also use different observational methods, as the movement out of the camera's view could change the overall average displacement for each child.

Conclusion

The current study attempts to provide data about the ways in which play markings, gross motor toys, and a larger play space could potentially impact physical activity levels of children with and without disabilities, although more research is needed. Statistical support was found for an increase in displacement between the A phase and B phase of the inclusive playgroup for children without disabilities, however, the difference between the A phase and B phase group was not statistically significant for the children with disabilities. No statistical significance was found for the difference in displacement between children with and without disabilities during the A phase or B phase. The visual evidence for these differences among the two populations between the A phase and B phase, suggest that there is potential for this type of physical activity intervention. Future research is needed to understand how changes in physical activity might differ for children with disabilities with a larger sample size and a narrower age range, as well as understanding the long-term impacts play markings, gross motor toys, and a larger play space has on children's development and overall health.

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