O’NEILL UNDERGRADUATE HONORS THESIS

American Recess in Children's Developing Decade

How does nature deficiency disorder impact developing brains, and as a nation should this be a priority on our political agenda?

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Acknowledgments

When brainstorming what I wanted to do for my thesis I didn't have a particular topic in mind. I went back and forth between ideas, but was always supported by my thesis advisor, adjunct professor, Mark Kruzan. His support was evident in every email, meeting and zoom call through the past semester. When it came time to picking a topic to research, he not only supported all of my ideas, but pushed me to question my research and to dig past the surface level content. In a time when classes were canceled and moved online, he continued to help me find relevance in my research topic. Ironically, when classes were moved online, officials encouraged us to go outside more than ever. It seems only fitting that I was researching the natural environment and education during this pandemic.

In addition to the support I have received from Mark, I would also like to recognize all my other professors at O'Neill school. It seems when you are unable to sit within the four walls of a classroom is when you tend to miss the classroom more than ever. I would like to also acknowledge all my family, friends and teammates for listening to my thesis ideas and for questioning me. Nothing great is ever accomplished without a little bit of pushback, for if it was easy, everyone would do it!

I. Abstract

Within the past two decades, goals in childhood education have shifted. Now, more emphasis is placed on standardized test scores through acts such as No Child Left Behind and Every Student Succeeds Act (2001) while less focus is placed on recreational physical activity, or recess, for those with developing minds. The concept of "Nature Deficiency Disorder" (NDD), developed by Richard Louv, questions the "human cost of alienation from nature" (Louv). This strikes the question of how does NDD impact developing brains? The impact of school recess time will be closely compared to mental health, specifically ADHD and general brain function. Moreover, this paper will analyze policy measures that have impacted recreational physical activity in school (recess), both positively and negatively. Lastly, this paper will compare United States recess statistics to those of foreign nations to highlight the correlation of recess to academic and mental health.

II. Introduction

Recess, "a regularly scheduled period within the school day for physical activity and play that is monitored by trained staff or volunteers," is just one of the five components of the comprehensive school physical activity program recommended by the CDC (Centers for Disease Control and Prevention). The CDC links recess to improved development, both socially and emotionally as well as increased memory, attention and concentration skills all while reducing disruptive behavior. While there is a direct linkage between organized physical activity and academic performance, the percentage of recess in schools exponentially decreases starting in 6th grade. Does recreational physical activity lead to increased academic performance? Moreover, how does using "green settings" positively impact attention-deficit/hyperactive disorder?

The history of recreational play legislation was sparked in 1948 through The United Nations Universal Declaration of Human Rights and brings to light the policy aspect of play in an educational setting. This movement sparked others such as the International Association for the Child's Right to Play (IPA) in Denmark as well as The American Association for the Child's Right to Play (IPA/USA) in Philadelphia, Pennsylvania (History). While policy, and agencies, have begun to set a framework for recreational physical activity, policies such as the "No Child Left Behind Act" place more focus on standardized test scores and make recess "dispensable" (Shammas). While the United States moves indoors and disconnects from the natural world, Finnish schools get on average 75 minutes of recess, approximately 48 minutes more than their American peers (Cha). *How does nature deficiency disorder impact developing brains, and as a nation should this be a priority on our political agenda?*

III. Hypothesis & Expected Findings

I hypothesize that American (public school) students receive less recreational physical activity (recess) than their peers in foreign nations and therefore have higher rates of Attention Deficit Hyperactivity Disorder (ADHD) while also performing at a lower rate. A trend of decreasing recess times as students continue their schooling, combined with technological innovations, American students have moved indoors to satisfy their national academic standards and satiate their digital desires.

IV. Nature Deficiency Disorder: Defined

Nature Deficiency Disorder (NDD) is a term used to compare the cost of alienation from nature. This alienation is accompanied by "diminished use of the senses, attention difficulties, higher rates of physical and emotional illness, a rising rate of myopia (lack of imagination), [and] child and adult obesity . . .". Louv goes on to cite that activities occurring in non-green spaces, such as video gaming, leave children with reduced attention functionality. Moreover, Louv suggests that living in a digital world forces humans to block out other senses, such as auditory, visual and physical senses as we put on our horse-blinders to focus on screens directly in front of us. Therefore, this reduces the amount we are "alive" (Louv). While the professional and academic world move towards electronic proficiency, how does this relate to the amount of time developing brains spend outside? The CDC recommends recess for all grade levels, through 12th grade, however, the rate of recess decreases 56% between 5th and 6th grade (Centers for Disease). As time progresses in a student's primary education, "regular physical activity breaks during the school day" decrease from 65% in middle schools to 27% in high schools, outside of physical education classes (Centers for Disease).

V. History of Recess

Recess remains an etched memory in many adults. There were times of fun and games, contrasted sharply with disappointment and rejection. Both settings teach children in their developmental year's various life skills: patience, teamwork, communication and various coping skills. Yet, this developmental period of children's lives remained vastly unregulated until the mid-1900s. In 1948, the United Nations released the Universal Declaration of Human Rights. This represented common achievement standards for people with various cultures, religious beliefs, and geographical position. This document marked the first set of fundamental human rights to be universally recognized and protected. Below, is an outline of the document highlighting its significance.

Convention on the Rights of the Child

Over a decade later, in 1959, the UN went on to proclaim the '*Declaration of the Rights of the Child'.* A key right in this declaration is as follows - "Mankind owes the child the best it has to give . . . the child shall have full opportunity for play and recreation which should be directed to the same purposes as education." The preamble recognizes that "childhood is entitled to special care and assistance" and notes the family unit is a fundamental societal group. The family is the key to harmonious development and prepares future generations to abide by the United Nations ideals (Convention). Similarly, to the Universal Declaration of Human Rights, the Declaration of the Rights of the Child, recognizes that this doctrine will apply to countries at different developmental stages. The doctrine recognizes this and sets out to ensure children's development is protected throughout all countries, regardless of their resources available. This is broken down into three parts. Part I focuses on the child's rights, whereas, Parts II and III focus more on the procedural nature of the doctrine. For this paper, Part I will be examined. A brief outline of the preamble and the rights ensured in Part I is as follows -

Preamble: *Explains the need for this doctrine and the general purpose of this "new" doctrine, based on the Universal Declaration of Human Rights*

Part I:

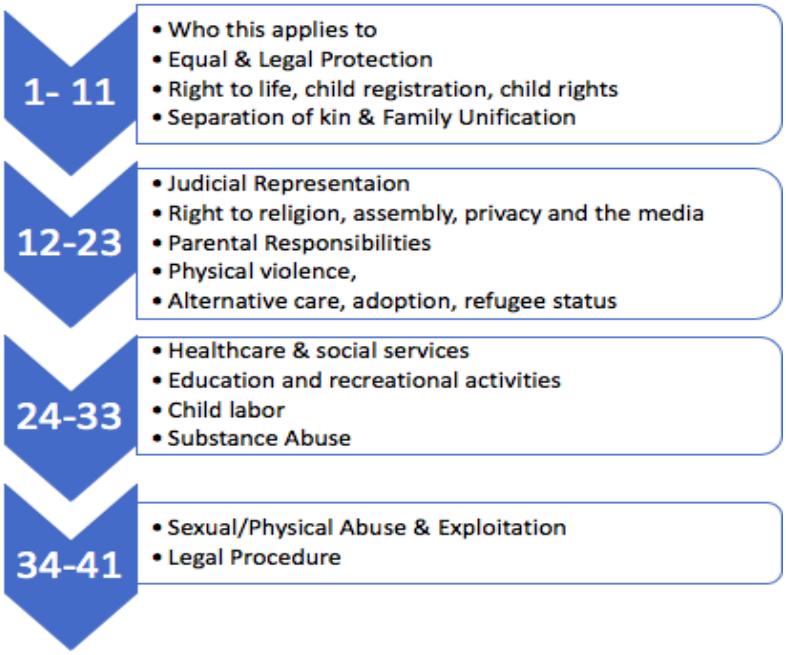


Figure 1(Convention)

Article 28-29 & 31

Key principles relating to the developing child, their education and their right to recreational activity are highlighted in articles 28, 29 and 31. These developmental tokens are broken into three subsections, right to education (Article 28), how to reach educational benchmarks (Article 29), and recreational rights (Article 31). Article 28, addresses the responsibility of the state [country] to administer disciplinary measures in a way that protects them and aligns with the general human rights doctrine. This overlaps the CDC's national guidance for recess where they prohibit the exclusion or prohibit students from participating in recess due to poor academic or behavioral performance (Center for Disease).

Article 29 binds the states [countries] to principles enabling them to reach educational rights previously stated in Article 28. Key notions in this article recognize the child's fundamental freedoms, how they may look different based on their culture/heritage, the

importance of skills development, and the need for respecting the natural environment. Article 31 goes on to recognize the "right of the child to rest and leisure, to engage in play and recreational activities appropriate to the age of the child . . . (Convention)." Again, these two articles align quite closely with the National Guidelines for Recess established by the CDC in America. While this document served and continues to serve as a key resource, the history of recess continued over the new few decades.

History of Recess (Continued)

Moving forward, in 1961 The International Association for the Child's Right to Play (IPA or International Play Association) was formed in Denmark. This was based on Article 31 of the Convention on the Rights of the Child; 40 nations became affiliates. The primary goal was to "Protect, preserve and promote children's play as a fundamental human right of all children, everywhere; provide an international forum to promote and improve the development of play environments, leisure time facilities, for *children* and youth; contribute to a better education including play spaces indoors and outdoors of play-leaders. From a broader perspective, this falls under goal number three of the UN's Sustainable Development Goal, or the goal of "Good Health and Well-Being" (International). As the IPA is established, a little over a decade later The American Association for the Child's Right to Play (IPA/USA) was formed in 1973 in Philadelphia, Pennsylvania. This organization sets out to ensure fundamental rights for all children are protected, preserved and that play is promoted as a fundamental right. IPA/USA disseminates information about play facilities and programs as well as hosts seminars and conferences to support the IPA goals and mission (History).

In 1989, three decades after the UN proclaimed the Declaration of the Rights of the Child, The General Assembly of the UN adopted the Convention on the Rights of the Child. This serves as a human rights treaty; those who ratified the treaty obligations are considered "states parties" and must enact laws to adhere to the Conventions articles (History). These include, but are not limited to, the right to - a name/nationality, healthcare services, education, protection against discrimination, abuse, economic exploitation and lastly recreational activities.

VI. Data

To see how NDD impacts a child's developing brain, in an academic setting, it is important to first understand how recreational physical activity in the natural environment impacts them. Analyzing three unique studies will allow data to enforce the notion that recreational physical activity and academic performance are, or are not, related.

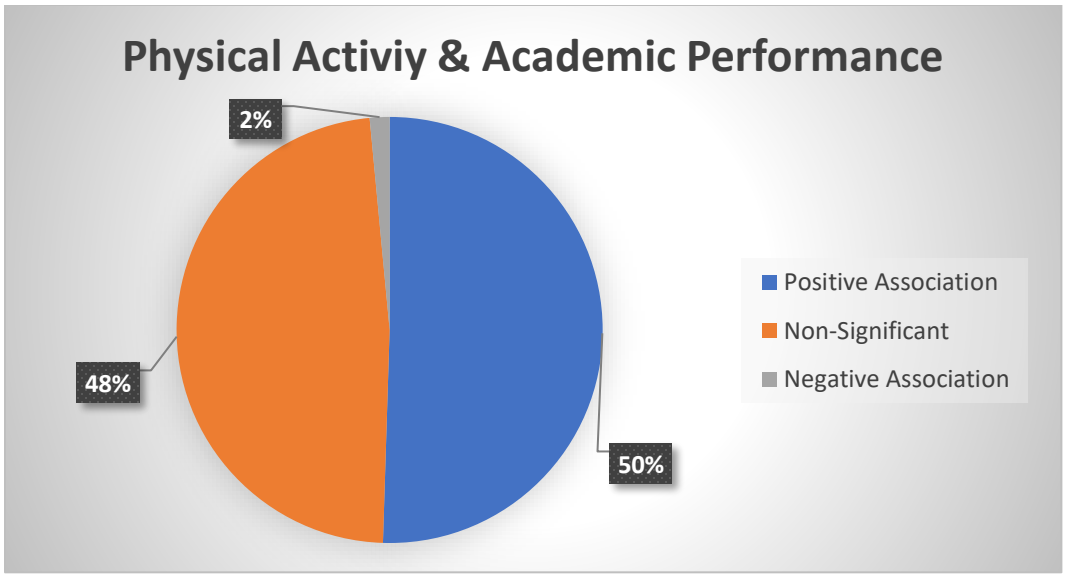
A. Association Between Physical Activity and Academic Performance

Approximately 56 million youth are in American schools, making schools a key proponent in serving this developing generation. The CDC National Guidelines for Recess suggest 20 minutes per day of recess, however. it is recommended at least 60 minutes per day to see health benefits. Looking at this discrepancy in suggested recess allocations, this study questions how school-based physical activity relates to academic performance in adolescents in their defining decade of development?

This study, done by the CDC, more specifically the Division of Adolescent and School Health in July 2010, uses the yields of electronic databases to synthesize and categorize physical activity and academic performance outcomes. This categorical method was broken down into three categories:

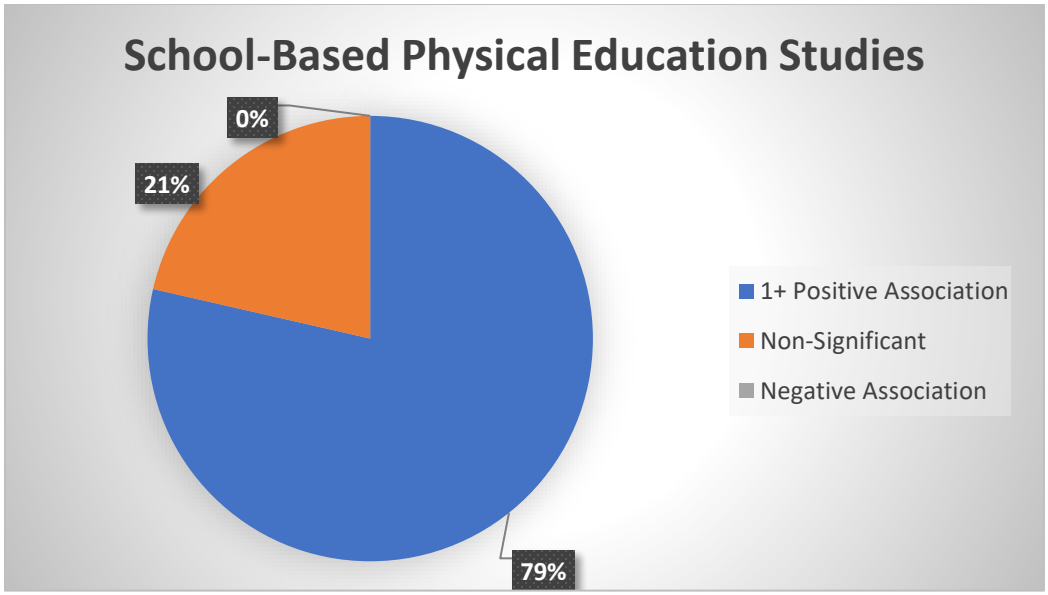
1) Academic Achievement (grades/tests score - quantitative)
2) Academic Behavior (task behavior/attendance - quantitative and qualitative)
3) Cognitive skills and attitudes (attention, memory, mood - qualitative)

The synthesis of 50 studies yielded 251 correlations between physical activity and academic performance using the three categorical methods above. The chart below highlights the correlation -

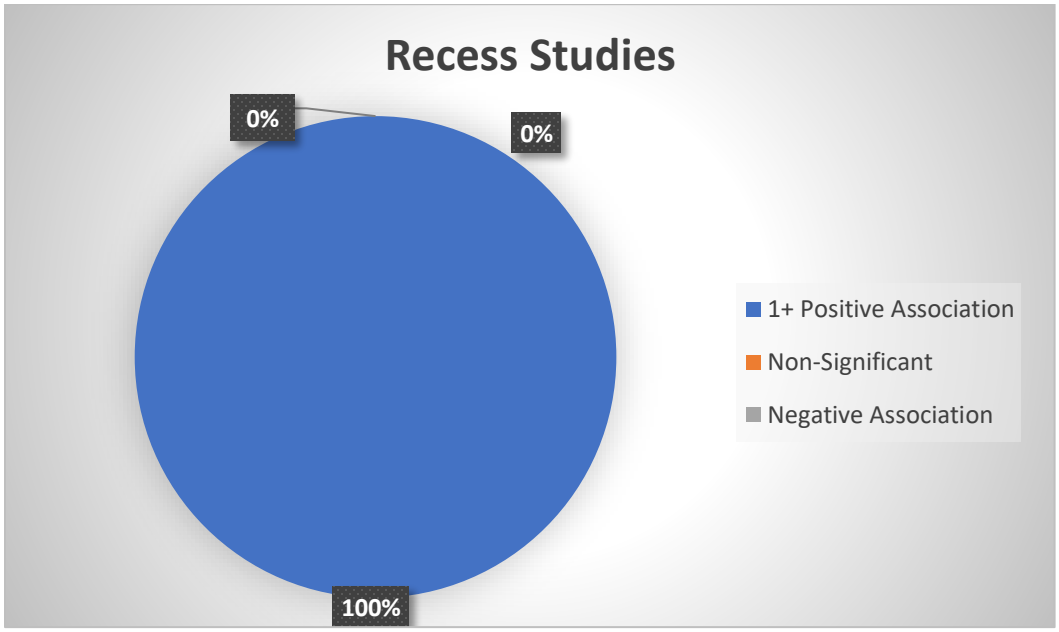


Moreover, the 50 studies were broken down into four categories to further examine the physical activity and educational correlation*. (*Some studies were used more than once in the breakdown, resulting in greater than 50 total "studies" in the graphics below)

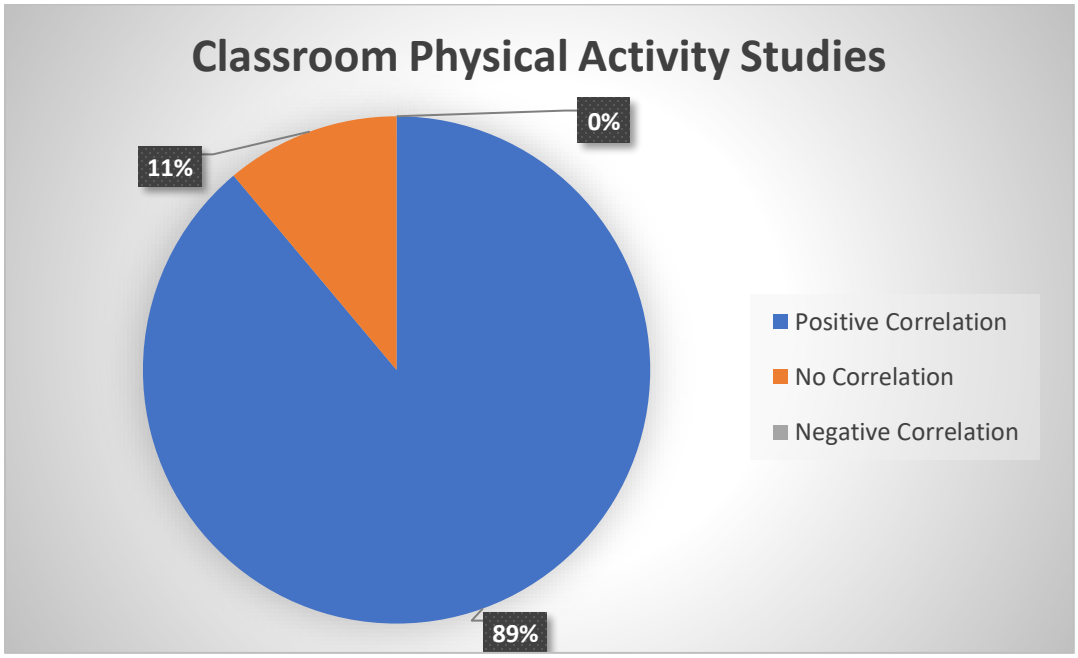
1) School-Based Physical Education Studies: *Reviewed time spent in physical education courses (or similar content) to academic performance.*



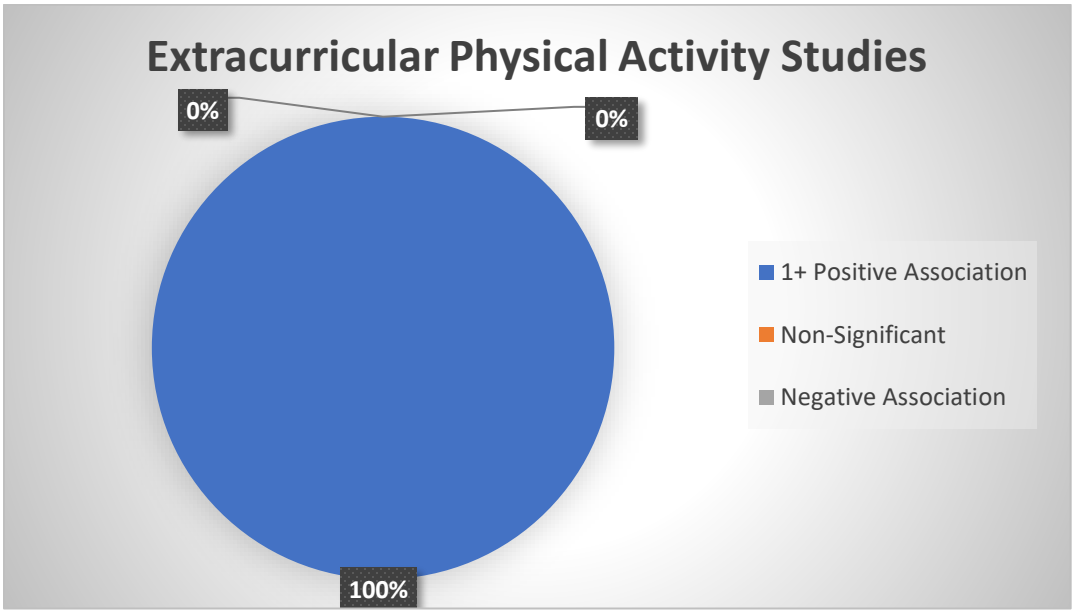
2) Recess Studies: *Searched for a correlation between academic performance and recess during the educational day in elementary schools*.



3) Classroom Physical Activity Studies: *Reviewed how brief physical activity breaks, during the school day (roughly 5-20 minutes in duration) impacted cognitive skills, academic behaviors, and achievements.*



4) Extracurricular Physical Activity Studies: *Analyzed the relationship between activities planned by the school, outside the school day, related to academic performance (i.e.: school sports and other physical activity programs)*



Confounding Variables

While this study had a systematic approach for the bases of the review and covered a broad number of studies, it failed to have a quantitative ranking system. This produces a broad outcome of conclusions that showcase a higher level of the impact between recreational play and academic performance. However, this serves as a significant stepping stone as we probe into the importance of recreational-play policy and how it impacts the academic performance of children in varying countries.

B. Physical Activity and Behavioral Indices

This study reviewed the impact of physical activity intervention on the brain and behavior indices, indicators used to assess behavior, in developing children, ages seven to nine.

In this study, 221 children were randomly assigned either to a physical activity intervention program or a control program (the wait-list), as seen in the diagram below (Hilman).

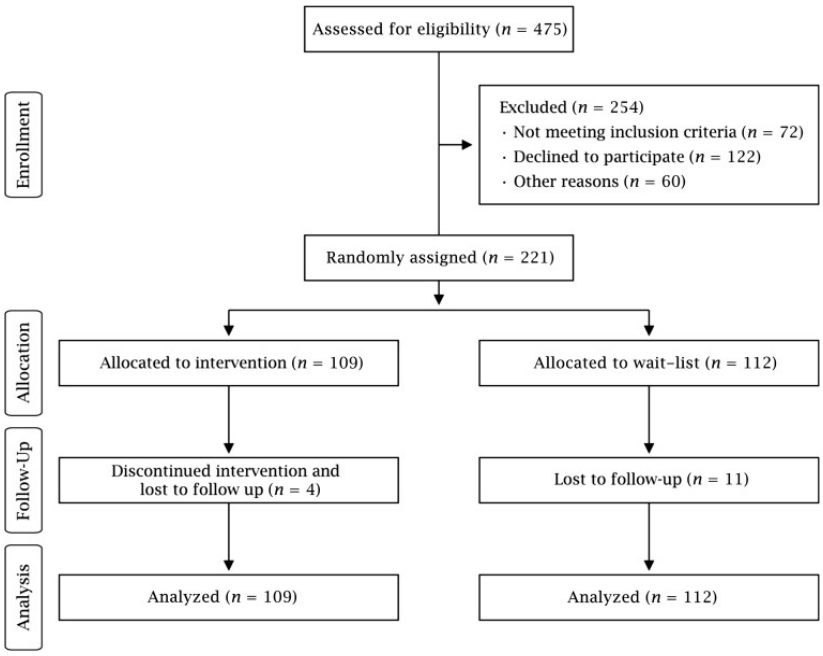


Figure 2: (Hilman)

Participants who received the physical activity intervention program showed improved skills in the following categories: fitness, inhibition, cognitive flexibility, attention, cognitive flexibility, and brain function. The last key result drew a correlation between intervention attendance and brain function during the inhibition tasks (Hilman). The correlation between physical intervention and a positive change in academic standards continues to reinforce the notion that recreational physical activity has a positive impact on a developing child's academic success. Furthermore, the attendance component shows that consistency in a recreational physical activity regime further reinforces the academic results.

C. National Treatment for ADHD

To strengthen the idea that recreational physical time directly correlates to improved academic performance, a study reviewed the impact of "green" settings on children already diagnosed with attention-deficit/hyperactivity disorder or ADHD. This was done through creating a categorical ranking system that compared post-academic activities, occurring after school hours and on the weekend, to an ADHD child's symptoms (Kuo). In addition to showing a correlation, this study has the potential to serve as a therapeutic alternative to ADHD medicines that are accompanied by intense side-effects.

To conduct this study, children aged five to eighteen were observed. These subjects were also formally diagnosed with ADHD by the appropriate doctor. There was also a diverse inclusion of children from various genders, ages, socio-economic levels, regions, and community types. Parents were used as observers. Using the predetermined ranking system, they "rated the aftereffects of 49 common afterschool and weekend activities on their child's ADHD symptoms. This included using four symptoms:

1. *Difficulty in remaining focused on unappealing tasks*
2. *Difficulty in completing tasks*
3. *Difficulty in listening and following directions*
4. *Difficulty in resisting distractions*

From here, parents ranked the systems using the following impact levels after approximately an hour after the activity concluded. Parents observed the same activity in a multitude of settings, "green" and "non-green". "Green" is defined as "any mostly natural area--a park, a farm, or just a green backyard or neighborhood space". Whereas, "non-green" spaces were defined as "mostly human-made -- parking lots, downtown areas, or just a neighborhood space that doesn't have much greenery" (Kuo)

a. *Much worse than usual*
b. *Worse than usual*
c. *Same as usual*
d. *Better than usual*
e. *Much better than usual*
f. *Don't know (if the child did not engage often in an activity)*

Results showed a correlation between activities, green space and social context. Overall, activities completed in green outdoors reduced ADHD symptoms at a higher level than both indoor and built outdoor activities. Furthermore, activities taking place in green spaces proved **beneficial for children with and without ADHD**. Results were also seen throughout the variance in the children's severity of ADHD and other learning disorders. Finally, for subjects with worsened ADHD symptoms, the green spaces, and built-outdoor areas, proved to be significantly more helpful in reducing ADHD symptoms than indoor activities. These results were attributed to a few attributes. In outdoor settings, both built and green, children have the "freedom of movement" and are stimulated in a variety of ever-changing patterns. These results were not impacted by the parents' perspectives on physical activity in green/outdoor spaces (Kuo). In green spaces, fewer symptoms for alone/pairs & large groups. Built outdoors - fewer symptoms for alone or pairs, not large groups. Indoor - fewer symptoms for only alone or in pairs, symptoms were significantly worse when completed in large groups.

	Green Spaces	Built Outdoors	Indoor
Alone	Less	Less	Less
Pairs	Less	Less	Less
Large Groups	Less	-	More

Confounding Variables

Parents' perceptions of their child's symptoms and settings may have led to discrepancies in reporting. Additionally, situational differences, such as if an area is more or less natural than another's child may have led to increased bias in the results. It is suggested that future studies use a dose-response method to better control confounding variables found in this study (Kuo).

VII. Synthesized Data

Each of the three studies used a unique method to find correlations between recreational physical activity and academic performance. The first showed a correlation between the activity and how it varied through various implementations. The next, showed the correlation from an academic lens using more academic standards, such as attendance. Finally, the last study was judged from a parental perspective. This 360-degree nature of the studies all proved to have a positive correlation between recreational physical activity and academic performance. Using a more focused lens, the studies pinpointed strategies on how to implement physical recreational play to ensure it is highly productive.

Overall, each study yielded mostly positive correlations. Those that did not, produced non-significant impacts, with a very small percentage producing negative correlations. While confounding variables exist, it is reasonable to assume that nature deficiency disorder negatively impacts developing brains.

VIII. Recess in Other Countries

In a globally connected world, we use other countries as a way to define our success. On an educational level, this is done through The Program for International Student Assessment (PISA). This assessment is run by The Organization for Economic Cooperation and Development (OECD), which includes countries that frequently discuss economic development as well as social policy. PISA aims to provide the PISA test and to develop opportunities for improving learning outcomes. This test is widely administered in over 80 countries and provides insight on school children, aged 15 to 16, on their performance in reading, mathematics, and science. This aims to inform education policy decisions on a global scale (About - PISA).

The following graphic comparatively shows countries from 2003 and 2012 and how their math results have shifted with other countries. It is notable that the United States still falls below the top 20 countries. Ironically, the United States spends more money per student than most countries (Chappell). Yet, it is clear that money and PISA scores do not directly correlate. There are some confounding factors such as what cities receive the PISA test, and what preparation is done for the test. However, what is not noted is how recreational physical activity plays a role.

Figure 3 (About – PISA)

Recess in Finland

While the average recess time in the United States is approximately 27 minutes (Centers), Finland has an average of 75 minutes of recess (Phillippo). Additionally, the general schooling structure is varied in Finland. Younger children attend school for only 20 hours per week, compared to 35 hours in the states. This extra 15 hours outside of the classroom encourages children to explore and play outside of the four walls of a classroom. When Finnish playgrounds are redone, architects turn to the children for insight. How has American recess been altered in the past few decades? It has decreased after the No Child Left Behind (NCLB) act passed in 2001.

Recess in Denmark

A unique Kindergarten classroom goes beyond the four walls, and instead, takes place in a forest. No matter the weather, class meets. One day, temperatures were as low as 5 degrees. This is quite normal in Denmark, where 10% of pre-schools, or 500, are forest kindergartens. These aren't run by hippie converts, but rather university-educated specialists. One expert in the forest kindergartens notes how children in a standard playground setting would not get to experience developing motor skills like they do when they climb a tree for instance. Other skills, such as wildling, teach the children life skills, where a knife is a tool that enables freedom, not a weapon. "Teachers", which are called pedagogues, state they trust the children are safe, and when they're not, that's how they learn. In the 17 years of running a forest kindergarten, one pedagogue states he's only taken a child to the hospital once. Ironically, it was from a parent running over a child's foot with their vehicle. This unique education method does not have formal review processes.

This instills a strong sense of trust between the child, parents, and the pedagogue's. The children get a break from the digital world and generally have a relaxed frame of mind (Roberts). So how does the forest kindergarten integrate as the move into traditional schools? Traditional teachers state they have little trouble integrating and are generally interested in learning due to inspiration from their forest kindergartens. Similarly, they are more concentrated. While it is clear their soft skills and motor skills improve, they also perform at an elevated level on the PISA test, right behind Finland, and in front of the United States.

Recess in Other Countries

Are Denmark and Finland anomalies? Less school and better PISA scores, how is it done? Other countries, specifically those in the Schengen region and Russia have 45-minute recess in their elementary schools. Many of the countries in the Schengen region aim to have a recess that has no teacher interaction. In Asian countries, the way recess was distributed altered from the way it is done in America. Japanese "recess" occurred after approximately 40 minutes of instruction, allowing roughly 10 minutes for the brain to recharge after maxing out on attention span. China has a morning recess and eye exercises in the afternoon. Similarly, other Chinese cities limit the time an instructor can teach a class (Phillippo). Except for a few outlier countries, most European and Asian countries perform higher than the United States on the PISA tests.

While recess is stimulating for the child's mind, it also allows the teachers to have a break. It gives teachers a chance to refresh their minds. To plan more thought out lessons, to enjoy their lunch break. So, while recreational physical activity enriches students directly, there

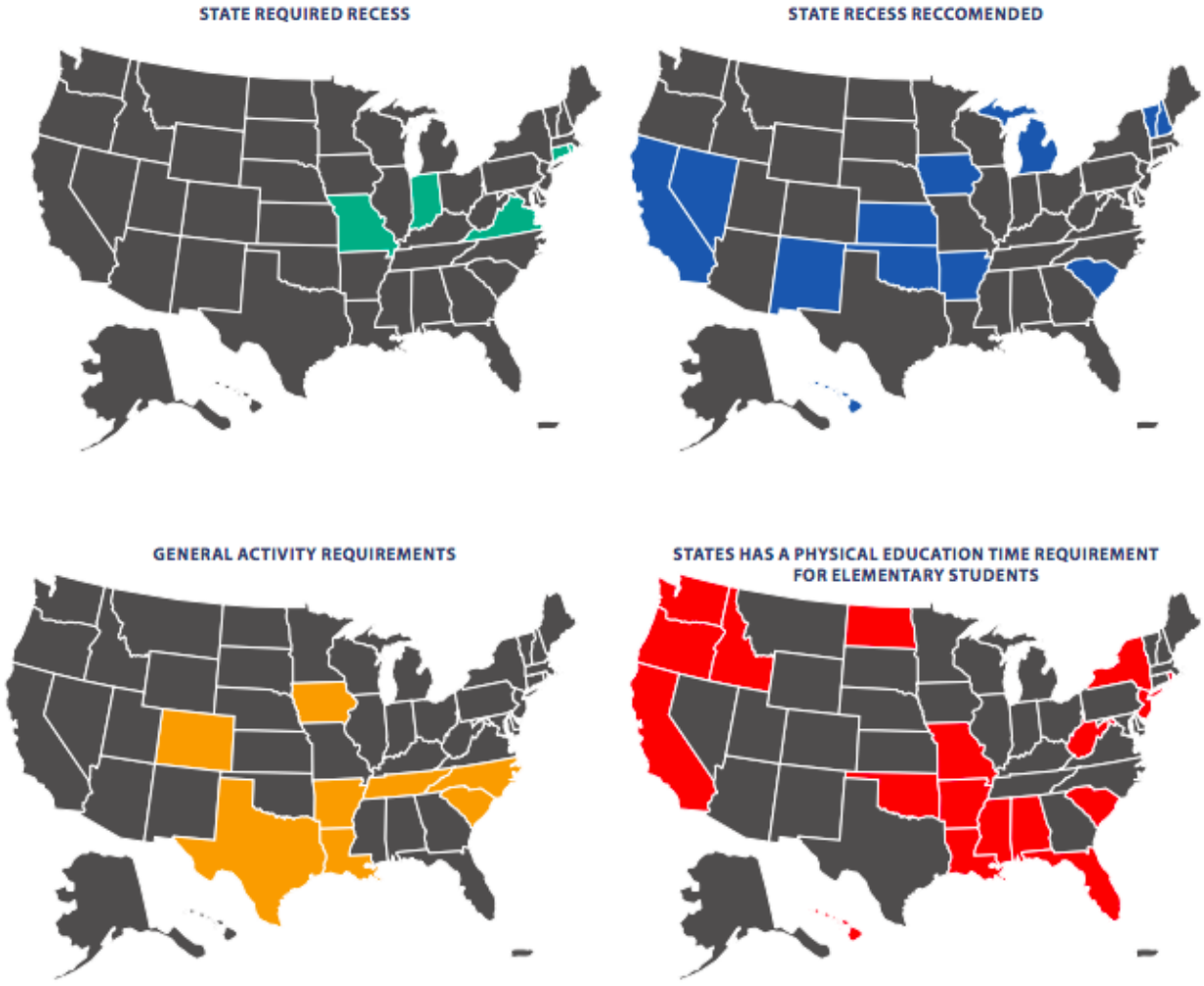
may also be an impact on teachers that indirectly correlates to children's success. While it is clear that recess impacts children, what is being done to protect this right for children?

IX. Moving Forward: Policy

In education policy, we look to No Child Left Behind to improve our test scores. Ironically, this cut time designated to "science, art, social studies, and recess [and] PE" (Shafer). The theory is the more time spent in the classroom, the better test scores will be. However, there is a gap in science to prove the correlation between time spent in the classroom and test scores. Rather, Professor Rick Pappas draws on his research to support the notion that children perform, listen and focus better following a recess. Moreover, how can non-traditional policies help propel the United States as a progressive country in terms of education? The convention on the rights of the child drafts stepping stones for our government, yet there is very little legislation on how recreational physical activity should be incorporated into schools.

The CDC has national guidelines for recess, but there are no punitive measures if schools do not follow these. Children lose the right to recess for disciplinary issues, schools have recess after lunch, and upper-level schools replace physical education with recess, all which go against the CDC national guidelines for recess (Center). However, due to cooperative federalism, states have begun enacting their own "recess laws." The graphic below showcases the disparity in

recess "regulations" throughout the country, as of March 9th, 2017 (Shafer).



Concerns arise when varying states and districts have inconsistent standards. While NCLB (No Child Left Behind) standards create a blanket policy, inconsistent recess legislation may create further inequalities in access to quality education. Moreover, recess is not only beneficial to students, but to teachers and society as a whole. As teachers recharge they are more likely to create a better learning environment. As students resolve disputes on the playground they serve as mediators and learn to respect one another and the natural environment. Children are the future of our nation, and we must give them a holistic education so that one day they may contribute wholeheartedly to our society, not just score well on a performance review. It is

important to continue looking towards other nations to see how we can incorporate their solutions into our schools and communities. From this, we must also continue to research the impacts new policy has on developing minds. As our world and technology adapt, our nation must also adapt.

While there is a focus on the correlation between recreational physical activity and developing brains, it is also notable that "over the last 30 years, obesity has tripled among children and youth ages 6-19 years old" (Shafer). While the CDC and The American Academy of Pediatrics recognize the various benefits of recess, it is believed that schools are more likely to have the recommended amount of recreational time when enacted by state laws. A caveat of this is, policies tend to encourage 'physical education' (PE) or recess, not both. This suggestion has led schools to choose one or the other.

The suggested recommendation is that a recreational physical activity policy is added, as an amendment, to an already existing education policy, such as Every Student Succeeds Act or ESSA. ESSA was implemented for the 2017-2018 school year and strived to amend many of the statutes set forth by the NCLB policy. As an amendment to ESSA, the penalty for not abiding by this amendment would directly be linked to a decrease in annual funding.

ESSA includes a way to rate schools through annual testing, while there are fewer tests than included in NCLB, and also allows schools to pick one other indicator that determines whether kids have the opportunity to learn (Klein). The suggestion is that a recess pillar is added as a necessary indicator that schools ***must*** use to determine the opportunity to learn. This pillar would positively rank recesses based on the amount of physical recreational play per educational grade, access to indoor recess plans for rainy/cold weather days, implementation of recreational guides for disabled students. Similarly, schools would lose points for taking recess away as a

punishment or for using a PE (or Fine Arts/Academic) related course in place of unstructured physical activity. This pillar would not only be used as an indicator of accessibility/opportunity to learn, but it would also serve as a national ranking system. Here schools would be able to see where their school ranks in comparison to others in their district, city, state, and nation. Furthermore, schools may receive additional funding for each year they receive high physical recreational pillar schools. This money would be designated to furthering access to recreational physical activities (i.e.: playgrounds, field trips related to recreational physical activity, etc.)

X. Conclusion

The correlation between recreational physical activity and developing brains is clear. Unstructured recreational physical activity proves to have a positive impact on academic achievements, behavioral indices, cognitive skills, attitudes, and ADHD. Furthermore, it is clear other countries both outrank the United States in terms of academic performance and recreational time. With this in mind, it is recommended that the ESSA be amended to include a new ***required*** pillar for determining opportunity to learn. The introduction of this scoring pillar would allow for a national scoring system to evaluate schools based on a new factor. Schools, and researchers, would have equal access to this measurement. Specifically, schools would be rewarded for positive scores, both financially and intrinsically. While it may be unrealistic to assume every school in America will adopt Denmark's "Forest Kindergartens," this is a small step the United States can take to further develop its educational system to continue serving its citizens and developing as a nation.

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