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Comparison of National Assessment of Educational Progress (NAEP) Reports and State Physical Education Mandates

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ABSTRACT

There have been several studies that analyzed the relationship between physical education and academic achievement at a local level, but a longitudinal analysis across the United States has not been done. An understanding of the relationship between physical education policies across the United States and academic achievement at the state level may provide insight into best practices to ensure that comprehensive physical education policies are adopted in all states. Using data from the Society of Health and Physical Educators and The National Assessment of Educational Progress, I investigated the relationship between physical education policies and academic achievement. Minor relationships with minimal statistical significance were found between mandated physical education at the elementary level and reading/math NAEP outcomes. Inverse relationships with slight statistical significance were found in reading/math NAEP scores when states required physical education licensure. These results are important because there is a visible misalignment between current research and state level outcomes. Ultimately, federal initiatives may be "lost in translation" when they are passed down from state legislators to the local school level.

DEDICATION

"The three great essentials to achieve anything worthwhile are, first, hard work; second, stick-to-itiveness; third, common sense." –Thomas A. Edison

I don't believe that anyone has captivated the true essence of this journey in a single statement better than Thomas Edison. To say that the last two years have been life changing would be an understatement. The journey of attaining one's doctoral degree is an odyssey of highs, lows, laughs, and tears. Cumulatively, it is one of the most humbling experiences anyone can undergo. It is said that it takes a village to raise a child; this also applies to someone completing a doctorate. Without the support of my close friends, family, and the staff of the Executive Ed.D. program, I would not have been able to complete the program. There are two individuals who were the driving force and greatest source of motivation throughout this process.

To Emely: You are my little miracle and the reason I want to be a better man every day. I can't say I was truly living up to my potential before you came into this world. When I first held you, I promised you two things. First, I would never leave your side. Second, you will be proud of the man I will become. You had a critical role in the completion of my dissertation. Every time I became overwhelmed or lost in my writing, I went to dad's house to play with you and it anchored me back to my WHY. I thank you for being my greatest motivation and driving force. I love you.

Next, to my grandmother, Marta: Abuela, gracias por tu amor incondicional y por estar siempre a mi lado. Nadie me conoce mejor que tu. En mis momentos más difíciles tú siempre sabes que tienes que decir para calmarme y dirigirme en la dirección correcta. Le doy gracias a dios todos los días por bendecirme con una segunda madre como tu. Gracias por siempre creer en mi. Este logro tan especial te lo dedico a ti. Te quiero muchísimo.

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CHAPTER 1

INTRODUCTION

Given the pressure on school administrations from federal, state, and education boards to improve student academic performance, educators, teachers, and communities have sought to increase students' capacity for learning to improve their academic scores (Fedewa & Ahn, 2011). This goal has been complicated by the diverse socioeconomic, ethnic and school backgrounds of students, motivating educators to ensure accountability through a renewed focus on effective methods for improving student academic achievement. Arguably, physical education programs may be one mechanism for realizing improvement in the ELA and Math disciplines.

Various scholars, such as Chomitz et al. (2009) and Raine et al. (2013), have emphasized that the integration of physical education programs enhances student cognitive abilities, including memory, spatial orientation, language, behavior, and attention. In addition, Grissom (2005) confirmed a relationship between physical education and improved student learning. In light of this assumption, school administrators often include physical education as part of their curricula.

In fact, many schools, illustrating current efforts to improve student achievement, have adopted practices that promote the inclusion of physical education sessions (Pellegrini & Bohn, 2005). Further, eleven out of fourteen correlational studies have identified the significant association between classroom achievement and physical education (Rasberry et al., 2011). Meanwhile, there is minimal research that confirms the relationship between classroom instruction periods and improved academic scores. Nevertheless, the school-wide implementation of physical education can be challenging in schools that strictly emphasize instructional time.

Yet another barrier to the sufficient inclusion of physical education for all elementary students is the argument that there are several factors besides engaging in physical exercise that affect academic achievement. However, it is still undeniable that after participating in physical activity through physical education class, children demonstrate improved response and precision skills across a range of intellectual tasks (Pesce et al., 2009). Further, as Sibley and Etnier (2003) and Pontifex et al. (2012) argued, improved neural functionality enhances cognitive ability. In other cases, physical education classes promote unique listening and attention skills (Bartholomew & Jowers, 2011). According to Kibbe et al. (2011), besides maintaining students' overall well-being, physical education constitutes a basic skill set required by a student for academic learning. It is also arguable that engaging in physical education improves listening skills which, in turn, influences student achievement.

From a broader perspective, activities such as recess and physical education that take place out of the conventional learning environment allow students to develop diverse skills, enhancing their academic, physical, and social abilities (Pellegrini & Bohn, 2005). In response, many school administrations have implemented physical education as a way to improve student achievement. As such, this study explores the role of physical education in schools and how it influences student academic achievement. To achieve this objective, the study examines the status of physical education policy and its effects on reading and mathematics scores.

Background of Study

Some of the physical education activities that commonly take place in schools include games, free-play, and sports. As mentioned, participation in such activities has been linked to improved learning, capturing the attention of scholars. In a more recent example, Podschuweit, Bernholt, and Bruckmann (2016) found that these activities have a significant influence on

conventional learning as well as on students' overall performance at school. Yet, in spite of the aforementioned research, legislative policies have increased instructional learning time while cutting back on physical education (Berkey, Rockett, Gillman, & Coldtiz, 2003). Inevitably, educational policies that are formulated by the federal, state, and local administrators influence the ways that physical education is implemented in elementary school. Arguably, such stakeholders as teachers, school administrators, and policymakers have a responsibility to put measures in place that enhance student performance overall. In doing so, they should review the available research and consider if existing policies are aligned with those measures. Many recent sources have cite the benefits of physical education on the academic performance of school children.

Background of Physical Education

Formal physical education dates back to the early 19th century, when programs focused on gymnastics, hygiene and physical development (Hackensmith, 1966). The implementation of physical education programs across Europe inspired the inclusion of formal physical education in the American school system. However, the motivation for this inclusion has changed from improving health to promoting the development of youngsters over time. That paradigm shift led to the use of physical education as a means of enhancing classroom instructional periods. Arguably, physical education has evolved to promote the body's efficiency for the sake of improved academic learning. The evolution of physical education and its integration into schools has been a product of local policies and state-sponsored laws. However, physical education programs vary widely among different schools depending upon how the schools implement existing policies.

Although many scholarly works point to the benefits of physical education, teachers and institutional administrations have not yet devised a consistent approach for integrating it into the school system, in spite of the fact that many non-profit organizations offer resources and support for promoting physical education programs. For example, the National Association of Sports and Physical Education (NASPE), in conjunction with the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD), has developed physical education initiatives that assist in the creation of holistic physical education programs in elementary schools. These initiatives are based on the premise that physical education boosts students' capacity for learning in the classroom while instilling discipline and promoting academic excellence. Nevertheless, most states continue to use approaches that neglect the importance of physical education, therefore simultaneously failing to realize its potential to improve academic performance (National Association of Sports and Physical Education and American Heart Association, 2006). Given this situation, it is imperative for physical education policies to be amended in a way that ensures their universal applicability in all elementary schools.

Problem Statement

Following global pressure to prepare students with sufficient skills for future jobs, efforts have increased at both the state and federal levels to improve student academic performance in elementary schools. These efforts include an emphasis on promoting accountability within the learning community while enhancing academic discipline and professionalism (Fedewa & Ahn, 2011). Arguably, improved performance is reliant upon a solid comprehension of reading and mathematics skills. Hardman (2008) noted that the purpose of education is to nurture an individual's intellectual capacity by imparting knowledge and skills in a systematic way.

However, while conventional classroom learning time has been directly associated with improved student achievement, a focus on new, more effective learning approaches is imperative for improved performance in general (Fedewa & Ahn, 2011). Physical education provides one way for learners to grasp concepts through physical movements and participate in activities that differ from the mainstream curriculum. Notably, the focus of educational practices has shifted from merely teaching children about curricular subjects, health, and hygiene to engaging them in physical activities that are linked to learning. In the process, the primary goal of educators has shifted to furthering students' potential for learning and allowing them to realize their dreams as a whole (NASPE, 2004).

Thus, to improve performance in the field of education, institutions have adopted policies aimed at enhancing student academic performance through the integration of physical education. In fact, Kirk (2012) noted that physical education provides a renewed focus on student learning while also promoting the moral skills necessary for a functioning society. While controversy remains regarding the optimal implementation of physical education programs, progress has been made with respect to policies. Between 2015 and 2016, various policy changes took place. For example, the *Elementary and Secondary Education Act* of 1965 (ESEA) was changed to the *Every Student Succeeds Act* (ESSA). Such legislation has been aimed at fostering the better overall safety and well-being of each student (ESAA, 2015).

In spite of SHAPE America's suggestion that elementary school children engage in 150 minutes of instructional physical education, numerous states have revised their physical education policies to simply guarantee that they get the desired financing from Title IV, Part A of ESSA. The National Assessment of Education Programs (NAEP) has examined Reading/Writing and Math scores in association with these physical education policy changes.

Through the assessments conducted by organizations such as NAEP and Society of Health and Physical Educators (SHAPE), relevant stakeholders have been able to further evaluate the role of physical education in academic achievement. An extensive report titled "Shape of the Nation" released by the National Association for Sport and Physical Education established that only a small number of states instituted physical education activities across all grades (SHAPE, 1993): Forty-two out of forty-six states did not adopt physical education policies for all grades. In spite of these findings, following the pressure to improve academic scores, the *No Child Left Behind* (NCLB) policy was enacted in 2001, reigniting a focus on academic performance and downplaying the benefits of physical education to academics (Center on Education Policy, 2011).

As a result, school-wide implementation of physical education has encountered several challenges that have been attributed to its contemporary low status reputation compared to other educational subjects (Hardman, 2008). Policies have devoted more classroom time to enhancing students' reading skills, science, and mathematics (Fedewa & Ahn, 2011). Inevitably, this outcome is a product of legislative mandates and stakeholder pressure aimed, above all, at increasing academic performance. However, with an emphasis placed on typical learning approaches that undermine physical education, the intended increase in academic scores has still not been achieved. Therefore, the current study sought to investigate the contribution of physical education to the improvement of elementary students' reading and math scores. The rationale was established based upon evidence that points to boosted academic excellence through the sufficient inclusion of physical education in the school system nationwide. Ultimately, the results of this investigation illustrate the importance of physical education to the academic

development of elementary students and the benefits that can be realized from its inclusion as a consistent part of the core curriculum.

Justification

As part of the school curriculum, the inclusion of physical education has proven to be an effective way of building the psychological, social, and physical domains of the students. For instance, Biddle and Asare (2011) noted that the process of engaging in regular physical exercise enhances motor capacity and physical and mental endurance. The enhancement of students' overall health, in turn, boosts their capacity to perform in reading, writing, and mathematical sciences. Moreover, students have a chance to acquire more skills that are aligned with the learning process. In response to the need for improved standardized test scores, federal, state, and local government agencies have initiated curricular platforms geared towards the promotion of academic excellence. In this context, exploring physical education as a means of improving academic outcomes is of relevance to educational administrators.

Despite the extensive studies, reviews, and meta-analyses documenting the positive correlation between physical education and children's cognitive capacities, a universal consensus has not been achieved on whether physical education has positive effects on children's cognitive power (Bailey, 2006; Sibley & Etnier, 2003). In a different study, Fedewa and Ahn (2011) argued that the associated benefits of physical education can improve students' performance in mathematics, language arts, and sciences. Based on the findings of these studies, it is clear that there are inconsistencies in the outcomes of academic learning that are attributable to physical activity and physical education program practices.

Although the effects of physical education on academic achievement are debatable, it is certain that the physical activity inherent in effective physical education programs has significant

benefits on the health and physical well-being of individuals. Notably, contemporary educational policies tend to overemphasize academic excellence achieved through classroom instruction rather than the development of the entire child. Therefore, there is a need for an exploration of how physical education policies and physical education itself affect reading and mathematics scores in elementary schools. This is relevant in light of the sometimes-contradictory findings in the literature, the insufficient application of this knowledge, and the failure of policy to consistently mandate effective physical education programs as a means of achieving student academic performance goals.

Research Questions

The researcher used combined data from NAEP and SOTN to answer the following questions in order to achieve the objective of the study.

RQ1: What is the current status of state-level physical education policies at the elementary level and how has this changed over time?

RQ2: Have changes to physical education policies contributed to changes in 4th grade reading performance over time?

RQ3: Have changes to physical education policies contributed to changes in 4th grade mathematics performance over time?

RQ4: What is the relationship between physical education policies and 4th grade NAEP scores, particularly among students who are eligible to receive free/reduced lunch?

Significance of Study

The study aimed to investigate whether there is a relationship between physical education policies and students' performance in reading and mathematics. From a broader perspective, the present research provides vital information that concerns the pedagogy of elementary schools,

thus expanding the existing body of literature pertaining to physical education and its role in enhancing student learning. Further, the study highlighted the aspects involved in the inclusion of physical education in the school curriculum. Therefore, it provides insights into the relationship between physical engagement and improved student academic achievement.

The study also highlighted the importance of engaging all the relevant stakeholders of the education sector—such as parents, teachers, and school administrators—in improving student performance. Singh, Uijtdewilligen, Twisk, van Mechelen, and Chinapaw (2012) stated that the benefits of physical education are diverse insofar as the academic, social, and physiological lives of students are concerned. The authors further argued that the alignment of educational policies with physical education initiatives enabled the concerned stakeholders to promote those initiatives (Singh et al., 2012). As such, the present study was based on the assumption that students' academic performance can improve if the relevant stakeholders make an adequate effort.

In addition, the study explored the current status of physical education in schools and its relation to contemporary educational policies. The investigation was based on the premise that the inclusion of physical education is meant to strengthen the social, physical, and academic abilities of students. Given that the study explored the potential benefits to students of participating in physical education, as well as the current status of relevant legislative policies, the results provide valuable insights that can be applied towards improving elementary school pedagogy. Additionally, it offers guidance on school-based physical education programs and initiatives. The findings of the study can be used to examine various issues in the educational field, such as the relationship between instructional time and time that is allocated to physical education. Moreover, factors related to various aspects of learning are illuminated by the

presentation of findings and the subsequent discussion of physical education interventions in education. Although the inclusion of physical education in the required curriculum is associated with learning benefits, it also has a potential psychological and social influence on children's lives (Bailey, 2006). For instance, Hardman noted that children are able to establish peer relationships while engaging in physical activities (2008). In light of this knowledge, the present study is significant because it explores the implications implementing current physical education policies and their effects on student performance.

This study relied upon the assumption that state policies are being applied and adhered to, as detailed in reports from relevant associations such as the CDC and SHAPE. Another assumption was that these policies can be revised to improve physical education programs in schools. The study utilized data from various associations, including The American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD), which publishes reports (e.g., *The Shape of the Nation*) on the status of physical education programs within each state that are useful for developing models of more effective physical education initiatives. Overall, the present research is useful because its findings may illuminate a more effective strategy for increasing student academic performance and is relevant to state and national government organizations and educational agencies. In this respect, the findings suggested that physical education may be an effective mechanism for promoting academic excellence. The influence of physical education programs on promoting improved reading and math scores will be explored through the application of the study design.

Design

This study was organized into five chapters. This first chapter establishes the study's framework and provides a foundation for discussing the effects of Physical Education on

learning. The next chapter examines relevant academic research on the topic, including scholarly articles and reports by organizations in the United States that promote physical education in schools. Chapter 3 explores the methodology utilized for the data analysis, focusing on a fixed effects panel data analysis, and Chapter 4 presents the results. Finally, conclusions, recommendations, and implications for the educational field are presented in Chapter 5.

Strengths

Through the research questions posed, this research study provides a better understanding of physical education and the importance of its inclusion in contemporary curriculum. The subsequent insights will expand upon existing knowledge of pedagogy related to academic improvement through physical education initiatives. In the same manner, this research study employs a systematic procedure for identifying, reviewing, coding, and evaluating the scholarly work gathered from an extensive database review.

The studies selected as relevant to this investigation provide a broader context for the inclusion of physical education in elementary schools. Moreover, relevant organizational reports related to the topic are important for exploring policy implications and their subsequent impacts on education. The information contained within the review of the literature provides meaningful insight into the link between the two phenomena while establishing how they are related.

Limitations

While there are merits to the research study in its current form, the study includes several shortcomings. For instance, the incorporation of varying physical education practices in different schools limited the ability to make clear assessment of how academic performance on reading and mathematics is linked to physical education initiatives. In this regard, existing inconsistencies among the different local boards restrict the exploration of physical education

insofar as state-sponsored policies are concerned. Moreover, limited access to some information from the various state sources posed a challenge when the necessary data were not available. However, the utility of the available information from the Department of Education website was considered sufficient for the goals of this study.

CHAPTER 2

LITERATURE REVIEW

History of Physical Education Policies

The inclusion of physical education programs in schools dates to ancient times, especially in European countries such as Greece. The rationale for integrating physical activities into education was based on the premise that physical fitness is essential for the well-being and educational achievement of learners. The major aim of educating individuals on physical fitness was to achieve perfection. That rationale has informed the evolution of physical education programs to date.

Importance of Physical Education Policies

The American physical education system has undergone a lot of transformations since its inception in the 1800s. When it was first implemented in American schools, it focused on gymnastics, hygiene training, and care and development of the human body. Physical education is important to developing intellectuals who possess the awareness, abilities, and self-assurance to participate in a life that is full of healthy physical activity. Focusing on movement skills, for instance, Abels and Bridges (2010) analyzed the need for policies that emphasize the physical education aspect of learning. The authors concluded that learners could lead more physically active lifestyles if they participated in physical education as part of their school curricula. Arguably, in light of the authors' conclusions, a pedagogical model of curriculum that includes physical education is vital as it enables students to get physically fit. Therefore, physical education policies are important because they promote healthy lifestyles.

In addition, physical education has been considered essential to the overall development of students and necessary for their academic performance. For instance, Pellegrini and Bohn

(2005) noted that the education systems in most countries focus on improving the academic achievement of children in the classroom. However, the authors dismissed this over-emphasis on classroom work as the sole means to academic achievement. On the contrary, they asserted that children learn better if they are physically active (Pellegrini & Bohn, 2005). Similarly, Fedewa and Ahn (2011) argued that engagement in these activities has many health benefits, including enhanced psychological development. Thus, it is clear that these policies are crucial for both improved academic achievement and the well-being of the student as a whole because increasing a student's level of activity through physical education may affect their health and well-being, resulting in a positive influence on their ability to learn.

Meanwhile, Fedewa and Ahn (2011) asserted that physical education is important to the academic achievement of a learner as it significantly improves cognition (Fedewa & Ahn, 2011). The authors analyzed fifty-nine studies conducted between 1947 and 2009 and found a significant correlation between a child's academic accomplishments and their engagement in physical activities. They also found that cognitive outcomes were positive, which illustrates the need to incorporate school-based policies that emphasize the inclusion of this subject in the curriculum (Fedewa & Ahn, 2011). Based on these findings, it is clear that the inclusion of physical education programs in elementary schools is important to increasing the competency of learners not only pertaining to health-related fitness but also to positively effect learning outcomes. Therefore, policies that ensure the integration of physical education in all schools are essential.

Yet another reason that these policies may be important is that they enhance the psycho-social development of students. For example, Sibley and Etnier (2003) conducted a quantitative study exploring the effects of physical education classes on pupils' reasoning skills. The authors

also examined the effects that these classes had on the overall behavior of a child while at school. Based on their study's results, they established that students who enjoyed greater exposure to physical activity performed better than their peers. Further, their study showed that physical activity, such as a physical education class, promoted the development of cognitive ability (Sibley & Etnier, 2003). Their findings provide evidence that the inclusion of physical education in school curriculum is important because it enhances students' cognitive processes and supports positive behaviors, both of which contribute to more effective learning.

Physical education policies are also essential because the education system in the United States overemphasizes classroom instruction as a means of promoting academic achievement at the expense of other aspects of learning, such as physical education. To this extent, there is a need to understand how these two factors affect each other. To explore the need for physical education policies, Singh et al. (2012) carried out a methodical appraisal of scholarly work on these issues and drew various conclusions. Their inquiry examined whether a relationship existed between physical activity and the performance of employees. Their findings illustrated that there was a positive longitudinal correlation between physical activity and academic achievement. Notably, this finding confirms the importance of deploying policies that regulate the integration of physical education into school curriculum because such policies are necessary to improving students' academic performance.

Policies for physical education in schools have also been shown to improve the mental health of children. According to Biddle and Asare (2011), some learners suffer from anxiety, depression, and self-esteem issues that impede learning through diminished cognitive functioning. Such disorders can be attributed to sedentary behavior, partly because more hours are spent dormant or seated in classrooms. Moreover, the authors pointed out that the benefits of

the inclusion of physical education programs demonstrate the need to have policies that promote physical activity in schools. Such policies are crucial because they promote the incorporation of physical education programs that, in turn, reduce, and in some cases reverse, mental health issues. Overall, the research findings indicate that physical education policies are relevant to academic achievement as they promote various aspects of students' well-being that contribute to the student's ability to learn.

Physical Education Policies throughout the U.S.

The United States government does not use a unified term to refer to physical education policies. Although the roles of policymakers in education are divided between federal, state, and local governments, other professional organizations may develop standards that have jurisdiction over education matters across the country. For instance, Kohl III and Cook (2013) pointed out that the National Association for Sport and Physical Education (NASPE), in conjunction with state agencies, school districts, and individual schools, have devised their own distinct policies.

For example, the 2016 *Shape of the Nation* (SOTN) report, published by the Society of Health and Physical Educators, detailed the development and influence of education policies. This document has become a valuable reference work related to the physical education of children. SOTN supports the need to add daily physical education lessons in schools. One of its recommendations is to allocate at least one hour per day to physical education. SOTN calls for physical educators to help states to encourage children to be active as a means of keeping fit and healthy in the future. SOTN reports spanning the last three decades, as Fedewa and Ahn (2011) noted, showed that physical education has significant effects on the academic accomplishment of children at all levels of education. However, there are various stakeholders who have not yet fully adopted the recommended programs, and the SOTN reports have also noted differences

between states' levels of physical education integration. For example, Oregon and the District of Columbia have a uniform recommended time for physical education at both the elementary and secondary school levels. However, this is not the case in most other states.

Besides the SOTN, various policies and laws have had an effect on the integration of physical education programs in schools. For example, *No Child Left behind Act* (NCLB), first enacted in 2002, while an improvement over past educational policies, has diminished the role of physical education in schools (Kymes, 2004). Further, as White (2009) argued, NCLB focused on improving the test scores of students at the expense of other aspects of learning by concentrating on enhancing students' performance in reading and mathematics. White argued that this focus limited the time and resources allocated to physical education. In fact, physical education was reduced in many schools for the purpose of dedicating more time and attention to subjects that are present on mandated standardized tests. In many cases, schools relied on sufficient standardized test scores to receive much-needed funding or maintain their teachers' employment. Therefore, the implementation of NCLB was detrimental to the status of physical education programs, as many schools erroneously reduced physical education time to increase core curriculum and test preparation time.

However, some authors have argued that the introduction of NCLB has more advantages in education than disadvantages. For example, contrary to Kymes (2004) and White (2009), Dee and Jacob (2011) argued that NCLB was not only meant to enforce accountability purposes but also to ensure that all schools adhere to a holistic education approach. As Madsen, Hicks, and Thompson (2011) explained, since the inception of NCLB policy, there has been an increase in standardized test scores, but schools that have reduced physical education time to increase classroom time have actually demonstrated lower test scores than schools that have dedicated

time to physical education. Therefore, the authors concluded that schools should increase the time that they allocate for physical education realize improved test scores (Madsen et al., 2011). Ringwalt et al. (2011) supported this claim, arguing that more time allocated to physical education can help students to avoid bad behaviors, such as drug abuse and other issues, that distract from their focus in the classroom. The authors further suggested that a successful school can only attain its learning objectives within the context of the NCLB law by increasing the time dedicated to physical activities in school (Ringwalt et al., 2011).

Another policy that has had a significant influence on physical education and, subsequently, academic achievement is "Fitness for Life: Middle School." The policy advocates for improved fitness amongst students. According to Corbin, Le Masurier, and Lambdin (2010), this policy is aimed at improving the level of health-related aspects of school fitness programs. The "Fitness for Life" policy is derived from various learning theories that support the overall development of human beings by encouraging their physical movement. Essentially, the policy was designed to ensure that students will be fit in the middle years of school, and it integrated concepts of fitness into math and language arts, among other subjects (Corbin et al., 2010). The main objective of establishing this policy was to improve student scores in these subjects. As such, it is relevant to the way that physical education is integrated into schools and the subsequent effects of such integration on students learning. Also, in 2002, Stokes and Schultz proposed a policy referred to as "Personal Fitness for You." The goal of that policy was to improve the physical fitness of learners while focusing on enhancing the social and emotional well-being of students through activity. In a subsequent policy, called "Get Active! Get Fit!", Stokes and Schultz (2009) further proposed that learners must be active to achieve overall development.

Arguably, policies such as these an indirect effect on the development of an individual as a whole. For instance, while analyzing the policy titled "Personal Fitness: Looking Good, Feeling Good," Williams et al. (2005) described the influence of fitness on a person's future performance. According to the authors, exercise is recommended to enhance students' academic performance as well as other variables that promote health, such as nutrition. They further asserted that physical activity contributes significantly to the attainment of educational goals (William et al., 2005). This is because overall well-being may indirectly affect learning and academic performance by influencing cognition, attention, and other factors related to academic achievement. Therefore, physical education should be included in schools not only to improve academic performance and promote fitness, but also to positively influence related factors that may affect learning.

Policy Trends across the United States

With the existence of multiple policies that are applied throughout the United States' education system, there have been various trends related to the use of physical education programs that support reading and math scores amongst learners. Since the creation of the national *Every Student Succeeds Act* (ESSA), states have adopted different models of physical education (Darling-Hammond et al., 2016). Most frequently, schools have used Title I, Title II, and Title IV funds to support physical education programs. Saultz, Fusarelli, and McEachin (2017) stated that school administrations have the freedom to use these financial resources for the inclusion of physical education activities that benefit students. The authors also implied that to address students' learning needs, a holistic approach must be taken, thereby justifying the inclusion of physical education programs.

According to the reports highlighted in *Shape of the Nation*, the current trend in most school is toward the integration of physical education as part of the curriculum. Gallahue and Donnelly (2007) explained that this trend has gained popularity in response to the realization that physical activities benefit students by allowing them to have a comprehensive learning experience. With enhanced funding through ESSA, educators have had the opportunity to address decision-makers with the goal ensuring that quality integrated physical education programs and policies are put in place. Notably, physical education policies have affected the amount of time allocated for physical education activities in schools. Barroso et al. (2009) found that several states have enacted policies that require school administrations to reserve a specified period of time for physical sessions daily. The integration of such policies may promote regular participation in physical activity for some students. Following the adoption of such policies, physical education teachers have also had to acquire more knowledge, skills, confidence, and expertise to provide students with lessons in appropriate ways. Barroso et al. explained that, in the past, some states have put in place policies that mandated a minimum time that allotted to physical activity or physical education, resulting in 30% more time allocation than the minimum requirement. Moreover, states have implemented Senate Bill 42 as a way of ensuring that schools increase the number of physical education hours as a way of improving academic outcomes (Barroso et al., 2009). The incremental increase of time allocated to physical education beyond the minimal requirement implies that school administrations acknowledge the benefits of physical education and its effects on students' academic achievement.

In addition, Evenson et al. (2009) noted that the application of state-based policies has increased physical activity. With a required allocation fixed at 30 minutes per day, schools have been able to engage students in about half an hour of moderate to high-intensity physical activity

through physical education programs. Evenson et al.'s assessment of this policy showed that school districts have utilized the available federal funds to expedite the implementation of physical education policies.

In contrast, other reports and articles have claimed that the federal government's efforts to enhance physical activity amongst children have failed or produced minimal success. For instance, the 2004 *Child Nutrition and WIC Reauthorization Act* was expected to ensure that schools create more effective wellness policies. However, Belansky, Chriqui, and Schwartz (2009) noted that the idea of creating standards at the federal level has not been successful as such standards have been poorly implemented and monitored. In light of this statement, it can be argued that physical education policies should be implemented at the state rather than the national level. Moreover, they should be coordinated and monitored by schools as well as properly funded to ensure their success.

Eyler et al. (2010) theorized that most states have enacted physical education as a means of satisfying federally-mandated requirements. While some policies have been enacted in the recent past through PE bills as a result of federal directives, they have not been as effective as envisioned. For example, Eyler et al. (2010) reported that there have been 178 bills enacted but that these policies cannot be effective without adequate funding. Therefore, for PE policies to be effective, it is important to ensure that they have adequate funding, as well as sufficient monitoring by both state and local officials, once they are implemented.

The Value of Physical Education

As stated in Chapter 1, Physical Education has many benefits, including the improved health and the physiological, psychological, and social welfare of a child. These benefits influence the overall well-being of students and may indirectly affect their ability to learn. It is

with this background in mind that the following benefits of physical education have been included and considered relevant within the context of this study.

Health

Physical activities have been linked to the prevention of lifestyle diseases. Health professionals, especially physiotherapists, have found that education in physical activity is one of most effective strategies for promoting healthy lifestyles. Indeed, the World Health Organization (WHO) has described the absence of exercise as one of the contributing factors to chronic disease worldwide.

Various studies purport that the inclusion of physical education in school systems is important to improving the health of students. For instance, Lynch and Soukup (2016) found that the implementation of PE in schools enhances student health. According to these authors, health and physical education represent an "all-inclusive health dimensional act" that has been incorporated into many educational systems around the world (Lynch & Soukup, 2016). Similarly, Evenson et al. (2009) stated that physical activity improves academic performance and that, therefore, school administrators should consider it as essential as other core subjects, such as Math and English.

In a related study, Solomon (2015) evaluated the role of athletic activities in schools and found that a lack of physical activity can lead to major health risks, including lifestyle diseases and chronic illnesses (Solomon, 2015). Based on this knowledge, relevant stakeholders need to make efforts to address the issue of public health in light of physical education. Undoubtedly, addressing public health requires a comprehensive approach that ensures that quality physical education can be offered. Sparling et al. (2000), meanwhile, proposed that there is a link between physical activity and the well-being of a person. According to those authors, there is a need to

minimize sedentary lifestyles and promote physical activity in any setting, including schools. Based on a review of clinical trials, laboratory results, and other sources of information, they concluded that health and fitness is achieved by exercising consistently. In addition to the preventative effects of physical education, such as reducing one's risk for diabetes or cardiovascular diseases, research has also shown that physical education may improve mental health (Sparling et al., 2000). Breda et al. (2018) showed that most of the states in the European Union have identified physical education as a means of ensuring that people live healthy lifestyles. Throughout the EU, there are policies concerning sports, health, and education. Moreover, there are EU recommendations geared towards promoting physical activity across all sectors, including education (Breda et al., 2018). These Health-Enhancing Physical Activity (HEPA) policies have been applied across the EU for the purpose of ensuring reduced cases of morbid obesity and death across populations. Policies that promote the inclusion of physical education programs in schools are important to achieving good health among students and the academic benefits that may arise from it.

Psychological

Physical education also likely has significant benefits on the psychological well-being of people, especially children in elementary and secondary schools. Regular participation in PE activities increases the individual's level of fitness, including the mental aspects of a person's growth. For instance, Mburu-Matiba (2015) stated that physical activity keeps an individual fit while boosting their psychological health which, in turn, may impact confidence, self-esteem, concentration, participation, and other factors that influence academic performance. Further, Ryan and Deci (2008) argued that the total well-being of an individual is important since a person must be in the right mental state in order to perform any function well, including

academic-related functions. Thus, it can be concluded that policies that promote physical education in school have an indirect positive influence on the psychological well-being of school children.

Other authors have also linked physical education, mental health, and psychological well-being. For instance, Biddle and Asare (2011) carried out research on the significance of exercise to the mental health of students by reviewing various literature materials focusing on the relationship between exercising and anxiety, intellectual function, and self-esteem among adolescents. The authors found a positive correlation between engagement in physical activity and improved cognitive function that may translate into academic achievement (Biddle & Asare, 2011).

Meanwhile, psychological status is linked to an individual's cognitive functioning. In a meta-analysis study focused on exercise, the cognitive operation of a child, and achievement in the classroom, Fedewa and Ahn (2011) found that physical activity has numerous benefits for every person, including children. However, the authors noted that there is minimal data linking these benefits to academic achievement. Further, they clarified that different studies have provided different levels of correlation, including strong, small, or negative relationships. However, their study is relevant to the present study as it highlighted the need to improve the academic performance of students through school-based policies that incorporate physical education into their curricula.

Similarly, Janssen (2007) argued that physical activity can help in the development of the psychological capacity of a child or an adolescent. While a vast number of studies have concentrated on the physical benefits of exercise, Janssen reported that its mental benefits have not properly been documented. Janssen's argument is supported by Eime et al. (2013), who

showed that an increased level of physical activity through sports improves the psychological health of students. Some of the psychological benefits cited include the enhancement of an individual's self-esteem and reduced levels of depression. Arguably, the well-being of students in this respect can be linked to their academic achievement.

In another study, Bonhauser et al. (2005) investigated the role that physical activity plays in the emotional well-being of adolescents in Chilean schools. The authors found a positive relationship between emotional well-being and school performance in school. Physical education reduced the incidence of emotional distress while simultaneously improving self-esteem (Bonhauser et al., 2005). Based on their results, the researchers recommend that nations such as Chile devise strategies that help to integrate physical activities in school-based programs to improve the psychological health status of teenagers who come from a low socioeconomic standing. The authors' findings and recommendations also confirm that physical education has a significant effect on the psychological well-being of students.

Bonhauser et al.'s (2005) findings are reiterated by Sagatun (2010), who stated that most of the discussions of physical education or activity show similar positive effects on the psychological well-being of individuals as well as their physical health. However, the authors noted that most studies have focused on adults and that there is a limited body of literature that concentrates on children and adolescents. Despite the lack of adequate research on the topic, it is notable that physical activity can enhance the psychological health of students of all ages.

Some authors have concentrated on specific physical activities to illustrate the benefits of physical education to an individual's psychological well-being. For instance, Kim et al. (2016) evaluated the effects of physical education in the form of yoga on young children in schools. In their research, the scholars proposed that participation in yoga activities helps to improve the

psychological well-being of students. As such, they proposed, yoga should be implemented in childhood so that it can improve the mind of a child as well as support body harmony. In addition, yoga helps in the development of kinesthetic awareness, enables children to acquire knowledge about health, aids in the development of the skills of self-control and imagination in the classroom (Kim et al., 2016). All these advantages show that even less intensive physical education classes such as yoga may be appropriate for the mental development of children.

Similarly, Smedegaard et al. (2016) evaluated the role of physical activity in supporting the emotional wellness of a child. According to the authors' findings, better physical activity during school times was associated with improved inner health. The scholars also noted that some schools have reduced the number of hours that they use for physical activity. Further, they recommend that schools include physical education programs in their curriculum because they help in the mental and psychological development of children, which translates to better academic scores.

Breslin et al. (2017) also affirmed that there is a link between exercise and the psychological well-being of a child. Based on their findings, the scholars claimed that students who engage in moderate or vigorous physical activities daily have a high chance of developing a stable psychological status. The authors reiterated Smedegaard et al.'s (2016) recommendation that schools develop strategies aimed at encouraging children to change their sedentary behaviors. Based on the findings of these authors, it is evident that the integration of physical education classes into the curriculum of schools can encourage the psychological well-being of the students.

Also, in a study aimed at identifying the association between mental health and physical wellness among children between the ages of 10 and 14 years, LaVigne et al. (2016) found that

students who are actively involved in physical fitness exercises experience lower levels of loneliness and depression as well as better cognitive abilities. These results showed that physical fitness is linked to the psychological well-being of both boys and girls of the same age group, underscoring that physical education is vital to the psychological health of students. Mura et al. (2015) reported results similar to those of LaVigne et al. (2016). They found that some of the benefits of physical activities include enhancing self-esteem and lowering the level of depression, thus limiting the chances of suicide in extreme circumstances. The authors also stated that the inclusion of physical education in school curricula in European countries has been an effective way of preventing problems that result from psychological disorders.

Christiansen et al. (2017) also pointed out that physical activity remains an important tool for supporting the psychological well-being of a child. The scholars explained that children could improve their self-perception through school-based physical activities that, in turn, improve the way they develop confidence in themselves. In addition, the researchers reiterated that increased participation in these activities via physical education classes can support the attainment of better grades amongst children in schools.

Similarly, Liu, Wu, and Ming (2015) asserted that exercising helps with the development of courage and confidence among teenagers and children. After carrying out a meta-analysis and meta-regression to determine the significance of supervised exercises as a way of enhancing the self-esteem and self-concepts of children, the authors confirmed that the intervention of physical activity could improve these psychological aspects of learners, particularly their self-concept and self-worth. The major significance of this study to the present research is that it emphasized the need to make changes in education policies and integrate physical education into the school system. Lastly, Sibley and Etnier (2003) concluded, based on their meta-analysis, that there is a

link between physical activity and reasoning in school-age children. According to these authors, children must, at minimum, participate in physical activity to enhance their cognitive functioning.

Collectively, these scholarly sources provide evidence of a relationship between physical education (and the activities that comprise it) and a more positive sense of mental health or more stable psychological well-being among students. Since a positive state of psychological well-being may contribute to improved academic performance (via self-confidence, greater ability to focus, enhanced reasoning, etc.) and, conversely, poor mental health may deter learning (i.e., depression impedes concentration, anxiety deters attention, etc.), any variable that improves or promotes mental health will, in turn, positively influence academic performance. Physical education has been shown to be a means of improving psychological status and, therefore, it benefits students in this regard. For this reason, existing research demonstrates the need for physical education policies in schools.

Social

Physical education also contributes to the social development of a child. Arguably, the formation of interpersonal relationships is an important aspect of the human way of life. Physical exercise, to some extent, helps in the promotion of social skills. While most people consider physical activity as a source of pleasure, it is also a good way of enhancing the relationship that people have between themselves. According to Dacica (2015), physical education influences not only the health children but also the level of socialization that they attain. The author implied that the functions of physical education and extracurricular activities are not solely to improve physical and mental health, but social integration as well. Individuals must communicate with

each other while they engage in physical activities. As such, these activities are a good avenue for establishing various strategies for communication and better relationships with others.

The effectiveness of teachers imparting knowledge in schools is dependent on the relationships that they have with their students, and this relationship can be established through participation in physical activities through physical education programs. Dacica (2015) stated that physical education enables students and their educators to interact with one another. Further, physical education activities are usually performed in team settings and help people build trust in each another. To this extent, physical education helps people to promote listening and speaking skills that are some of the cornerstones of effective learning. It also instills positive behaviors, regular school attendance, and the emotional well-being of students. Ogilvie and Noble (2005) noted that schools that provide opportunities to learn outside the classroom enable students to attain improved personal, social, and mental growth. These author's arguments show that physical education has a positive influence on students' social development.

Further, Putnam and Rickson (2004) highlighted that it is possible to achieve social association through outdoor activities, which enhance the connection between individuals. Following the creation of good interpersonal relationships, a positive learning environment is established in the schools, motivating students to perform well in the classroom (Putman & Rickson, 2004). Further, Putman and Rickson (2004) proposed that outdoor learning through physical activities can have a positive effect on the long-term memory of a child. That effect reinforces the affective and cognitive domains of a child, thus creating higher order learning supported by a functioning social system. It is evident that outdoor education through physical activities can have a positive effect on the social abilities and skills of children.

Kohl and Cook (2013) also affirmed that physical education is important to the development of the social aspects of a child. The authors asserted that it promotes growth and development while supporting the psychosocial aspects of life. In addition, it improves peoples' social behaviors, such as their self-efficacy (Kohl & Cook, 2013). The authors implied that any time a student gets involved in physical activities, there is a high chance that they will increase their self-esteem which, in turn, encourages their peer socialization. Through this path of social development, students become empowered to engage in group activities that are critical to their course of learning. In theory, schools that create proficient policies for physical education classes provide students with several benefits that enable them to attain their academic targets and maximize their achievement.

Sami, Mahmoudi, and Aghaei (2015) also noted that students who take part in physical activities are expected to develop socially. Based on the result of their study, the scholars reported that physical activities enhance the development of students' social skills as well as their process of learning adaptive behaviors that enable them to interact well with other people (Sami et al., 2015). Thus, the students become cooperative, responsible, and empathetic, and they exercise better self-control and self-reliance. All these are considered components of social development. Consequently, a child with these characteristics can perform well academically while, at the same time, interacting effectively with their peers. The authors concluded that the inclusion of physical education in school is vital as it enables students to acquire social skills that, in turn, enhance their academic performance.

The results of this review of literature show that physical education policies have a significant effect on the social lives of students. As such, the findings reported in this chapter are essential for answering the questions of the present study because they clarify how physical

education policy changes can affect academic achievement. Further, the findings can be used to investigate whether the NAEP and SOTN reports show any link between such policies and academic achievement through an improvement in social welfare. That research objective can be achieved by identifying an existing pattern of changes in the social welfare of students in relation to their performance based on the two reports.

Physical Activity and Academic Achievement

The existing research reveals a correlation between physical activity and academic achievement. McDonald et al. (2014) stated that there has been a debate about the association between the physical, cognitive, and academic functioning of a child. The scholars investigated the connection between the three concepts by conducting an empirical study of the effects of the Active Kids Active Minds (AKAM) intervention. They analyzed the effect of children's participation in moderate and vigorous daily physical activity, without focusing on a specific exercise, on academic learning. Based on the findings of their study, they concluded that physical activities are important in schools because they enable children to perform better in class. The authors attributed their conclusion to the fact that the children's cognitive functioning was improved whenever they took part in the rigorous activities modeled in physical education classes. Considering this finding, it can be concluded that physical exercises have positive effects on academic performance. Therefore, physical education is essential in schools.

The exercises that children do during the physical education periods in school enhances also their cognitive functioning. In one theoretical study, Keeley and Fox (2009) investigated how physical activity in general influences academic achievement among children. The authors noted that engaging in physical exercise can improve the cognitive functioning of persons as well as their academic and learning accomplishments. Using a systematic approach to the

identification and analysis of relevant studies, the researchers assessed the effects of physical fitness on academic achievement and cognitive performance. Their findings suggested that there is a weak correlation between physical wellness and academic performance although physical exercise stimulated neural functioning. The authors also noted that there is limited existing evidence to prove that physical exercise time enhances class performance. Ploughman (2008) also supported the view that exercise has a way of stimulating the neural functioning of a person. He based his argument on an empirical study that focused on a Morris water maze exercise. The improved cognitive and physical functioning of participants in the study contributed to their higher academic achievement. Despite these authors highlighting that the correlation was weak, there is still a need to put children through physical activities to help improve their intellectual capacities.

Notably, some schools consider physical fitness a criterion for admitting students. For example, Ericsson and Cederberg (2015) examined the acceptance rates of students who moved from lower schools to upper schools in Sweden. The goal of their research was to find out whether involvement in physical activities supported their acceptance into the upper schools. The authors based their investigation on earlier theories suggesting that grades in Physical Education could have an influence on achievement in school. The results indicated that students who moved to the higher schools were more physically active than the students who did not. The result is important because it shows that incorporating physical education could be an effective strategy for improving the rates of admission in the upper schools, which is a mark of achievement.

Other researchers have also sought to investigate the link between physical education and academic achievement with respect to the time allocated for the former. For instance, Sallis et al.

(1999) carried out an empirical study that involved the implementation of the SPARK education program to examine the benefits of school wellness programs carried out over two years on the academic achievement results of seven hundred fifty children. To obtain a comprehensive result, the specialists taught the children physical education activities and the children continued their usual learning process in classrooms. On the other hand, a control group continued in a program that did not incorporate physical education. The findings of the research indicated that engaging in health-related physical education programs can have a positive influence on academic achievement.

The importance of performing exercise to enhance the physical and psychological health of people was also supported in the findings of Fedewa and Ahn (2011). Basing their argument on a theoretical study that involved a quantitative synthesis of fifty-nine studies, the authors asserted that it is a well-known that physical education influences academic performance as it helps in the development of the cognitive functioning of a child as well as the child's capacity to perform well in school. The authors proposed using aerobic exercise as the staple of physical activity aimed at improving a child's academic performance. Based on their findings, they concluded that the correlation between the physical exercise and academic achievement should be the basis for school-based policies that support the inclusion of Physical Education in the curriculum. In light of these scholars' conclusions, it is clear that physical education policies are vital to the improvement of academic achievement.

Bailey et al. (2009) also supported the conclusions drawn by the proponents of the inclusion of physical education in schools' programs such as Fedewa and Ahn (2011). The former carried out a theoretical study on the importance of physical education and school sporting activities that influence the affective, cognitive, physical, and social features of the

progress of a child. The study focused on Physical Education and School Sport activity. Based on their findings, they concluded that physical education contributes to the development of a young person in all these domains. According to their results, exercise supplements coursework.

Notably, other countries have not embraced the idea of including physical education programs in schools despite the evident advantages. For instance, in an empirical study that involved three hundred thirty-three Chinese pre-adolescent children, Yu et al. (2006) noted that even though academic success is considered an indicator of overall personal achievement in China, physical activity is discouraged in the nation, where over 90% of the learning period is allocated to classroom instruction (Yu et al., 2006). Using tools to measure the self-esteem and the activity patterns of students, the authors established that high academic achievers had better school behaviors and that their levels of physical activity were independent of other aspects of learning. However, the authors also reported that boys who had independently participated in physical activities had better grades than those boys who preferred sedentary lifestyles (Yu et al., 2009). These results also show that physical education has a significant effect on the academic achievement of children.

Erwin et al. (2012) reviewed the importance of physical education lessons to improving the academic grades of children by carrying a theoretical study using quantitative analysis that focused on physical activity interventions with respect to health and academic achievement. According to the authors' findings, physical activity in schools may help to foster academic performance. The researchers noted that schools have excessively emphasized attaining higher academic standards at the expense of incorporating Physical Education lessons in their curricula.

Given the assertion that academic achievement is directly related to participation in physical activities, various scholars have devised proposals to improve academic achievement

through physical education. For example, Hernandez (2014) proposed that schools should consider the connection between health, physical activity, and the level of success that they want their students to achieve. He made his assertion based on a theoretical study that focused on understanding the role of teachers, the community, and schools in enhancing the health, physical activity, and academic achievement of students. As part of these interventions, teachers play a central role in the integration of Physical Education in schools, while schools administrations have a duty to promote stronger physical education policies and community members can support their efforts by lobbying legislators to allocate the necessary funding for these policies to succeed.

Table 1 summarizes of the findings of the various studies discussed heretofore.

Table 1

Summary of Research Findings

Authors	Program Studies	Outcome Studies	Major Results
Lynch and Soukup	Physical education", "health and physical education", "physical literacy" and "health literacy.	Physical activity improves academic performance and lack of it results in ill health.	Time was a major barrier in physical education implementation.
McDonald	Physical activity – academic achievement: student and teacher perspectives on the 'new' nexus.	The group that got the study intervention had better performance in academics.	The intervention group welcomed physical activity when augmented with fun and leaned on student's interest.
Keeley and Fox	The impact of physical activity and fitness on academic achievement and cognitive performance in children.	There is a weak correlation between academic achievement and physical wellness.	There is no evidence of increased academic performance from longer physical activity and no detrimental effect either.
Sallis et al.	Effects of health-related physical education on academic achievement: Project SPARK	An examination of school wellness programs	Engaging in health-related physical education programs can have a positive influence on the academic achievement of a student
Álvarez-Bueno et al.	Association of physical activity with cognition, metacognition and academic performance in children and adolescents: a protocol for systematic review and meta-analysis	They did research with the objective of assessing the effect of physical activity interventions on the academic performance and classroom behaviors in childhood	The overall results of this study showed that there was a significant effect of physical activity on academic achievement facets comprising of mathematics-related skills, reading, and composite scores
Erwin et al.	A quantitative review of physical activity, health, and learning outcomes associated with classroom-based physical activity interventions	Reviewed the importance of physical education lessons in improving the academic grades of children by carrying out a quantitative analysis	According to them, it is confirmed that physical activity may help in fostering academic performance in schools

Effects of Physical Education Policy

The existing literature suggests that there is a link between physical educational policies and academic achievement. For instance, Chomitz et al. (2009), Raine et al. (2013), and Fedewa and Ahn (2011) all argued that the integration of these policies can have a positive influence on

the academic achievement of students. Based on the findings of these studies, it may be concluded that existing policies have both direct and indirect effects on how individuals perform in various subjects at school. In particular, Chomitz et al. (2009) reported that physical education policies give students an opportunity to engage in physical activities that enhance their memories and cognitive skills, influencing students' overall academic performance.

For example, Kibbe et al. (2011) acknowledged that students' academic progress is a concept that requires an integrative and holistic approach to teaching. As such, it is imperative to carry out a study of existing state-level policies and how they influence academic performance. In order to achieve a credible outcome, such studies ought to focus on subjects in which students are likely to show improvement through engaging in physical activities.

Data to be Utilized

Information derived from Shape of the Nation Reports and NAEP were used for the present study.

The Shape of the Nation

The Shape of the Nation reports are published every few years by the Society of Health and Physical Educators. In a 2016 survey of state-level policy, some states reported improvement while the performance of others declined compared to the previous report, completed in 2012. In the report, it is noted that most states have approved laws, conditions, and frameworks for physical education programs. However, the results also showed that most states have also not adopted strict guidelines that require a specific amount of instructional time allocated for Physical Education. Additionally, more than half of states support exemptions from physical activities, waivers, or substitute programs.

According to Shape America, American Heart Association, and Voices for Healthy Kids (2016), the United States government strives to ensure that children who attend schools conduct physical exercise for about 60 minutes a day. These programs are perceived as meaningful to developing healthy children (Shape America, American Heart Association, and Voices for Healthy Kids, 2016). With consideration to state variations in the application of federal policies, the 2016 Shape of the Nation report reported on the differences amongst the states.

First, only Oregon and the District of Columbia fulfilled the federal recommendations for the number of times per week that students should engage in physical education at the elementary and secondary levels. Furthermore, only fifteen states have allocated funding specifically for physical education programs, while most states do not allocate such separate funding. The report also showed that all the states have set standards for physical education programs and that most of them require their physical education teachers to be licensed in their field. Only a few states allow teachers who do not have licenses in Physical Education to teach physical education classes.

Most states also require that students take part in physical education at different levels. These include thirty-nine states with elementary school requirements, thirty-seven with middle/junior high school requirements, and forty-four with high school requirements (Shape America, American Heart Foundation, and Voices for Healthy Kids, 2016). For substitutions, thirty-one states require that other activities be used, thirty states allow exemptions, and fifteen states allow waiver applications. Most states also allow the withholding of physical activity as a form of punishment, while ten states prohibit this practice. These reports are discussed in more depth in Chapter 3.

The National Assessment of Educational Progress (NAEP)

The National Assessment of Educational Progress (NAEP) is an integral part of measuring student achievement in the United States. Mandated by the United States Congress, it is responsible for such aspects of education as the assessments that are used to improve the educational standards in the country (National Assessment of Educational Progress, 2018). It operates differently from the state assessments, which have different standards and content. However, NAEP applies in all states as uniform means through which the achievements of students can be evaluated. Additionally, its data are used to compare and obtain a better understanding of the performance of all demographic groupings within the nation, states, districts, or local areas (National Assessment of Educational Progress, 2018). For this present student, data obtained from the NAEP were used to compare physical education policies across the nation and their effects on the academic performance of learners. Like SOTN, NAEP will be explored further in Chapter 3.

Conclusion

The integration of physical education into early schooling is a tradition that has been adopted by several countries over time based on the assumption that it has positive effects on the learning process. Based on the literature reviewed, it can be concluded that education policies that promote physical education are necessary because the activities that comprise these programs help to improve the health and the psychological and social well-being of students. The review also revealed that engagement in physical activities is crucial for the overall academic performance of children in school. The outcome showed that physical education policies are important because they contribute significantly to the achievement of better academic performance.

CHAPTER 3

METHODOLOGY

Numerous studies have pointed out that fitness achieved during physical education sessions has a beneficial effect on the academic performance of a child (Bornstein, Pate, & Buchner, 2014). An understanding of the relationship between physical education policies across the United States and academic achievement may provide additional insight into best practices to ensure that comprehensive physical education policies are adopted in all states.

For this study, panel data from 1997 through 2016 were used to examine the comprehensiveness of state physical education policies throughout the nation and their relationships to student achievement in reading and mathematics. The study relied on data from two sources: state physical education policies obtained from the Society of Health and Physical Educators (SHAPE) and data from the National Assessment of Educational Progress. These data were used to measure student achievement and investigate the contribution that physical education approaches make towards the Reading and Math scores of elementary school students. The utilization of reports from NAEP and SHAPE produced results that contributed to formulating a more tangible connection between physical education mandates and academic performance.

Research Questions, Hypotheses, and Variables

The general research questions underlying the overall purpose of this study are as follows:

RQ1: What is the current status of state-level physical education policies at the elementary level and how has this changed over time?

RQ2: Have changes to physical education policies contributed to changes in 4th grade reading performance over time?

RQ3: Have changes to physical education policies contributed to changes in 4th grade mathematics performance over time?

RQ4: What is the relationship between physical education policies and 4th grade NAEP scores, particularly among students who are eligible to receive free/reduced lunch?

Hypotheses

The hypotheses tested by the study design were as follows:

- **H1**: There will be a noticeable difference in 4th grade reading performance, with higher scores occurring in conjunction with increased physical education times.
- **H2:** There will be a noticeable difference in 4th grade mathematics performance, with higher scores occurring in conjunction with increased physical education times.
- **H3:** There will be a noticeable increase in 4th grade NAEP scores, particularly for students who are eligible to receive free/reduced lunch, when physical education mandates are present.

Variables

Independent variables. The primary independent variable was Physical Education (PE) data derived from the Health and Physical Educators (SHAPE) online database. This took a categorical or nominal form to define whether PE was mandated, whether PE teachers were required to be certified, and those students who were eligible to receive free/reduced lunch, defined as follows:

- 1 = No
- 2 = Yes

Dependent variables. The dependent variables were the Mathematics and Reading Scores derived from the NAEP database. These were treated as continuous variables, with the scores ranging from 0 to 500.

Control variables. The control variable was educational funding for programs. This variable is a noteworthy part of educational progress and tends to remain constant throughout the nation.

Study Design

In addressing the research questions, a primarily quantitative approach that included descriptive and quantitative analyses was used. To facilitate this approach, data were obtained from the SHAPE and NAEP websites. Taking a longitudinal approach, academic scores were compared over time, necessitating the use of correlation and fixed effects regression analyses to establish variations and possible causations in an effort to strengthen the findings related to possible correlational or predictive relationships (Creswell, 2015). A fixed effects regression is an estimation technique employed in a panel data setting that allows a researcher to control for time-invariant unobserved individual characteristics that can be correlated with observed independent variables (Encyclopedia of Social Sciences, 2008). Unit fixed effects regression models are widely used for making casual inferences from longitudinal or panel data in the social sciences (e.g., Angrist & Pischke, 2009). Many researchers use these models to adjust for unobserved, unit-specific, and time-invariant confounders when estimating casual effects from observational data (Imai & Kim, 2019). The procedure was used for each aspect of this research process.

Instruments

The primary tools of measurement for this study was the SHAPE survey, which provides national physical education data, and the NAEP assessments, which provide Reading and Math data.

Physical Education Assessment

As noted, the Society of Health and Physical Education website provides collected information pertaining to the status of physical education nationally. These "Shape of the Nation" reports include nationwide information pertaining to whether or not PE is mandated at the elementary level, whether those who teach PE must be licensed/certified, and whether or not each state has a mandated time for PE in a weekly (or other) capacity. Information is collected from all 50 states and the District of Columbia. Reports have been published every few years, including 1997, 2001, 2006, 2010, 2012, and 2016.

NAEP Reports

Academic data for elementary students (specifically, 4th grade) were derived from a national assessment known as the National Assessment of Educational Progress (NAEP). Created and presented by the National Center for Education Statistics (NCES, 2015a), the subject-specific tests are administered nationwide at intervals of approximately every other year, depending on the subject (NCES, 2015a). NAEP data collected for 4th grade Mathematics and Reading outcomes were of relevance to this study. Reports can be obtained through the NCES/NAEP archive for the years 1996, 2000, 2003, 2005, 2007, 2009, 2011, 2013, and 2015.

For each assessment, a variety of skills are tested that are age-appropriate and relevant to the particular subject (NCES, 2015a). Scores are calculated on a scale from 0 to 500 with benchmarks for Basic performance/knowledge, Proficient performance/ knowledge and

Advanced performance/knowledge included for comparison (NCES, 2015a, 2015b). Outcomes are reported as state and national averages. NAEP information, therefore, is not presented at the individual student level but is, rather, typically categorized by geographic location (or nationwide averages) and grade level.

Validity and Reliability

NAEP takes several measures to promote the most valid and reliable assessment outcomes possible. These measures include Item Response Theory (IRT), which is used for evaluating student responses to test items and the subsequent creation of scales (NCES, 2015a, 2015b). For the reading assessment, literary and informational subscales contribute to an overall composite score in which each is accurately weighted (NCES, 2015a). Finally, contextual factors are controlled and accounted for through the collection of data pertaining to demographic and background variables, thereby reducing the potential for bias associated with any obvious confounding factors (NCES, 2015a). The subsequent scores are then presented as an average based upon aggregate data that can be reviewed at the district, state, or national level (NCES, 2015a, 2015b).

Looking at the reliability, validity, or overall credibility of the NAEP reading Assessment, Bandeira de Mello et al. (2015) reported that its outcomes are used as the standard for the establishment of state mandates pertaining to student proficiency. In other studies, the assessment has been recognized as presenting both valid and reliable evaluations pertaining to the measurement of reading proficiency for elementary students (Rutkowski & Wild, 2015).

Meanwhile, Valencia et al. (2017) explored both the construct and instructional validity of the NAEP 4th grade elementary reading assessment. Their study took into consideration the actual performance of students in relation to an evaluation of specific item difficulty, resulting in

the conclusion that the assessment serves as a reliable evaluative tool in this regard and that the finding that student grade level was significantly related to the difficulty of items, thereby reaffirming the accuracy and overall credibility of the NAEP assessment (Valencia et al., 2017).

Finally, a recent study of the NAEP mathematics test (Kosko & Singh, 2018) explored the convergent validity of items related to multiplication. Although the items were not sufficiently accurate for identifying conceptual knowledge, the mathematics test was a good indicator of procedural recall (Kosko & Singh, 2018). Little other research of relevance related to validity and reliability is evident in the recent literature, thereby revealing a substantial gap in this area. Nevertheless, the NAEP tests continue to present as the most widely-used standard for evaluating student progress at the elementary school level (NCES, 2015a).

Participants/Cases

Given the nature of this analysis, the use of secondary data eliminated many of the required human subject protections or the need for informed consent and confidentiality measures (Creswell, 2015). All data were derived from the NCES/NAEP database archives of longitudinal data on student academic outcomes in all 50 states.

The NCES (2015) does not take certain measurements, such as mandated participation rates for each sample school selected, or separate the results obtained from private, public, and religious-affiliated schools (NCES, 2015a). In addition, schools with a rate of participation less than 85% are subject to further weighting and analysis to account for nonresponse bias (NCES, 2015a). Demographic data and other potential confounding variables, including ELLs and students with disabilities, are considered, allowing for a final sample that is most accurately representative of the 4th grade population nationally (NCES, 2015a). Although the final sample

of participants and associated schools may vary by year, approximately 7,850 schools each year are selected as participants, with an estimated total of 149,500 student subjects (NCES, 2015a).

According to NCES (2015), these schools are selected based upon a sampling frame that consists of all public schools in operation within each specific state. Each school chosen, as well as the students attending it, represents the general school and student population. Therefore, to ensure sufficient representation, final assessment scores are weighted with consideration to differences or variations between specific subgroups and the larger sample (NCES, 2015a). The schools chosen for assessment are those that undergo a process of classification by variables of interest, including the type of location in which the school resides (i.e., city or rural) and the racial/ethnic composition of the student population within each school (NCES, 2015a). After this initial classification, the potential schools are further broken down according to each school's level of achievement on the standardized tests (NCES, 2015a). The resulting sample of schools within each category is then compiled in a final list of schools representative of the larger population according to size, location, student ethnicity, and achievement levels.

Once the selection of schools is complete, students in each school that are in the appropriate grade level are randomly chosen to complete the assessment (NCES, 2015a). These student scores are then compiled for each school and each state, producing a mean state score for the specific assessment (NCES, 2015a). These mean scores for 4th graders reported by NCES were utilized within the context of this thesis.

Data Collection

Data from the National Assessment of Educational Progress reports were downloaded from the National Center for Education Statistics website, specifically including 4^{t}th grade

Reading and Mathematics results. Data from the Shape of The Nation reports providing the state and nationwide Physical Education data were downloaded from the Shape America website.

Data Analysis

All collected data were saved in an Excel spreadsheet and then exported to a Statistical Package for Social Sciences (SPSS) data file for analysis. The analysis was segmented into several objectives.

Descriptive Outcomes

Once all data were collected and recorded, common measures of central tendency and variability were used to report the student measures results. Since the NAEP and Shape of the Nation reports are published (coincidentally) in alternating calendar years, the two data sets were paired according to the academic year or school calendar year. For example, one data source (NAEP) reported on and published data in 1996, but the publication date for the SHAPE report covering the same period was 1997. In response, the SHAPE and NAEP findings for this period was simply paired for comparison (i.e., Reading and Math Scores examined in relation to PE mandates for 1996) and labeled as data for the 1996-1997 school year. In cases where one source published a report during the academic year but the other did not publish findings at that time, the data for that year were simply not included in the analysis. For example, NAEP published 4th grade Reading and Mathematics results in 2003, but SHAPE did not publish findings in any consecutive year or within an applicable school year. Therefore, a comparison could not be made, and this 2003 NAEP report was excluded from the analysis.

The final data set consisted of the following academic calendar years (indicating that both PE and academic reports were available for comparison): 1996-1997, 2000-2001, 2005-2006, 2009-2010, 2011-2012, and 2015-2016. These are illustrated in Table 2.

Table 2

Publication Year for NAEP and SOTN Reports that Comprise each Academic Year

Academic Year (represented in this study)	Associated NAEP Report	Associated SOTN Report
1996-1997	1996	1997
2000-2001	2000	2001
2005-2006	2005	2006
2009-2010	2009	2010
2011-2012	2011	2012
2015-2016	2015	2016

Analysis #1: Is Physical Education Mandated?

The first segment of analysis explored whether Physical Education is mandated in elementary schools by state and year. The independent variable was whether PE was mandated for elementary schools in a state during a given academic year, and the dependent variable was the associated NAEP reading and Mathematics scores. The purpose was not only to explore the mandated status of PE and how this may have changed over the years but also to examine whether any associated changes in elementary Reading and Mathematics scores occurred. Ultimately, this established whether an overall, general variation exists.

Each relevant academic year was categorized into two subgroups: states that had PE mandated that year and states that did not; in essence, a "Yes" (PE is mandated) and a "No" (PE not mandated) group. Once the states that belong to each subgroup for relevant academic year

were defined, the data were reviewed for longitudinal trends in progress (or a lack thereof). The same process was then implemented pertaining to Mathematics scores.

Analysis #2: Certification of PE Teachers

The second segment of analysis proceeded much like the first, but the intended purpose was to explore how many states required certification or licensure for PE teachers at the elementary level and how this number has changed over time. To examine these questions, the state data for each relevant academic year was, once again, assigned to one of two subgroups: states that required certification of elementary PE teachers each year and states that did not. This resulted in a "Yes" group (certification/licensure for PE teachers is mandated) and a "No group" (certification/licensure for PE teachers is not mandated) group. Once the states that belonged to each subgroup for each relevant academic year were defined, the data were reviewed for proportions and other descriptive results as well as longitudinal trends over time. The same process was then implemented pertaining to Mathematics scores.

CHAPTER 4

RESULTS

The goal of this study was to explore the status of Physical Education at the elementary school level and the potential relationship between Physical Education and Academic Outcomes as expressed in NAEP reading and Mathematics scores. A quantitative analysis was utilized to determine the potential relationship. The results provided a longitudinal exploration into the status of PE in the United States coupled with NAEP scores for the 4th grade education level. This presentation of results is composed of two segments. It begins by addressing the status of PE (i.e., mandated versus not mandated) and concludes with a discussion of the potential relationship between PE teacher certification and academic outcomes as revealed in NAEP results.

Analytic Segment #1: Is Physical Education Mandated?

The first segment of analysis explored whether Physical Education was mandated in elementary schools by state and year. Twenty years of data were examined to provide a strong basis for sampling. Data from each relevant academic year were divided into two subgroups: states that had PE mandated that year and states that did not: a "Yes" (PE is mandated) and a "No" (PE not mandated) group. Table 3 illustrates the number of states that mandated elementary physical education at the time points measured over the past two decades.

As shown in Table 4, the highest national percentages of state-mandated physical education at the elementary level appear to have occurred around the turn of the millennium. This was followed by a sharp decrease and a subsequent increase occurring around the end of the decade and leading into more recent years. It is important to note that the decrease happened after NCLB was signed into legislation. As discussed in Chapter 2, the enactment of NCLB

forced state and local legislators to increase instructional time of "core" subjects at the cost of physical education and the arts. Finally, as of 2015-2016, mandated PE appears to be trending downward again (see Figure 1).

Table 3

States with Mandated PE versus Non-Mandated States by Year

Academic Year	# That Mandate PE	# That Do Not	% Mandated
1996-1997	47	4	92.2%
2000-2001	48	3	94.1%
2005-2006	36	15	70.6%
2009-2010	43	8	84.3%
2011-2012	43	8	84.3%
2015-2016	39	12	76.5%

Note. For purposes of analysis, the total number of states = 51 (50 states and the District of Columbia). From *Shape of the Nation* reports (1997, 2001, 2006, 2010, 2012, 2016) https://www.shapeamerica.org/advocacy/son/sonarchives.aspx

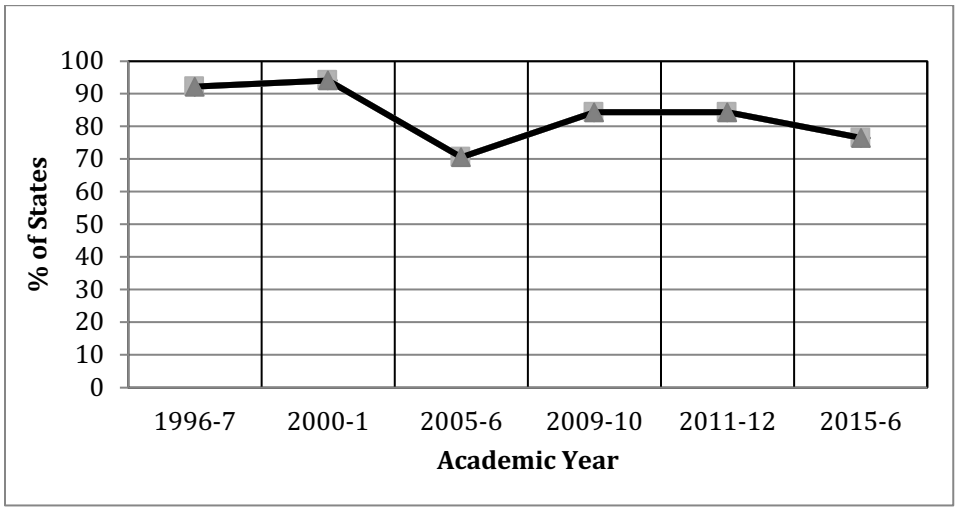

Figure 1. *Percent of states that mandate PE at the elementary school level (by year)*.

Exploring the Associated NAEP Academic Scores and the Potential for a Variation

The longitudinal trends in mandated PE status are evident. The goal of the next segment of this analysis was to examine the associated NAEP reading and Mathematics scores for these same years. The goal was to establish whether a general, overall variations existed between the average scores of mandated states and non-mandated states. This assisted with establishing a potential relationship between physical education and academic outcomes by determining if an overall variation presented between scores from states with mandated PE versus and those in which PE was not mandated. This entailed an examination of 4th grade/elementary NAEP reading scores followed by 4th grade NAEP mathematics scores for the years of relevance.

NAEP Reading Scores: Mandated vs. Not Mandated States

As previously discussed, the average 4th grade elementary NAEP reading Score was recorded for all the "Yes" PE-mandated states for each of the academic years included in the analysis. The average 4th grade elementary NAEP reading scores for each "No" PE-not mandated state was also recorded for each year. This produced yearly average reading scores for the mandated and not-mandated states. These descriptive data results allowed for the formulation of preliminary insights into a possible relationship between academic outcomes and physical education. Table 4 depicts the mean NAEP reading scores for mandated versus not-mandated states by year.

Table 4

Average NAEP Reading Scores for Mandated versus Non-Mandated States by Year

Academic Year	Average NAEP reading Score for "YES"/ Mandate States	Average NAEP reading Score for "NO"/ Non-Mandate States	Standard Deviation
1996-1997	214.49	215.40	8.9538
2000-2001*	N/A	N/A	N/A
2005-2006	217.92	218.47	7.4721
2009-2010	220.32	219.57	6.6822
2011-2012	220.52	218.33	6.7519
2015-2016	222.62	219.58	5.7766
Total	219.174	218.27	7.12732

The NAEP reports for Reading (1996, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

All data applied to the 4th grade elementary education level. Mandated states are those in which PE was mandated; non-mandated states are those in which PE was not mandated that year. The standard deviation included all states within a given year. The year 2000-2001 was omitted due to data not being available. When looking at the states' overall average NAEP reading scores for "Yes" compared to "No" states, a higher mean of 219.17 (N=196) was revealed for the first subgroup, while the latter produced a mean of 218.27 (N=48).

These overall mandated versus not mandated mean scores were then compared with the subgroup of students who qualified for free or reduced lunch. Students were identified as eligible to receive free/reduced lunch based on household income as well as their enrollment in

programs such as The Supplemental Nutrition Assistance Program. This was selected as a subgroup to identify whether this sample of the larger student population realized any results that differed from the sample as a whole. Figures 2 and 3 illustrate the results for both the student sample as a whole and the reduced/free lunch subgroup pertaining to states in which PE was mandated and states in which it was not.

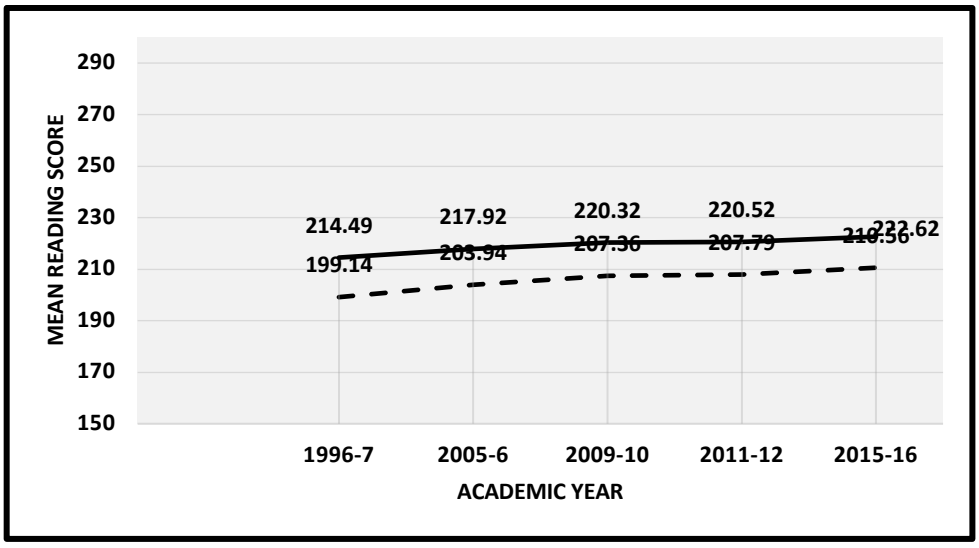

Figure 2. Annual reading scores: PE mandated states-General sample & free lunch eligible subgroup. *Note*. Solid = General student sample; Dotted = Free/reduced lunch eligible sample.

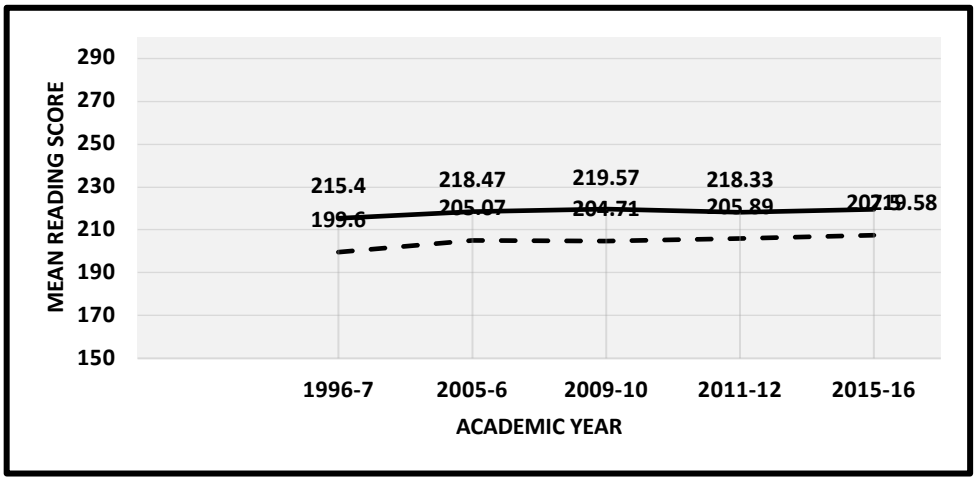

Figure 3. Annual mean reading scores: PE not mandated states-general sample & free lunch eligible subgroup. *Note.* Solid = general student sample; Dotted = free/reduced lunch eligible sample.

The mean reading scores for mandated states was slightly higher than for non-mandated states, but not to a notable extent. In addition, the reduced/free lunch subgroup had consistently lower scores than the general sample. In fact, the overall pattern for both groups, longitudinally, was remarkably similar.

Analysis of NAEP Reading Scores & Mandated PE

The full data panel was subject to a regression analysis, involving mandated PE as the independent variable or potential predictor and NAEP reading scores as the dependent variable. A regression analysis was chosen as the method of analysis due to its ability to determine if the independent variable is a predictor of the dependent variable. A correlation analysis was executed to evaluate the potential relationship between mandated PE and NAEP reading scores, which is illustrated in the corresponding output table (see Table 5). The subsequent correlation coefficient (Pearson's *r*) of .182 represents a very weak correlation between both variables. Based on the common assumption that a coefficient of 0 indicates absolutely no relationship and a coefficient of 1 indicates a perfect relationship, the correlation coefficient is not remarkable but is statistically significant.

Table 5

Correlation Analysis Results: Mandated PE & NAEP Reading Scores

Correlations

		Mandated PE	Reading Score
Mandated PE	**Pearson Correlation**	1	**.182**
	Sig. (2-tailed)		.004
	N	306	245
Reading Score	**Pearson Correlation**	**.182**	1
	Sig. (2-tailed)	.004	
	N	245	245

The NAEP reports for Reading (1996, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

Next, these same variables were subject to a fixed effects panel data regression analysis involving PE time as the independent variable or potential predictor and NAEP reading scores as the dependent variable. For the purpose of this analysis, states that mandated PE were coded as 2 and states that did not were coded as 1. As shown in the model summary of this analysis in Table 6, the R-squared value, which indicates the extent to which the variation in the dependent variable (NAEP reading scores) can be attributed to the influence of the independent variable (mandated PE) in this analysis, is .876, or 87.6%.

Table 6

Mandated PE & NAEP Reading Scores

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.936[a]	.876	.839	2.993

a. Predictors: (Constant), Mandated PE
b. Dependent Variable: NAEP reading scores

Table 7 depicts the ANOVA output table derived from the SPSS analysis for the same variables: NAEP reading scores and mandated PE. The information in this table provides insight into how well the independent variable predicts the dependent variable. Once again, the information highlighted in bold details the degree of statistical significance associated with the regression analysis and the model as a whole. Based on a standard alpha level of .05, which is necessary for establishing statistical significance, the significance level of .000 associated with these variables meets this criterion. This regression model was statistically significant $F(55,189)=24.178$, $p=.000$.

Table 7

NAEP reading scores & Mandated PE: ANOVA SPSS Output

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11915.637	55	216.648	24.178	**.000[b]**
	Residual	1693.563	189	8.961		
	Total	13609.200	244			

a. Dependent Variable: NAEP reading scores
b. Predictors: (Constant), Mandated PE

Ultimately, as shown in Table 8, this fixed effect clearly shows that when a state applied a physical education mandate, average NAEP reading outcomes increased by .956 units, but that is not statistically significant at .140. Observing the *p*-value is critical because when it is not statistically significant, we are not able to state with confidence that the fixed effects have not happened by chance. Although we cannot state with certainty that an increase of .956 units in NAEP reading scores occurs by state mandates, we can state with confidence that state-mandated PE is a predictor of NAEP reading scores.

Table 8

NAEP reading scores & Mandated PE: Coefficients SPSS Output

Coefficients[a]						
Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Mandated	.956	.645	.060	1.483	.140

a. Dependent Variable: NAEP reading scores
The NAEP reports for Reading (1996, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

Analysis of NAEP Reading Scores (Eligible Free/Reduced Lunch) and Mandated PE

When conducting an analysis, a researcher will often utilize a subgroup to gain a better understanding of the traits that comprise a dependent variable or attempt to substantiate unexpected findings. A fixed effects regression analysis utilizing NAEP reading outcome panel data for students eligible to receive free/reduced lunch as a dependent variable was run for states that mandated physical education. As shown in Table 9, the R-squared for this analysis was .808, indicating that 80.8% of the variance in the NAEP reading scores of students who are eligible for free/reduced lunch can be explained by state-mandated PE.

Table 9

Mandated PE & NAEP Reading Scores (Free/Reduced Lunch Eligible)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.899[a]	.808	.752	3.581

a. Predictors: (Constant), Mandated PE
b. Dependent Variable: NAEP reading scores
The NAEP reports for Reading (1996, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

The ANOVA output shown in Table 10 provides insight into how well state-mandated PE predicted the NAEP reading scores of students who were eligible to receive free/reduced lunch. Once again, based on a standard alpha level of .05 statistical significance, this regression model was statistically significant $F(55,187)=14.351$, $p=.000$.

Table 10

NAEP Reading Scores (Free/Reduced Lunch) & Mandated PE: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10118.632	55	183.975	14.351	**.000[b]**
	Residual	2397.351	187	12.820		
	Total	12515.984	242			

a. Dependent Variable: NAEP reading scores (Free/Reduced Lunch)
b. Predictors: (Constant), Mandated PE

As displayed in Table 11, this fixed effect depicts that when a state inputs a physical education mandate, the average NAEP reading scores among students who were eligible to receive free/reduced lunch decrease by .548 units. Nevertheless, this was not statistically significant (p=.482).

Table 11

NAEP Reading Scores (Free/Reduced Lunch) & Mandated PE: Coefficients SPSS Output

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Mandated	-.548	.778	-.305	-.704	.482

a. Dependent Variable: NAEP reading scores (Free/Reduced Lunch)

NAEP Mathematics Scores: Mandated vs. Not Mandated States

As previously discussed, the average 4th grade elementary NAEP mathematics scores were recorded for all of the PE-mandated states for each of the academic years included in this analysis. Like the reading scores, the average 4th grade elementary NAEP mathematics scores for each "No-PE Not Mandated" state was also recorded for each relevant academic year. Once again, this produced a yearly average score for PE-mandated states as well as for not-mandated states, thereby enabling a comparison the scores of 4th graders who were mandated to take PE and the scores of those who were not. This led to the creation of mean yearly scores for "Yes" versus "No" states. The mean annual NAEP mathematics Scores for mandated versus not-mandated states is illustrated in Table 12, as are the total mean scores for all states, grouped by mandated PE status, across all years.

Table 12

Average NAEP Mathematics Scores for Mandated States versus Non-Mandated States by Year

Academic Year	Average NAEP math Score for "YES"/ Mandate States	Average NAEP math Score for "NO"/ Non-Mandate States	SD
1996-1997	221.56	220.80	8.5303
2000-2001	N/A	N/A	N/A
2005-2006	236.67	238.20	6.7576
2009-2010	239.55	239.43	6.4260
2011-2012	240.74	239.22	5.8355
2015-2016	240.59	239.25	4.9561
Overall Mean Score	**235.82**	**235.38**	**6.5199**

The NAEP reports for Math (1996, 2000, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

All data apply to the elementary education level. Mandated states are those in which PE was mandated; non-mandated states are those in which PE was not mandated that year. The standard Deviation includes all states within a given year.

A higher overall mean for "Yes" states of 235.82 (N=5) was revealed for the first subgroup, while the latter subgroup produced a mean of 235.38 (N=5). However, when weighted and the means calculated by each individual state for each academic year, a higher mean was found in non-mandated states (m=237.02, N=48) compared to the weighted average for mandated states (m=236.98, N=200). Figures 4 and 5 illustrate the mathematics scores as yearly means for both "Yes" and "No" states supplemented with a comparison of the free/reduced lunch eligible subgroup.

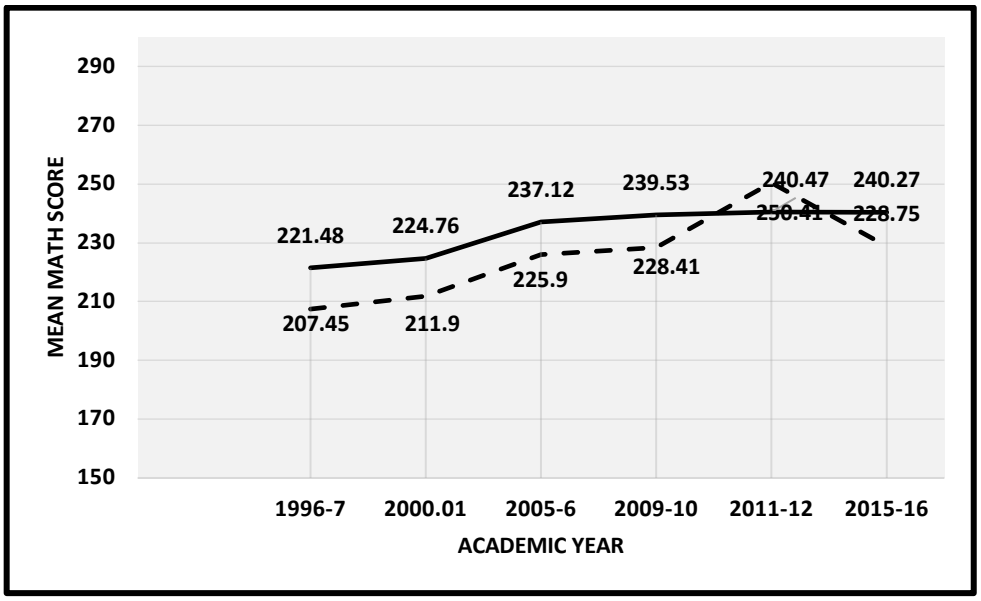

Figure 4. Annual mean mathematics scores: PE mandated states-general sample & free lunch eligible subgroup. *Note.* Solid = general student sample; Dotted = free/reduced lunch eligible sample.

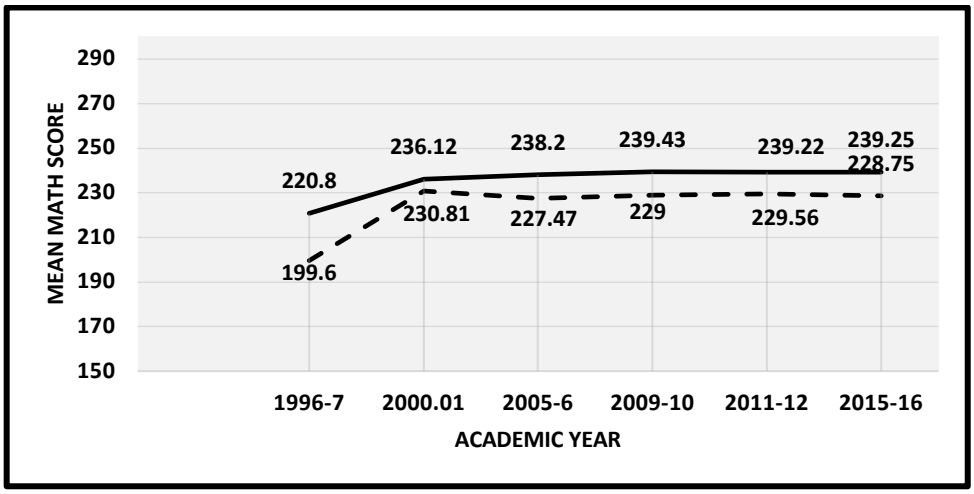

Figure 5. Annual mean mathematics scores: PE not mandated states-general sample & free lunch eligible subgroup. *Note.* Solid = general student sample; Dotted = free/reduced lunch eligible sample.

Analysis of NAEP Math Scores & Mandated PE

The full data panel was subject to a regression analysis involving mandated PE as the independent variable and NAEP math scores as the dependent variable. Congruent with the analysis of NAEP math scores, a correlation analysis was executed to evaluate the potential relationship between mandated PE and NAEP math Scores. The correlation output is provided in

Table 13. The subsequent correlation coefficient (Pearson's *r*) of .243 represents a minimal correlation, if any, between both variables. Additionally, the faint relationship was statistically significant, at .000, meaning that the results of the minimal relationship could not have happened by chance.

Table 13

Correlation Analysis Results: Mandated PE & NAEP Math Scores

Correlations

		Mandated PE	Math Score
Mandated PE	**Pearson Correlation**	1	**.243**
	Sig. (2-tailed)		.000
	N	306	289
Math Score	**Pearson Correlation**	**.243**	1
	Sig. (2-tailed)	.000	
	N	289	289

These same variables were, next, run through a fixed effects panel data regression analysis involving PE time as the independent variable and the NAEP math scores as the dependent variable. Similar to the previous regression analysis of NAEP reading scores, states that mandated PE were coded as "2" and states that did not mandate PE were coded as "1." As shown in the model summary in Table 14, the R-squared value, indicating the extent to which the variation in the NAEP math scores can be attributed to the influence of states that mandate PE in this analysis, is .920, or 92%.

Table 14

Mandated PE & NAEP Math Scores

Model Summary

Model	**R**	**R Square**	Adjusted R Square	Std. Error of the Estimate
1	**.959**[a]	**.920**	.900	3.146

a. Predictors: (Constant), Mandated PE

b. Dependent Variable: NAEP math Scores

The ANOVA output table derived from the SPSS analysis for the same variables, NAEP math scores, and mandated PE is provided below. The information in the ANOVA output table displays a statistical significance of $F(56,232)=47.329$, $p=.000$, revealing that mandated physical education could predict how well students perform on NAEP math.

The fixed effects coefficient for states that have policies mandating physical education and NAEP math scores is -.128. As shown in Table 15, when a state passes a mandate for physical education at an elementary level, the NAEP math scores will, on average, decrease by .128 units. This analysis was not statistically significant, at .838. Although the results for the coefficient output were not statistically significant, the decrease produced by the analysis was approximately one tenth of a unit.

Table 15

NAEP Math Scores & Mandated PE: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	**Regression**	26238.542	56	468.545	47.329	**.**000[b]
	Residual	2296.766	232	9.900		
	Total	28535.308	288			

a. Dependent Variable: NAEP math Scores

b. Predictors: (Constant), Mandated PE

Table 16

NAEP math Scores & Mandated PE: Coefficients SPSS Output

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Mandated	-.128	.629	-.006	-.204	.838

a. Dependent Variable: NAEP math Scores

Analysis of NAEP Math Scores (Free/Reduced Lunch Subgroup) and Mandated PE

As explored in the analysis of NAEP reading scores, a fixed effects regression analysis utilizing the NAEP math panel data scores of students who were eligible for free/reduced lunch was conducted in conjunction with states that mandated physical education at an elementary

level. As shown in Table 17, the R-squared for this analysis was .953, which indicates that 95.3% of the variance in the NAEP math scores of students who were eligible for free/reduced lunch can be explained by state mandated PE.

Table 17

Mandated PE & NAEP Math Scores (Free/Reduced Lunch Eligible)

Model Summary

Model	**R**	**R Square**	Adjusted R Square	Std. Error of the Estimate
1	.976[a]	.953	.941	3.657

a. Predictors: (Constant), Mandated PE

b. Dependent Variable: NAEP math Scores (Free/Reduced Lunch Eligible)

To gain a more comprehensive understanding of how well state-mandated PE predicted the NAEP math scores of students who were eligible to receive free/reduced lunch, the ANOVA output table is provided in Table 18. Based on these results, it is clear that state-mandated physical education is a strong predictor of NAEP math scores, in particular for students who are eligible for free/reduced lunch. The results of this regression model were statistically significant, $F(56,232)=83.680$, $p=.000$.

Table 18

NAEP Reading Scores (Free/Reduced Lunch) & Mandated PE: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	**Regression**	62653.326	56	1118.809	83.680	**.**000[b]
	Residual	3101.865	232	13.370		
	Total	65755.190	288			

a. Dependent Variable: NAEP math Scores (Free/Reduced Lunch)

b. Predictors: (Constant), Mandated PE

The coefficients output table (Table 19) provides the fixed effects results for the independent variable of state-mandated physical education at the elementary level and its effect on NAEP math scores, specifically for students who are eligible to receive free/reduced lunch. The unstandardized coefficient, or "raw" coefficient, is -.077. This suggests that for every unit that is increased in the independent variable (state-mandated PE), the dependent variable (NAEP math scores of students eligible for free/reduced lunch) should decrease by .077 units. This inverse relationship was not statistically significant, at .916.

Analytic Segment #2: Certification of PE Teachers

The second segment of analysis was executed using much the same method as applied in the previous segment. However, the purpose, in this case, was to examine how many states required certification or licensure for PE teachers at the elementary level, as well as whether or not this has changed over time and the subsequent effect (if any) on academic outcomes. Once again, the state data for each relevant academic year were assigned to one of two subgroups. However, in this study segment, the groups were categorized according to whether or not the associated states required certification for elementary PE teachers each year. Thus, the "Yes"

subgroup was indicative of states that mandated certification/licensure for PE teachers and the "No" subgroup represented states that did not have a mandate for licensure. Table 20 illustrates the number of states that mandated elementary PE teacher licensure/certifications over the past two decades.

Table 19

NAEP Reading Scores (Free/Reduced Lunch) & Mandated PE: Coefficients SPSS Output

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Mandated	-.077	.731	-.002	-.106	.916

a. Dependent Variable: NAEP math Scores (Free/Reduced Lunch)

Table 20

States with Mandated PE Teacher Licensure/Certification vs. Non-Mandated States

Academic Year	# That Mandate PE licensure/cert.	# That Do Not	% Mandated
1996-1997	10	41	19.6%
2000-2001	10	41	19.6%
2005-2006	28	23	54.9%
2009-2010	42	9	82.4%
2011-2012	40	11	78.4%
2015-2016	35	16	68.6%

Note. For purposes of analysis, the total number of states = 51 (50 states & the District of Columbia). From *Shape of the Nation* reports (1997, 2001, 2006, 2010, 2012, 2016). https://www.shapeamerica.org/advocacy/son/sonarchives.aspx

It is evident in the data contained in Table 20 that a steady increase in states that required licensed/certified PE teachers occurred in the second half of the 2000 to 2010 decade. Subsequently, this seems to have been followed by a slower decrease in later years, as illustrated in Figure 6.

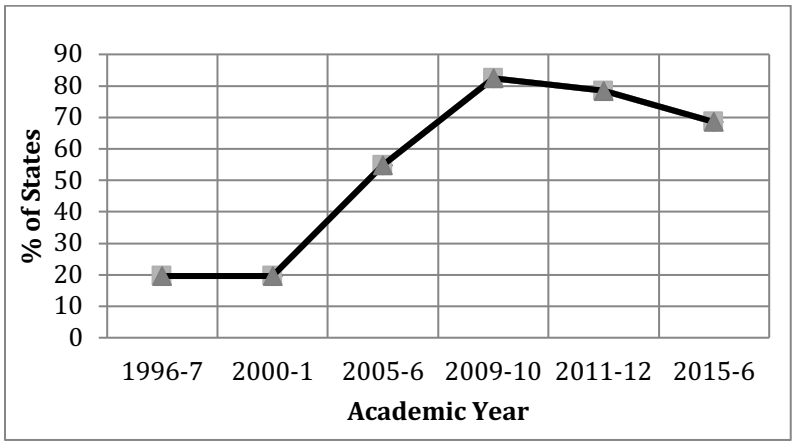

Figure 6. Percent of states that mandate PE teacher certification/ licensure at the elementary school level (by year).

Academic Scores and the Potential for a Variation: PE Teacher Certification Status

The next segment of analysis served to explore the associated NAEP reading and mathematics scores for these same years to evaluate whether any distinction exists that may be associated with the licensure status of PE teachers and academic outcomes. This not only served to reveal if an overall variation existed between the average scores of mandated states and average scores of non-mandated states, but it provided insight for later discussion related to the possible quality of physical education as a function of teacher expertise and the academic benefits that result. An examination of 4th grade/elementary NAEP reading scores, followed by 4th grade NAEP mathematics scores for the years of relevance.

NAEP Reading Scores: PE Teacher Certification Mandated vs. Not Mandated States

As previously discussed, average 4th grade elementary NAEP reading scores were recorded for all of the "Yes-PE Teacher Licensure/Certification Mandated" states for each of the academic years included in this analysis. The average 4th grade elementary NAEP reading scores for each "No-Licensure Not Mandated" states were also recorded for each relevant academic year. The result was a yearly average reading score for licensure-mandated states and not-mandated states that allowed for an overall comparison of those scores among 4th graders who participated in physical education with licensed/certified PE teachers compared with the scores of students who did not.

Although the descriptive outcomes only provided preliminary insights related to the possible relationship between academic outcomes and physical education, the mean scores calculated for both state classifications with the same years allowed for yearly comparisons. The result of this analysis was supplemented with a comprehensive mean score that was calculated for the total inventory of "Yes" states versus the total inventory of "No" states that included data from all the years. This information is detailed in Table 21.

Table 21

Average NAEP Reading Scores for Mandated PE Teacher Licensure/Certification States versus Non-Mandated States by Year

Academic Year	Average NAEP reading Score for "YES"/ Mandate States	Average NAEP reading Score for "NO"/ Non-Mandate States
1996-1997	209.00	215.59
2000-2001	N/A	N/A
2005-2006	218.54	217.52
2009-2010	220.40	219.33
2011-2012	221.05	198.64
2015-2016	221.89	221.94
Overall Mean Score	**220.12**	**215.51**

The NAEP reports for Reading (1996, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

All data from this analysis came from the elementary education level. Mandated states are those in which PE teacher certification/licensure was mandated; non-mandated states are those in which it was not mandated for that year.

When examining the states' overall average NAEP reading scores for "Yes-PE Teachers Licensed/Certification Mandated" compared to "No" states, a higher overall mean of 220.12 (*N*=151) was revealed for the first subgroup, while the latter subgroup produced a mean of 215.51 (*N*=93). Yearly state-level data for the PE teacher licensure/certification mandated versus not-mandated states, including the minimum, maximum, standard deviation, and number within each sample (*N*), may be viewed in Appendix F.

This analysis was supplemented with an examination of the free/reduced lunch eligible subgroup, as shown in Figures 7 and 8, for states that mandated teacher certification and states that did not, respectively. As the previous cases, both student groups followed a consistent yet

parallel pattern in which the Free/Reduced Lunch subgroup showed the same effects from the independent variable, but the results remained continually lower in a parallel relationship. However, the general student population shown in Figure 8 experienced a substantial decline in score in the later years that later increased once again. This is the same pattern shown for the Free/Reduced Lunch Eligible subgroup, except for a much more significant decrease in 2011-2012. These outcomes will be discussed in more detail in the final chapter of this dissertation.

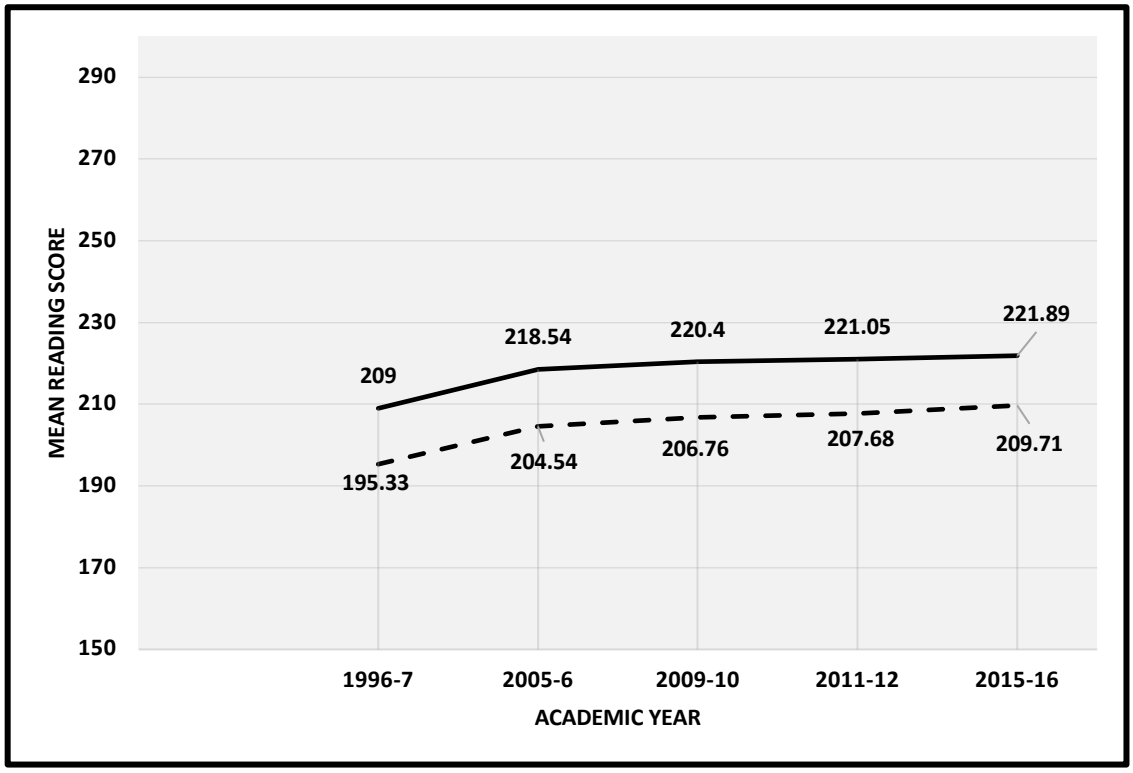

Figure 7. Annual mean reading scores: PE teacher certification/ licensure mandated states-general sample & free lunch eligible subgroup. *Note.* Solid = general student sample; Dotted = free/reduced lunch eligible sample.

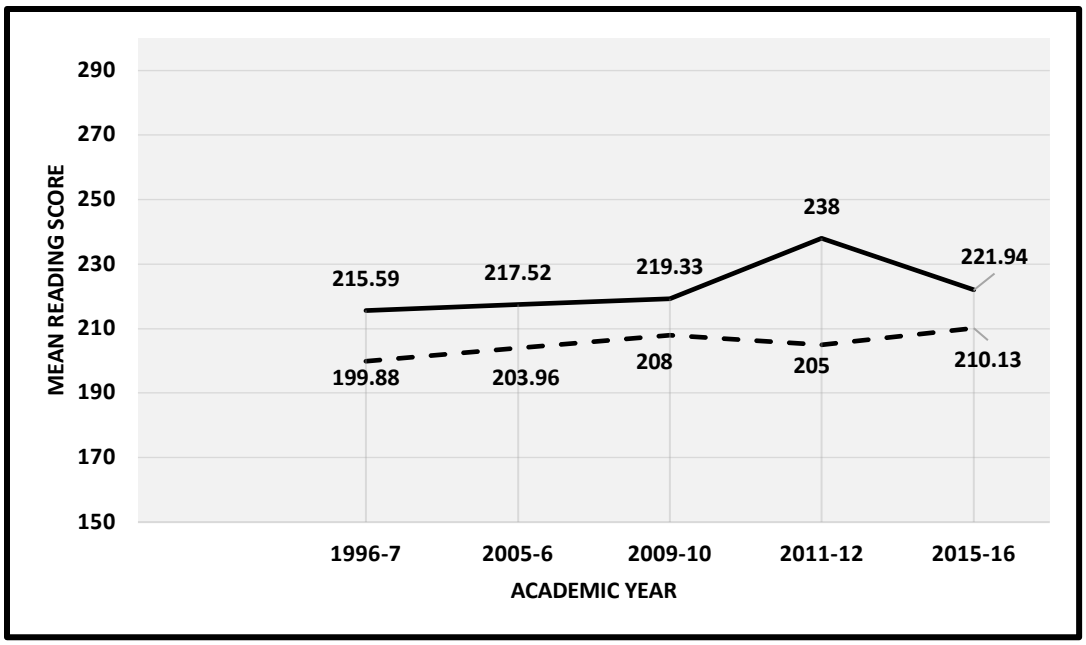

Figure 8. Annual mean reading scores: PE teacher certification/ licensure not mandated states-general sample & free lunch eligible subgroup. Note. Solid = General Student Sample; Dotted = Free/Reduced Lunch Eligible Sample.

Analysis of NAEP Reading Scores and PE Certification

The full data panel was subject to a regression analysis involving PE certification as the independent variable or potential predictor and NAEP reading scores as the dependent variable. For these data, a correlation analysis was executed to evaluate the potential relationship between PE certification and NAEP reading scores, which is illustrated in Table 22. The subsequent correlation coefficient (Pearson's *r*) of .167 showed a very weak correlation, if any, between the two variables. This result is based on the common assumption that a coefficient of "0" indicates absolutely no relationship and a coefficient of "1" indicates a perfect relationship. The resulting correlation coefficient is not remarkable, but it was statistically significant, at p=.009.

Table 22

Correlation Analysis Results: PE Cert & NAEP Reading Scores

Correlations

		PE Cert	Reading Score
PE Cert	Pearson Correlation	1	**.**167
	Sig. (2-tailed)		.009
	N	306	245
Reading Score	Pearson Correlation	**.**167	1
	Sig. (2-tailed)	.009	
	N	245	245

These same variables were, next, subject to a fixed effects, panel data regression analysis involving PE certification as the independent variable or potential predictor and the NAEP reading scores as the dependent variable. For the purpose of this analysis, states that required PE certification to teach were coded as "2" and states that did not require PE certification were coded as "1." As shown in Table 23, the R-squared value, which indicates the extent to which the variation in the dependent variable (NAEP reading scores) can be attributed to the influence of the independent variable (PE certification), in this analysis was .936, or 93.6%.

Table 23

PE Certification & NAEP Reading Scores

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.936[a]	.876	.840	2.984

a. Predictors: (Constant), PE Cert
b. Dependent Variable: NAEP reading scores

Table 24 depicts the ANOVA output table derived from the SPSS analysis for the same variables: NAEP reading scores and PE certification. The information in this table provides insight into how well the independent variable predicts the dependent variable. Once again, the information highlighted in bold is of relevance in that it details the degree of statistical significance associated with the regression analysis and the model as a whole. Based on a standard alpha level of .05, which is necessary for establishing statistical significance, the significance level of .000 associated with these variables meets this criterion. This regression model result is statistically significant, at $F(55,189)=24.361$, $p=.000$.

Lastly, as displayed in Table 25, this fixed effect clearly shows that when a state requires physical education classes to be taught by certified PE teachers, average NAEP reading outcomes decrease by 1.058 units. Although the results do not meet the standard .05 for statistical significance, a *p*-value of .064 could be considered "slightly" statistically significant.

Table 24

NAEP Reading Scores & PE Certification: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11926.817	55	216.851	24.361	.000[b]
	Residual	1682.383	189	8.901		
	Total	13609.200	244			

a. Dependent Variable: NAEP reading scores
b. Predictors: (Constant), PE Cert

Table 25

NAEP Reading Scores & PE Certification: Coefficients SPSS Output

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	PE Cert	-1.058	.568	-.069	-1.862	.064

a. Dependent Variable: NAEP reading scores

Analysis of NAEP Reading Scores (Eligible Free/Reduced Lunch) and PE Certificate

To analyze a subgroup that has been extensively researched in reference to academic performance, students who are eligible to receive free/reduced lunch were analyzed in the same respect as the first analytic segment of this chapter. A fixed effects regression analysis utilizing panel data of NAEP reading outcomes, specifically of students who are eligible to receive free/reduced lunch, was run with states that required physical education certification to teach physical education class. As shown in Table 26, the R-squared for this analysis was .903, which indicates that 90.3% of the variance in the NAEP reading scores of students who are eligible for free/reduced lunch can be explained by physical education certification.

Table 26

PE Certification & NAEP Reading Scores (Free/Reduced Lunch Eligible)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.903[a]	.815	.761	3.581

a. Predictors: (Constant), PE Cert

b. Dependent Variable: NAEP reading scores (Free/Reduced Lunch)

To provide insight into how well PE certification predicted the NAEP reading scores of students eligible to receive free/reduced lunch, the ANOVA output table is provided in Table 27. Once again, based on a standard alpha level of .05 statistical significance, the results of this regression model were statistically significant $F(55,187)=14.988$, $p=.000$., meaning that PE certificated states were a strong predictor of the NAEP reading scores of students who were eligible to receive free/reduced lunch.

Table 27

NAEP Reading Scores (Free/Reduced Lunch) & PE Certificate: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	**Regression**	10201.726	55	185.486	14.988	**.**000[b]
	Residual	2314.258	187	12.376		
	Total	12515.984	242			

a. Dependent Variable: NAEP reading scores (Free/Reduced Lunch)

b. Predictors: (Constant), PE Cert

As displayed in Table 28, this fixed effect suggests an inverse relationship between the two variables. When a state requires certification of physical education teachers, average NAEP reading scores among students who are eligible to receive free/reduced lunch decrease by 1.805 units, and this outcome is statistically significant at .000.

NAEP Mathematics Scores: PE Teacher Certification Mandated vs. Not Mandated States

Subsequent to the NAEP reading scores and PE teacher certification/licensure mandated status analysis, the same analysis was applied to 4th grade elementary NAEP mathematics scores. Descriptive data were calculated by categorizing the mean state scores according to

whether or not PE teacher licensure/certification was mandated that year within each state. Average yearly mathematics scores were calculated for licensure mandated states, as well as licensure not mandated states. This average was supplemented with a total mean score across all years for each of these categories.

Table 28

NAEP Reading Scores (Free/Reduced Lunch) & PE Cert.: Coefficients SPSS Output

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	PE Cert	-1.805	.671	-.123	-2.688	.008

a. Dependent Variable: NAEP reading scores (Free/Reduced Lunch)

Table 29 shows the mean annual NAEP mathematics scores for mandated versus not-mandated states, as well as the total mean scores for all states, grouped by mandated PE teacher licensure/certification status across all years.

All data apply to the elementary education level. Mandated states are those in which PE teacher certification/licensure was mandated; non-mandated states are those in which it was not mandated that year. As indicated, a higher overall mean for "Yes" states of 238.87 (*N*=151) was revealed for the first subgroup, while the latter subgroup produced a mean of 232.00 (*N*=99). This was supplemented with a comparison of results in the free/reduced lunch subgroup. As shown in previous findings, scores were consistently lower than across the general group, but the longitudinal data appeared to exhibit the same trend. These results are presented in Figures 9 and 10.

Table 29

Average NAEP Math Scores for Mandated PE Teacher Licensure/Certification States versus Non-Mandated States by Year

Academic Year	Average NAEP math Score for "YES"/ Mandate States	Average NAEP math Score for "NO"/ Non-Mandate States
1996-1997	215.67	222.39
2000-2001	225.03	223.43
2005-2006	237.25	236.96
2009-2010	239.83	237.09
2011-2012	241.18	237.91
2015-2016	240.34	240.13
Overall Mean Score	**238.87**	**232.00**

The NAEP reports for Math (1996, 2000, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

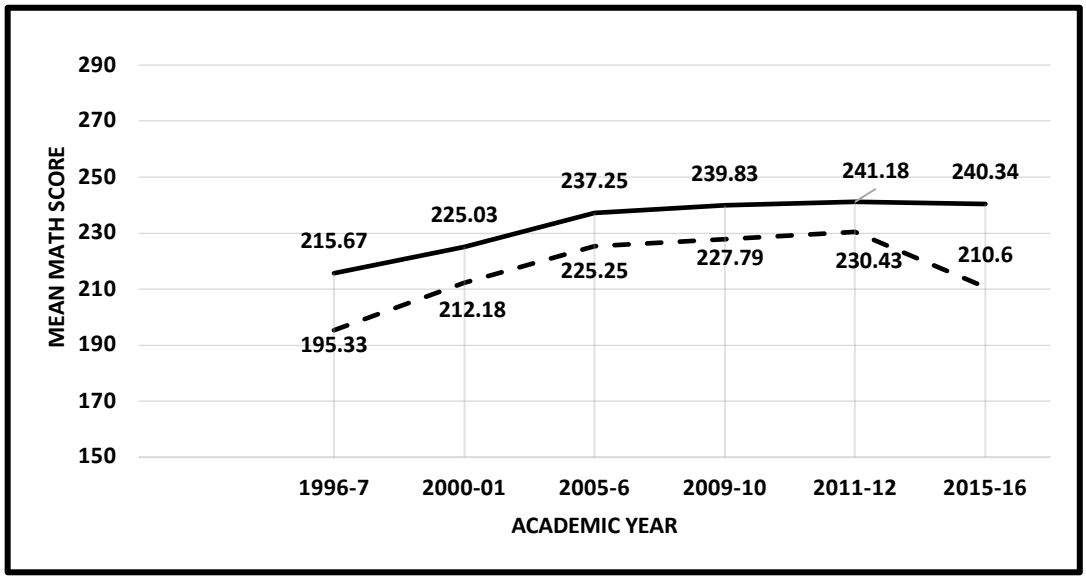

Figure 9. Annual mean math scores: PE teacher certification/licensure mandated states- general sample & free lunch eligible subgroup. *Note*. Solid = general student sample;
Dotted = free/reduced lunch eligible sample.

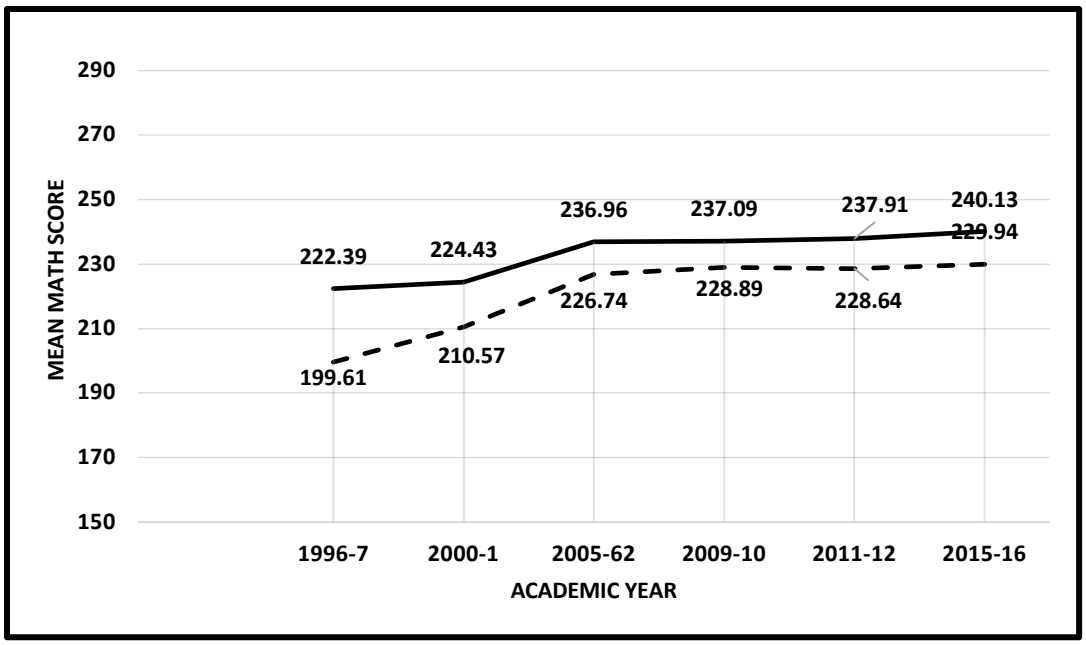

Figure 10. Annual mean math scores: PE teacher certification/licensure not mandated states-general sample & free lunch eligible subgroup. *Note*. Solid = general student sample; Dotted = Free/Reduced Lunch Eligible Sample.

Analysis of NAEP Math Scores and PE certification

The full data panel was subject to a regression analysis involving PE certification as the independent variable and NAEP math scores as the dependent variable. Congruent with the analysis of NAEP math scores, a correlation analysis was executed to evaluate the potential relationship between PE certification and NAEP math scores. Evaluation of the potential relationship between PE certification and NAEP math scores is provided in Table 30. The Pearson's *r* of .210 reveals a very weak correlation, if any, between PE certification and NAEP math scores. Although there is a relatively minimal relationship between the two variables, it should be noted that the correlation is statistically significant at .000 when compared to the standard *p*-value of .005.

Table 30

Correlation Analysis Results: PE Cert & NAEP Math Scores

Correlations			
		PE Cert	Math Score
PE Cert	Pearson Correlation	1	.210
	Sig. (2-tailed)		.000
	N	306	289
Math Score	Pearson Correlation	.210	1
	Sig. (2-tailed)	.000	
	N	289	289

These same variables were, next, subject to a fixed effects regression analysis utilizing PE certification as the independent variable and the NAEP math scores as the dependent variable. For the purpose of this analysis, states that required PE certification to teach were coded as "2" and states that did not require PE certification were coded as "1." As shown in the model summary of this analysis, the R-squared value, which indicates the extent to which the variation in the dependent variable (NAEP math scores) can be credited to the influence of the independent variable (PE certification) in this analysis, is .921, or 92.1% (Table 31).

Table 31

PE Certification & NAEP Math Scores

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.959[a]	.921	.901	3.127

a. Predictors: (Constant), PE Cert

b. Dependent Variable: NAEP math Scores

Table 32 depicts the ANOVA output table derived from the SPSS analysis for the same variables—NAEP math scores and PE certification—providing insight into how well the PE teacher certification predicts the NAEP math scores. It details the degree of statistical significance associated with the regression analysis and the model as a whole. Based on a standard alpha level of .05, which is necessary for establishing statistical significance, the significance level of .000 associated with these variables meets this criterion. This regression model is statistically significant at $F(56,232)=24.361$, $p=.000$, meaning that the results of this analysis did not occur by chance.

Lastly, as displayed in Table 32, this fixed effect clearly shows that when a state requires physical education classes to be taught by certified PE teachers, average NAEP math scores decrease by .944 units. Although the results do not meet the standard of .05 for statistical significance, a *p*-value of .085 could be considered "slightly" statistically significant. As noted previously in this chapter, the reporting years of 1996-1997 and 2000-2001 were outliers based on the lack of data provided for those years. All the subsequent years proved to have a positive relationship with PE certification.

Table 32

NAEP Math Scores & PE Certification: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26267.437	56	469.984	24.361	.000[b]
	Residual	2267.871	232			
	Total	28535.308	288			

a. Dependent Variable: NAEP math Scores

b. Predictors: (Constant), PE Cert

Table 33

NAEP Math Scores & PE Certification: Coefficients SPSS Output

Coefficients[a]						
Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	PE Cert	-.944	.545	-.046	-1.732	.085

a. Dependent Variable: NAEP math Scores

The NAEP reports for Math (1996, 2000, 2005, 2009, 2011, 2015)
https://www.nationsreportcard.gov/report_archive.aspx

NAEP Math Scores (Eligible Free/Reduced Lunch) and PE Certificate

In the final analysis of this segment, NAEP math score panel data, particularly of students who were eligible to receive free/reduced lunch, was examined in a regression analysis with fixed effects utilizing PE teacher certification as the predictor. As shown in Table 34, the R-squared for this analysis was .953, which indicates that 95.3% of the variance in the NAEP reading scores of students who were eligible for free/reduced lunch can be explained by requiring teachers to obtain certification in physical education.

Table 34

PE Certification & NAEP Math Scores (Free/Reduced Lunch Eligible)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976[a]	.953	.941	3.655

a. Predictors: (Constant), PE Cert

b. Dependent Variable: NAEP math Scores (Free/Reduced Lunch)

To provide insight into how well PE certification predicted the NAEP math scores of students who are eligible to receive free/reduced lunch, the ANOVA output table is provided

below. As previously mentioned, based on a standard alpha level of .05 statistical significance, this regression model is statistically significant, $F(56,232)=83.754$, $p=.000$. This confirms that PE teacher certification is a measurable predictor of the NAEP math scores of students who are eligible to receive free/reduced lunch.

As displayed in Table 35, this fixed effect suggests an inverse relationship between PE certification and NAEP math scores, focusing on students who qualify for free/reduced lunch. When a state requires the certification of physical education teachers, the average NAEP math scores of students who are eligible to receive free/reduced lunch decreases by .290 units. On the other hand, this result was not statistically significant ($p=.649$), and it highlights the possibility of obtaining the results by chance.

Table 35

NAEP Math Scores (Free/Reduced Lunch) & PE Certificate: ANOVA SPSS Output

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	62655.951	56	1118.856	83.754	.000[b]
	Residual	3099.240	232	13.359		
	Total	65755.190	288			

a. Dependent Variable: NAEP math Scores (Free/Reduced Lunch)

b. Predictors: (Constant), PE Cert

Table 36

NAEP Math Scores (Free/Reduced Lunch) & PE Cert.: Coefficients SPSS Output

Coefficients[a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	PE Cert	-.290	.637	-.009	-.456	.649

a. Dependent Variable: NAEP math Scores (Free/Reduced Lunch)

In summation, the correlation analyses in the two analytic segments of this chapter revealed a minimal relationship between the physical education policies (mandated PE and PE

certification) and assessment tools (NAEP reading and math scores). Additionally, when the fixed effects regression analyses were conducted, all eight of the analyses displayed a lack of statistical significance, meaning that there is a possibility the results occurred by chance. As previously mentioned, the reporting years of 1996-1997 and 2000-2001 seemed to have a large impact on the results produced by the analyses. This will be discussed in further detail in Chapter 5, where an interpretation of these results, including the conclusions to be derived from them, the implications, possible limitations, and recommendations for future study, are elaborated.

CHAPTER 5

DISCUSSION

The ongoing debate over the relationship between physical education and academic outcomes has produced various opinions and often contrasting findings. As such, this study was intended to comprehensively explore this possible relationship. While some questions still remain, the results provide some unexpected outcomes that potentially provide insight into this proposed relationship. An interpretation of the findings is elaborated in the pages that follow, supplemented with a discussion of their implications, limitations, and areas for future study, beginning with the descriptive analyses addressed below.

Interpretation of Results

Analytic Segment #1: Mandated PE

The first segment of analysis explored whether or not physical education was mandated in each state at the elementary level. Interestingly, the highest mandated proportions were in the earlier years examined (92.2% for 1996-1997; 94.1% for 2000-2001). Following a drastic decrease during the 2005-2006 academic year (a drop to 70.6%), the rates of mandated PE increased to 84.3%, but they did not reach the former proportions. Perhaps most interesting is the marked decrease during the 2015 to 2016 school year (76.5%) in which a downward trend seemed to, once again, occur.

One can infer from this inconsistent pattern that many factors likely contributed to these "up and down" trends. Among them, contrasting information on the importance of physical education, supplemented with an increased emphasis on core academics, as well as budget considerations, likely played a role. One of the two data points of particular interest is the academic year of 2005-2006. Almost immediately after the 2001 Shape of The Nation report was

published, *No Child Left Behind* was signed into law. As cited in the literature review, when NCLB was enacted, any classes that were not considered "core classes" were drastically cut. The 2005-2006 year is the first reporting year after NCLB was signed into law. Additionally, the downward trend in the final year studied (2015-2016) is of particular interest because it coincides with the reauthorization of *Every Student Succeeds Act* (ESSA) and its added funding for the inclusion of a physical education program in the provision of a "well-rounded" education. It would seem logical to assume that this funding would incentivize states to focus on mandated physical education, but this clearly was not the case. Assigning specific causation is beyond the confines of this thesis, but it may be that the distribution of funds, and its impact, were not evident until the proceeding academic year or that factors other not explored in this study came into play. Nevertheless, what is evident is the absence of a clear, longitudinal trend, which is reflective of the contrasting opinions and research findings associated with the influence of PE on academic success.

Furthermore, in the first segment of analysis, reading and mathematics scores were compared between states in which PE was mandated and states in which it was not. The intent was to identify a definitive overall variation that clearly distinguished the academic outcomes of PE-mandated states from the outcomes of non-mandated states. Unfortunately, this was not the case. Neither reading nor mathematics scores had a significant variation between mandated states and non-mandated states.

Next, a correlation analysis was executed to evaluate the potential relationship between mandated PE and NAEP reading and mathematics scores. The correlation coefficient between both variables represented a very weak correlation. This is noteworthy because both correlational analyses were statistically significant; hence, the strength of the relationships did not happen by

chance. In other words, the analysis found a minimal relationship between states that mandated PE and NAEP reading and mathematics scores.

In the final segment of analysis, mandated PE, NAEP reading and mathematics scores, and the subgroups of eligibility to receive free/reduced lunch were subject to a fixed effect panel data regression analysis. These analyses were run separately, with mandated PE being the independent variable and NAEP reading scores the dependent variable. It was found that mandated PE, state, and year explained 95.9% of the variance in NAEP reading scores. The high variance in NAEP reading scores indicates that the data points were very spread out from the mean and from one another. Additionally, the independent variables of mandated PE, state, and year proved to be statistically significant predictors of NAEP reading scores, but the positive fixed effect was not substantiated as statistically significant. It is important to note that due to the mandate, state, and year all being included as independent variables, the importance of any statistical significance was diluted; therefore, not much can speak specifically to the mandate alone.

The findings for NAEP math scores were similar. As with reading, the relationship between NAEP math and mandated PE was minimal. Mandated PE, the state, and the year explained 95.9% of the variance in NAEP math scores. Mandated PE, the state, and the year also proved to be a statistically significant predictor of NAEP math scores. On the other hand, unlike reading results, math results demonstrated an inverse relationship: Every state that mandated PE lost .128 units on its NAEP math scores. Lack of statistical significance negated the relevance of the inverse relationship between the predictor and the dependent variable.

The last analyses to be interpreted in this segment was the subgroup of students who were eligible to receive free/reduced lunch. This subgroup was derived from the NAEP reading and

math scores. Both subgroups exhibited similar results. Approximately 90% of the variance of both subgroups was explained by states mandating physical education. Mandated PE also proved to be a statistically significant predictor of both subgroups. The differences between subgroups are found within the fixed effects. Students who were eligible to receive free/reduced lunch had an increase of .956 units on their NAEP reading scores when there was mandated PE. In contrast, students who were eligible to receive free/reduced lunch scores had a statistically significant decrease of 1.805 units in their NAEP math when there was mandated PE.

Analytic Segment #2: Certification of PE Teachers

The second analytic segment explored whether or not physical education certification was mandated in each state at the elementary school level. Surprisingly, the percentage of states that mandate PE teacher certification in the years examined varied significantly (19.6% from 1996-2001, 54.9% from 2005-2006, 82.4 % from 2009-2010, 78.4% from 2011-2012, and 68.6% from 2015-2016). The largest increase from one reporting year to another was between the 2000-2001 and 2005-2006 academic years, where the percentage of states that required PE certification spiked from 19.6% to 54.9%. This change deserves additional attention due to the fact that NCLB was enacted almost simultaneously. Inversely, there has been a consistent decline from 2009-2010 of 82.4% to 2015-2016 of 68.6%.

A correlation analysis was also executed to evaluate the potential relationship between PE certification and NAEP reading and math scores. Like the previous correlation analyses run with mandated PE, the correlation coefficient exhibited a very weak correlation between PE certification and NAEP reading and writing scores. Both correlational analyses were statistically significant, confirming the analysis. These analyses also showed a minimal relationship between states that mandated PE certification and NAEP reading and mathematics scores.

The next segment consisted of a fixed effects panel data regression analysis of mandated PE certification, NAEP reading and Mathematics Scores and their subgroups of Eligibility to receive free/reduced lunch. These analyses were run separate with PE certification being the independent variable and NAEP reading scores the dependent variable. In the findings it was noted that mandated PE explained 93.6 percent of the variance in NAEP reading scores. Additionally, states that required PE certification proved to be a statistically significant predictor of NAEP reading scores, the inverse fixed effect was not substantiated due to not being statistically significant. Furthermore, NAEP math scores did prove to be affected by PE certification as a predictor, and they displayed an inverse fixed effect relationship but failed to prove statistically significant.

The final analysis conducted in this research was of the NAEP reading and math scores of students who were eligible to receive free/reduced lunch. As with most of the analyses conducted in this study, both subgroups produced comparable results. The amount of variance explained by the subgroups was in the 90th percentile. PE certification had statistical significance as a predictor in both subgroups. Similarly, both subgroups appeared to have inverse relationship in their respective coefficient tables, negating statistical significance with a value of well over .05.

To conclude, all analyses performed, with the exception of NAEP reading scores and mandated PE, demonstrated inverse relationships. In other words, when the particular PE policy that was analyzed was present, the NAEP scores were lower. Although the negative results were minimal, it is imperative to note them since they oppose all previous research reviewed in Chapter 2. Furthermore, the lack of distinction may be a product of many factors, including the effects of potential outliers, the varying and sometimes small sample sizes, or a decreasing

quality of physical education in spite of its being mandated. If students were not getting an optimal or sufficient physical education, it would likely not improve academic outcomes as strongly as if it were provided in a sufficient capacity and, therefore, a distinction between mandated and non-mandated states may be lacking. As such, a plausible contributing factor to the quality of a physical education programs may be whether or not the teachers themselves were certified. It was for this reason that teacher certification was the next variable explored.

Implications of the Current Study

There are several implications associated with this study's findings. These implications span a broad range of domains at the institutional and the individual level, as well as to the field of education itself. In fact, these findings may have varying implications for the field of education in that these findings provide insights that are applicable to the improvement of existing policies and, possibly, the creation of new ones.

To cite an example of specific relevance, according to Pate (2016), experts have targeted schools as a setting for the promotion of physical activity, ultimately intending to increase physical activity among children as a whole. For example, Resolution 97 was passed (in 1987) as a mechanism for encouraging state and local governments and local educational agencies to provide quality, daily physical education programs for all children from kindergarten through grade 12 (Resolution 97, 1987). Yet, as inferred from the findings of this study, merely offering physical education may not be sufficient to achieve the desired benefits. Meanwhile, inconsistencies seem to persist in what constitutes quality in terms of physical education. Thus, the findings of this study are significant in that they could lead to policy implications in terms of policy reforms toward consistency in PE's application within the field of education.

This need for consistency in the application of PE policy was evident in the previously-mentioned *Shape of The Nation* reports. The 1993 publication uncovered many inconsistencies in state policies throughout the country. For example, although forty-six states claimed to have physical education mandates in place, forty-two states did not have policies in place mandating physical education at all grade levels and thirty-six states had elementary physical education classes taught by classroom teachers (SHAPE, 1993). While one would hope that steady improvements ensued after the publication of the *Shape of the Nation* report, the findings in this study reveal an inconsistent longitudinal trend in PE mandates while also uncovering the large proportion of states that still do not mandate PE teacher certification at the elementary level. In previous years, this may have been due to budget restrictions, yet this may not be the case more recently. As a result, the findings of this study did not confirm the hypotheses: PE teacher certification did not demonstrate any positive, statistically significant results as hypothesized. This finding could highlight a critical need for the provision of quality physical education programs as well as the absence of consistent national standards for an effective physical education program.

At the national level, these findings also highlight the potential need to formulate standards for assessing quality PE education and instruction. There is a clear need to define criteria that are consistent across all schools, statewide and nationally. However, achieving this may require the coordination of data efforts, potentially requiring collaboration between agencies such as the NCES and SHAPE so that consistent years are surveyed across both variables by the organizations that collect these data. This would create data that are more conducive to comparison. In the current study, the absence of available data in random years, as well as

inconsistencies between the two reports in terms of the years surveyed, resulted in a smaller data set, which posed as a weakness to the research.

Meanwhile, at the institutional level, the inconsistencies in the findings of this study have implications related to the effects that the policies researched can have, even in local districts. According to the results from a CDC (2010) report, physical activity may help to improve academic performance (grades, standardized tests scores, etc.), academic behavior (e.g., on task behaviors, attendance), and factors that can influence academic achievement (e.g., concentration, attention, and improved classroom behavior). This study was not able to confirm most of the research reviewed in Chapter 2. Nevertheless, these findings should be used to further investigate inconsistencies in reporting among agencies as well as the lack of follow-through from state and local school officials.

This study also highlights implications related to distinctions in the American policy environment, particularly when it comes to physical education policy. Unlike in other countries, the absence of federally-mandated curricular requirements or a centralized curriculum in the United States leads to a greater degree of diversity at the local level (Kohl III & Cook, 2013; Savage & O'Connor, 2015). As a result, the findings of this study underscore the need to implement consistent standards, while the unique status of the American educational environment, reciprocally, also influenced the interpretations of these findings. In other words, the degree of diversity that exists at the local level may serve as a limitation to the generalizability of the outcomes presented in this research, while also impeding their possible accuracy because it is nearly impossible to account for all the factors that may be influential in each state and local scenario.

The same challenge that has been recognized in similar studies, such as that of Davidson et al. (2015), who examined the implementations of NCLB. They found that the interpretation of many elements that are left to the subjectivity and discretion of individual states contributed to a wide array of factors that influenced outcomes and influenced each other, thereby creating a web of complex interactions that factored into the states' implementation of NCLB components and the subsequent student outcomes (Davidson et al., 2015). This finding draws attention to the limitations that arise from state-level analyses, particularly regarding the ways in which policy may (or may not) translate into the intended outcomes at the school level due to the means by which it is implemented (Berkman & Plutzer, 2005; Davidson et al., 2015). In essence, the intention behind a federal initiative may be lost in translation when implemented at the state level or between the state level and the local school level (Berkman & Plutzer, 2005; Manna, 2011). In fact, studies like Berkman and Plutzer's (2005) affirmed the myriad of complex factors that contribute to policy administration and its effects, including district-by-district (rather than state-by-state) factors that prove influential.

Yet, even after attempting to control for all of these extraneous variables and confounding factors, Berkman and Plutzer (2005) found that public opinion was one of the predominant drivers of educational spending. Their findings imply that how a policy is implemented at the local level, may be largely dependent on the opinions of the local community and what they are motivated to prioritize (Berkman & Plutzer, 2005). Not only does this introduce the idea of yet one more factor to consider (thereby illuminating another limitation of a state-level analysis), but it also provides insight into the utility of research findings like those realized in this study.

Finally, this study adds to the existing body of literature by providing an uncommon perspective on the relationship between physical activity and academic performance. These findings present a new inventory of baseline data to serve as a springboard for other research endeavors, establishing new insights and better practices by dissecting the findings presented here and exploring them further.

Limitations

As is the case with any study, there are some weaknesses or limitations to this research that are worthy of mention. First and foremost, the study and its findings were limited by the availability of data in both the NAEP and SHAPE archives. Each had one year that was not available within the inventory of years chosen as the period of study. In addition, the original data set was limited due to the lack of alignment of the years selected for data collection between the two sources of data. Therefore, calendar years had to be redefined as academic years, with data often derived from consecutive calendar years rather than uniformly from the same year.

Other limitations include the use of mean scores, leading to the potential for the results to be skewed in response to outliers. However, although this effect is likely minimal, it is not feasible to examine the complete composition of individual student data that resulted in the mean scores for each state because only mean scores were provided by the data sources. These issues may be compounded by other limitations, including the small sample size in some segments of analysis. Finally, the results of the correlation and/or regression analyses did not equate to causation, thereby deterring the researcher's ability to definitively state a causative relationship. These limitations may be addressed in future studies.

Future Areas of Study

The findings of the current study, as well as the insights derived from them, provide suggestions for future research. The quantity of time dedicated to physical education, and its subsequent effects on (or relationship with) academic outcomes, should be explored within a larger sample to provide a better likelihood of extrapolation. Executing analytic methods that provide definitive causative conclusions could achieve this.

Meanwhile, this study was not able to substantiate the influence of the quality of PE programs on student outcomes and the potential role of PE teacher licensure/certification as a representation of quality. Therefore, future studies should further explore the influence of PE teacher certification/licensure and how it influences the quality of PE program while also examining the requirements for licensure and certification nationally. The latter will allow for distinguishing those factors related to certification/licensure that are particularly effective in contributing to the subsequent quality of a program compared to those factors that may not be as integral. This approach could serve as a springboard for recommendations for an inventory of PE teacher licensure/certification requirements that are necessary to effectively create quality PE teachers and improve the subsequent quality of the programs that they teach. Such an analysis may also lead to the formulation of research findings regarding the inclusion of these elements in policy and an exploration of suggestions for promoting the consistency of PE criteria across the nation. Additionally, better understanding how policy translates to practice in this arena is important because, at least at the broad level, it does not seem that the policy is having the academic outcomes that one would expect given previous research on physical activity in schools.

These recommendations for policy change or improvement should be accompanied by additional future studies that focus on more extensively assessing the impact of quality versus quantity within the context of physical education and subsequent outcomes, particularly evaluating additional influencing factors or confounding variables. Finally, an intriguing result emerged from this research pertaining to the effects of physical education on reading and math scores. Specifically, there appeared to be a minimally positive or negative effect on NAEP scores for reading and math alike. These results did not align with the previous research findings. Therefore, future studies should explore the underlying mechanisms behind these results. There is speculation on the effect that the reporting years of 1996-1997 and 2000-2001 had on the analyses. Both data points did not have complete data sets and the coefficient table displayed a noticeable inconsistency in these years compared to the other reporting years. This could be complemented by future studies that utilize varying samples to explore outcomes across various age groups and across all grade levels. The possibility of replicating this study with middle school and high school aged students is extremely feasible since NAEP assessments are distributed to grades 4, 8, and 11.

Conclusions

This chapter began with a discussion of the longitudinal trends associated with the number of states that mandated physical education as well as those that mandated the certification or licensure of physical education teachers. The absence of a clear linear progression, as well as the "up and down" nature of these trends, may be reflected in the inconsistent findings, contrasting outcomes, and the misinformation that have emerged in association with this topic over the years. These have, likely, been influenced by policy changes

and educational trends that focused on the importance of student academic success or the necessity of sufficient standardized test scores.

Another trend in education in recent years has been an ongoing emphasis on evidence-based practices and the application of evidence-based knowledge in facilitating a best practices approach. However, it is impossible to implement a best practices approach unless one knows what approaches work best. Thus, findings from studies such as this one can suggest the necessary changes to be made across the field of education as educators, policymakers, parents, and administrators are more accurately informed of the benefits realized from quality PE programs.

Further, when working towards the improvement of academic outcomes through the provision of quality PE programs, the benefits to be gained create a "win-win" scenario. These include the expected advantages that come from improved student health and fitness, as well as the emotional, social, and psychological benefits that may emerge. Although these may be topics for another dissertation, in the end, the inclusion of quality PE practices is consistent with the contemporary focus on the wellbeing of the whole child and the provision of a well-rounded education. Achieving this objective may begin with recognizing the importance of certified/licensed PE teachers in providing a quality physical education experience for students.

Such a focus should lead to a more dedicated emphasis on PE policies as they relate to the field of education and a more vigilant effort at executing practices with consistency nationwide. As indicated, in past decades, PE policy mandates were met with schools responding by meeting the minimal requirements. Perhaps, going forward, instead of settling for minimal compliance, schools should focus on the optimal provision of physical education. As a result, students will likely experience the full scope of benefits to be derived from a quality physical

education program and, in response, excel in a variety of capacities that not only improve their academic performance but, ultimately, their quality of life as a whole.

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