

The Effectiveness of Integrating Physical Activity in Primary School Environments

A Literature Review

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Summary

The presence of physical activity in primary school classrooms has been shown to provide better learning outcomes when comparing situations that have or have not integrated physical activity. Physical activity can be defined in many ways; in this study, we will categorise physical activity as movement, physical education, and non-sedentary time. How physical activity is integrated in different parts of the world varies greatly. In this study, we aim to explore the different methods of integrating physical activity in a primary school context, the effectiveness of physical activity on increasing academic achievements and students' well-being. Presenting two case studies of Finland and Macau respectively, their methods are compared in incorporating physical activity in an educational context and their respective results, as well as their aims and purposes of doing so. According to research conducted on the two listed locations, there is a positive relationship between physical activity and learning outcomes, in which the latter is supported by the former in this study. Physical activity has also shown to benefit physical health, mental health, reducing obesity rates and developing motor skills.

Keywords: physical activity, learning outcomes, well-being, Finland, Macau, primary schools

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1 Introduction

Physical activity (PA) has long proven to have numerous benefits to people, ranging from the condition of physical health to the development of cognitive skills (Haapala et al., 2016). Educational systems have various strategies in incorporating PA into their students' time spent in school. Maintaining higher levels of PA is encouraged on a daily basis in order to promote a healthy lifestyle. PA has also been shown to improve academic learning outcomes, where students who have higher levels of physical activity tend to perform better in class (Haapala, Poikkeus et al., 2014).

The purpose of this study is to showcase the importance of PA in children's lives and why it should be implemented in school contexts through a literature review. We aim to investigate how integrating physical activity in primary school environment affects students' learning. The reason for the choice of topic is the interest in understanding how different places in the world incorporate physical activity in students' learning and how the integration affects the learning outcomes. We will be using the cases of Finland and Macau as individual studies of how physical activity is integrated in the classroom and focus on their effects on learning outcomes and well-being of their respective students. The authors of this study are from Finland and Macau respectively; therefore, we became curious on how the two education systems from opposite parts of the world have different views on a common topic: integrating PA in primary school classrooms. Both locations have several differences in terms of culture and environment, but certain data show they share similar learning achievements.

The purpose is not to determine a better option for the integration of PA. We aim to provide insight into different ways different cultures manage the integration of PA and learn more about how different methods work. In addition to focusing on academic success, we want to explore the importance of PA in the well-being and social growth of students.

This thesis examines the role of physical activity in primary school context. We will try to answer the following questions,

1. How can physical activity affect student learning outcomes and well-being?
2. How is physical activity integrated into primary school environments in Finland and Macau?
 - a. What benefits of physical activity have been found in Finland and Macau in relation to students' learning outcomes and well-being?

2 What is Physical Activity?

Physical activity can be interpreted in multiple ways. PA is often defined as students' non-sedentary time, meaning any bodily movements produced by the skeletal muscle (Hartikainen et al., 2022). There are many varied ways of including PA in primary schools. To get a clear picture of different methods, it is important to understand how we are classifying PA and its different levels. PA integration can happen throughout the school days in varied activity levels or environments. For the purpose of our study, we are classifying PA as all non-sedentary time during school hours. This includes PA that takes place in the classroom, during recess breaks, and in Physical Education (PE) classes. This way PA considers student movement in means of structured lessons with teacher guidance as well as in a freeform manner based on student interest.

While the definition of non-sedentary time that PA covers happens mostly during the school day, it is important to determine the term moderate-to-vigorous physical activity (MVPA) and understand its purpose in relation to students' activity levels. MVPA can be defined as physical activity that raises one's heart rate or momentarily gets the person out of breath (Kokkonen et al., 2020). The World Health Organization (WHO, 2020) recommends at least 60 minutes of MVPA a day.

There are many different ways to incorporate PA in one's daily lifestyle. In this thesis, we will be addressing methods of integrating PA held during the school hours. The most typical practice of PA takes place during PE classes as its own class subject. Students spend the majority of their time in PE classes physically active, since PE is dedicated to train the students' movement and motor skills (Yli-Piipari, 2014). However, PE is commonly implemented only a few times a week, leaving a gap for other types of physical activity to upkeep the students' movement (Kokkonen et al., 2020).

When discussing different methods of how physical activity can be integrated in primary school classrooms, it is crucial to consider ways that have become the norm in specific education systems. Meanwhile, research also shows methods that are still currently being investigated and researched on their effectiveness.

3 The Effects of Physical Activity on Learning Outcomes and Well-Being

Regarding the integration of PA into primary schools, it is important to understand the implementation methods and the following benefits. PA integration has proven to be connected to signs of academic success, as well as affecting the pupils' well-being and mental health, showing positive signs in the link between an increase in physical activity and positive emotions (Wong, 2023). Another major benefit of PA in schools is to build an active lifestyle and supporting the pupils' activity levels both in and outside of school. It is essential to consider the value of PA for the pupils' future, as maintaining a sedentary lifestyle in primary school-aged students increases the risk of chronic diseases in adulthood (Haapala, Poikkeus et al., 2014).

Increasing the quality and quantity of PA in classrooms proves to be effective towards academic performance and health management (Peiris et al., 2022). There are many factors that could affect the results when discussing the effectiveness of PA, including the different standards in education systems, evaluation methods, and learning environments. The quality of PA can be assessed distinctly based on the activity content, duration per period, and test standardisation of the school curriculum. Peiris et al. (2022) proposes the cognitive load theory that implies the criteria of PA can affect the students' academic performance. While taking these factors into consideration, many studies held at an international context have results that show the correspondence between PA with student learning outcomes and well-being, where the inclusion of PA holds a positive impact.

3.1 The relationship of PA and student learning outcomes

Incorporating PA during academic subjects attest the students' focus retaining better throughout the lesson (Zask et al., 2022). PA interventions decrease off-task behaviour, which supports the student's learning and preparedness. On-task behaviour and focus are supported by having active breaks as well as classroom-based physical activity (Watson et al., 2017). To achieve better academic results, Watson et al., (2017) found that longer interventions of PA were needed for improvement in students' performances in their studies. To accomplish change in the results of standardised testing, one to three-years-long interventions of continuous integration of PA in student learning were required.

The percentage of curriculum time allocated to PE has positive effects on student learning on cognitive, affective and psychomotor domains. Lack of PE time and encouragement of sedentary lifestyles in curricula proved to have negative impacts on student's learning and attention in OECD countries (Dudley et al., 2020). Dudley et al. (2020) conclude that it is essential to place significance on PE as a subject and highlight the different pedagogical interventions in PE classes. Henceforth, with the support of PE, the results exhibited that the amount of time spent in PE has more benefits for students' academic results as compared to the time spent on a more traditional approach to studying, maintaining a sedentary lifestyle. Furthermore, these results provide solid evidence that increased PE time in school curricula can act as a tool to provide better learning outcomes for their students.

While there has been documented benefits of the integration of PA, they vary across the research. It is important to note that we have discovered no research showcasing results of PA interventions worsening students' academic results in the literature accessible to us.

3.2 Importance of PA at Schools to Well-Being

Students' well-being can be categorised as the students' physical, mental as well as social well-being. Physical well-being covers the students' muscle, cardiovascular and metabolic health (Zask et al., 2022). Mental well-being, on the other hand, is defined as the students' psychological health; mental health, stress levels and self-esteem as well as positive cognition functions in this study (Anzeneder et al., 2023, Zask et al., 2022). Students' social well-being covers the development of social skills when it comes to cooperation, empathy and the ability to build relationships with peers (Kokkonen et al., 2020).

Schools and the teacher's role in influencing the students' physical well-being and relationship to PA is crucial. PA interventions in schools have a significant role in building the students' active lifestyle outside of school. Students who participate in physical activity in schools, are more likely to continue PA on their free time (Zask et al., 2022) The school environments that have incorporated at least two hours of PE and PA activities per week promote the students' well-being and healthy lifestyles in school as well as out of school (Kliziene et al., 2021).

Primary school teachers have been able to identify the importance of PE in student's social well-being. While teachers in New Zealand value PE for its role for social-emotional development, the teachers lacked use of any specific implementation to focus on well-being (Deng et al., 2024). This indirectly suggests that all kinds of PE can be beneficial to the student's well-being without a specific implementation. PE and PA itself are beneficial for the students' social skills and well-being. As schools have an important role for student's emotional development, it is important to build an ideal environment to support that growth.

Lu et al. (2014) found that schools are the place where students facilitate their growth and develop themselves as an individual and a member of society. People assess situations with their feelings and emotions, and children use their emotions to express their thoughts and opinions. In school, students learn to regulate their feelings while being guided by teachers. Lu and colleagues indicate that students who have better emotional health show better results in their education, thus highlighting the importance of emotional well-being. They argue that maintaining a positive well-being has a relation to regular PA and active participation in PE classes. Students who harbour positive emotions in their daily lives tend to lead active lifestyles, signifying the relationship between emotional well-being and PA. Teachers provide students with a rich environment where they can learn and grow, in which both factors have an effect on each other; better emotional health leads to increase in motivation in PE classes and active lifestyles encourages positive emotions.

4 PA in Finland and Macau

Each education system in the world has its own way of planning its academic goals and incorporating learning skills into the subjects. We will be using two education systems from the world as cases to show how they integrate PA into their classrooms and how it affects their students' learning outcomes and well-being. We have chosen Finland and Macau as our case studies; both case studies have their own education systems and have shown academic successes throughout various records overtime. While both case studies have different ways of implementing their curriculum into schools, there has been a surprising similarity in academic results. Finland and Macau present results from two different education systems that showcase significantly outstanding learning outcomes (OECD, 2023), although the two cultures differ greatly in terms of purpose and attitude towards education. On the other hand, there are many factors that present the differences in learning outcomes of each education system, which can be affected by cultural perspectives and the state of environment.

The schools in Finland and Macau have different possibilities for the integration of physical activity. Finland has vast land space, allowing room for forests and nature to flourish without the disruption of commercial buildings and modern infrastructure. Thus, outdoor space is plentiful, where physical activity can be taken outside. On the other hand, Macau is drastically smaller in size and densely populated, allowing little room for outdoor activities. Schools in Macau make up for this by arranging activities to be held in various facilities, ranging from field trips to visits in other indoor spaces. As such these two places offer us solutions for integrating PA in many different environments in the world.

4.1 PA in Finland

4.1.1 Introduction to Finland

Finland is a Nordic country located in northern Europe. Finland's population is around 5,6 million and comparing the population to its geographical size of 338 363 km², the country is sparsely populated (European Union, n.d.). The population density of Finland means that most of Finland is covered in nature, 75% of the land area is covered by forest (Finnish Forest Industries, 2023).

In Finland, education is free of charge based on the Basic Education Act (1998) and it outlines the main principles of mandatory schooling in Finland. With the Ministry of Education and Culture, the Finnish National Agency for Education provides the educational system with the core curricula and determines the requirements for teachers. In 2023, there were 2014 comprehensive schools in Finland although the number has been decreasing (StatFin database, 2024).

In Finland, school days are built of at least 45 minutes of teaching per hour and recess time between lessons (Finnish National Agency of Education (FNAE), 2016). While FNAE does not mandate it, in most schools students are encouraged to go outside during recess, where the school grounds are built with the students' physical activities in mind. The outdoor environment itself also increases students' PA as the environments do not typically enable sedentary behaviour.

4.1.2 PA integration in Finland

In Finland recess is a key part of the pupils' healthy development in terms of physical activity, social aspects, and building the community (FNAE, 2016). During recess, Finnish students are able to freely socialise with each other, which often is supported by physical activity (Haapala, Hirvensalo et al., 2014). This time between classes enables students to act freely without a structure provided by adults, offering new possibilities for movement and imagination with their peers in an informal context. PA during recess increases the students' liking for school, feelings of belonging in the school environment as well as engagement in academics (Haapala, Hirvensalo et al., 2014).

The National Core Curriculum of Finland outlines the importance of physical education (PE) to promote an overall active lifestyle in the students' lives. The task of PE is not only to develop the students' motor skills but also to encourage a more active and healthier lifestyle (FNAE, 2016). The Government Decree on the National Objectives for Education Referred to in the Basic Education Act and on the Distribution of Lesson Hours mandates at least 494 PE lessons that are 45 minutes long to be held during a student's primary school time in Finland. Out of these lessons, 152 lessons are to be held in grades 1-2 and 342 lessons in grades 3-6 (Ministry of Education and Culture (OKM), 2024). The Finnish national curriculum states that the goal of PE is to provide the students with a variety of motor skills and does not give clear outlines for the activities in PE lessons, only suggesting overall

themes, for example, ball games, gymnastics, running and jumping (FNAE, 2016). Without clear content, the responsibility of the decision is left to the schools and teachers causing differences in PE education across the country (Yli-Piipari, 2014).

One of the biggest movements when it comes to PA in Finnish schools is the Finnish Schools on the Move (FSM) program. The program aims to incorporate PA in the school days and an estimated 90% of Finnish schools participate in the program (Hartikainen et al., 2022). While funded by the Finnish National Agency for Education, FSM's focus is not on increasing PE lessons, but on implementing PA during academic lessons and recess and increase the students' MVPA (Blom et al., 2017). For example, FSM supports the development of schoolyards and facilities, organised recess activities and clubs, and the training of school personnel. These actions provide opportunities for organised physical activities in school settings outside of PE lessons. Research shows the program can provide promising results and increase school day MVPA of the students (Haapala et al., 2016). In simple PA-promoting ways, the Finnish Schools on the Move program has been able to decrease students' sedentary time and increase PA during school days.

The inclusion of PA during recess and PE lessons have become very typical in Finland, but interventions regarding integrating PA into academic lessons is currently still being researched. In the last decade, open learning spaces have become a trend in Finland. Schools and classrooms have been built in ways of creating different options for group working, movement and more relaxed seating arrangements (Hartikainen et al., 2021). One of the reasons for this has been to extend the amount of physical activity. Open learning spaces have been shown to keep students' sedentary time under shorter periods and encourage students' movement. The overall seated time has decreased a significant amount in open learning environments, when compared to conventional classrooms (Hartikainen et al., 2022). While open learning environments seem to increase PA without having to add additional physical activity moments to the lessons, the complete amount of PA was not increased by a significant amount (Hartikainen et al., 2021).

While an open learning environment broadens up a dedicated learning environment, there is also an even wider approach. Outdoor schools and outdoor learning have been gaining popularity in Finland in recent years. While outdoor schools are more common at the early childhood education level, some primary schools have also

adopted this approach (Romar et al., 2018). Outdoor school is often organised with some days being traditional indoor school days, while other days of the week are spent outside. Research shows that the outdoor days have increased PA compared to indoor days (Romar et al., 2018).

Although we are interested in PA at schools, it is important to mention that PA during transportation to school and back home can be an effective way to add PA to the students' overall PA (Kallio et al., 2016), making it a school-related PA. Active school commuting does not only add to PA during commuting but has shown an increase in the students' PA outside of commuting too. Pupils in Finland are encouraged to arrive at school using methods of transport that promote their health (FNAE, 2016). Active commuting however, has its problems, as the percentage of Finnish pupils actively commuting to school changes considerably from season to season. Kallio et al. (2016) found that while 80% of students living 2-5km from the school used active commuting methods during spring and fall, that percentage dropped by nearly 50% during winter.

4.1.3 PA, learning outcomes and well-being in Finland

Research shows many different results when it comes to the relation of PA and academic achievement (Haapala, Poikkeus et al., 2014). In Finland research has shown both strong as well as weak relationships between PA and academic success, which follows the international findings. It is clear that the effect PA has on academic success is dependent on the type of PA and that not all PA can be used to boost academic results.

Haapala, Poikkeus et al., (2014) highlight the importance of considering other factors when comparing PA and academic success. While there was a clear connection between academic skills and overall PA in boys; with girls, the results changed based on the parents' education level. Recess PA had a direct association with academic success for both boys and girls. The correlation between PA and academic results can also span years, as research suggests that more physically active 8-year-old students received higher academic results as 16-year-olds (Kantomaa et al., 2012). In these results, there was not a significant difference between the genders. These varying results show the need for further research on the relationship between PA and academic results.

PA has a clear connection to the students' social skills and cooperation (Kokkonen et al., 2020). In the PE context, the students are offered a chance to interact and work together during the lessons building important social skills. Recess PA offers more free play compared to PE and the students are able to build their social competencies in informal situations and have an association for peer relationships (Haapala, Hirvensalo et al., 2014).

While the relationship between academic success and physical activity is still uncertain, the research available to us shows a clear connection between PA and well-being. An increase in PA benefits the school climate and peer relationships between students (Haapala, Hirvensalo et al., 2014). PA has a clear connection to the students' social skills and cooperation (Kokkonen et al., 2020). In the PE context, the students are offered a chance to interact and work together during the lessons building important social skills. Recess PA offers more free play compared to PE and the students are able to build their social competencies in informal situations and have an association for peer relationships (Haapala, Hirvensalo et al., 2014).

In recent years, the Finnish education system has clearly tried to adapt different ways to integrate PA into the primary school environment. The curriculum not only highlights the importance of PA to students' motor skills, but also emphasises how PA affects the students' overall lifestyle (FNAE, 2016). Finland has seen promising results on the effects of PA on students' well-being and learning outcomes, especially when focusing on the social skill development of the students. Interventions, such as the FSM programme have found their place in the education system, while others, such as outdoor learning, are still awaiting more research and resources.

4.2 PA in Macau

4.2.1 Introduction to Macau

Macau, also known as Macao, is a special administrative region of the People's Republic of China, referred to simply as Macau. It is a small city located in Southern China with a population of around 680 000 people (Government of Macao Special Administrative Region Statistics and Census Service, 2023).

Among all regions in China, Macau is the first region to have offered 15 years of free education to its citizens, starting from infant education, primary education, up to

secondary education (Macau SAR Government, 2024). As of 2024, there are 76 schools in Macau that offer pre-primary, primary, and/or secondary education (Government of Macao Special Administrative Region Statistics and Census Service, 2024). Schools offer public or private school services and follow the curriculum framework, the Requirement of Basic Academic Attainment (RBAA).

4.2.2 PA Integration in Macau

Macau has developed its own system and perspective regarding the connection between PA and education. According to the RBAA developed by the Education and Youth Development Bureau (typically referred to as DSEDJ according to its Portuguese title from 2020 onwards, previously under the abbreviation of DSEJ), teaching activities of Physical Education and Health from Primary 1 to 6 should be held at least two times per week on average and no less than 70 minutes in a week. In general, students are required to attend sports activities that consist of a minimum of 150 minutes weekly (Chen et al., 2020). The Curriculum Framework for Formal Education of Local Education System determines Physical Education and Health as one of its learning domains (Wei et al., 2020). The majority of schools in Macau are located in buildings, in which most have outdoor space dedicated for recess breaks and school events. However, due to dense population and limited space, some schools struggle to provide for better quality physical education classes and areas for exercise (Tu et al., 2024). Schools are required to include an appropriate amount of time for breaks in between lessons, in which students are located to the open area to spend their free time (DSEJ, 2014).

Schools are encouraged to collaborate with other organisations to introduce and provide opportunities for their students to join sporting activities. The Sports Bureau of Macao SAR Government offers countless of sports clubs and competitions for young people to join; events under the name Youth Academy have been organised to introduce new sports and allow adolescents and teenagers to pursue their interests as well as maintain their hours to physical activity (Sports Bureau of Macao SAR Government, n.d.). In 2019, the health and fitness project Living in Motion 123 was launched in primary schools to provide a better understanding of the students' physical health and promote ways to become healthier (Ho, 2019). DSEJ and the Sports Bureau have worked together in numerous projects to promote physical activity and improve the health of younger people, mainly targeting students in

schools. DSEJ funded and provided after-school programmes and summer activities which took place outside of the classroom, allowing students to enrich their leisure lives and find interest in different activities. Research shows a growth of participations in offered PE clubs in recent years (Wang et al., 2019).

Inter-school sports competitions were hosted among a variety of sports, as well as building sports teams to attend external sports competitions located outside of Macau (DSEJ, 2019). The statistics were provided by DSEJ, which showed high enrolment rates among young people when being involved in the supported activities.

Although there has been a high number of events supporting PA recorded in the past decade, Macau still has to improve when it comes to increasing the rate of PA. While PE is valued of importance and marked as one of the compulsory subjects in the curriculum, many organisations do question the quality of teaching and its effectiveness (Ho et al., 2017).

4.2.3 PA, learning Outcomes and Well-Being in Macau

Over the years, Macau has had the problem of rising rates of obesity and sedentary lifestyles among the younger generations. Malnutrition and worsening mental health have also been an issue, especially for students ranging from adolescents to young adults (Tu et al. 2024). It is crucial to deal with these problems from a younger age to avoid potential health problems in the future, focusing on early childhood obesity and unbalanced dietary intake (Chan, 2001).

There is no doubt that Macau has been improving in their students' academic successes, with results ranking Macau high in international tests such as PISA and TIMSS. Macau scored particularly high in subject areas of mathematics and sciences (DSEDJ, 2024). Research regarding the correlation between learning outcomes and the quantity of PA has provided different results. While Wang et al. (2019) found no evidence to prove that the learning outcomes stemmed from the quantity of PA, many researchers have strongly suggested that increase in PA can undoubtedly induce positive results. Wong et al. (2023) found a correlation between the presence of PA and student learning outcomes, along with student improvements supported by the quantity of PA. Children with higher participation in moderate-to-vigorous PA tend to have better results in academic success, activating their cognitive abilities and improving in academic subjects requiring analytical skills (Ho et al., 2021).

Children who performed better in PA have been a critical factor in improving people's health, ranging from physical, mental, to psychological health. There is definite connection between PA and physical fitness, where students who have high participation in sports clubs show better results in physical abilities, for instance ball throwing skills and running (Wang et al., 2019). Research has shown that students in Macau produce better learning outcomes with the presence of PA and exercise in their daily life as compared to students who were studying with low to no amounts of PA (Wong et al., 2023).

For students situated in Macau, the link between PA and well-being has substantially high impact among all age groups. In addition to benefits in school, PA is positively associated with overall life satisfaction (Chen et al., 2020). Students with longer periods of PA have better emotional moods and elevated levels of happiness (Wong et al., 2023). Macau has been aiming to improve the living conditions of their residents by providing more centres and programs for people to increase their interest in maintaining appropriate levels of PA in their daily lives, in which the rate of exercise among primary students has seen an increase of 13.7% in a period of five years (Sports Bureau of Macao SAR Government, 2023). Undoubtedly, students in Macau provided positive results in their academic performance through examinations and international testing; whether this academic success can be directly stimulated through PA requires further research. On the other hand, increasing hours of PA, as well as the quality of PA, links to the improvement of students' well-being in Macau, especially in regards to physical health and emotional health. Overall, it is suggested and encouraged for primary students in Macau to maintain a balanced lifestyle between sedentary time and moments for PA daily.

5 Discussion and Conclusion

Physical activity holds importance in people's lives, bringing many benefits in areas ranging from physical health to emotional well-being. Not only does it encourage an active lifestyle, incorporating PA in one's life can improve their performance in their work. Students need PA to sustain a healthy growth into adulthood, keeping their bodies and mind active and continuously in development. Learning improvement in academic results and maintaining a positive well-being have correlations to the practice of PA in daily lives of students. This is supported by teachers and the curriculum in the schools, acting as guidance for students in their educational journey. Schools have the ability to offer a rich environment and an abundance of opportunities for students to lead an active lifestyle, stimulating their cognitive skills in the classroom and ensuring students understand how to manage their own well-being. Participation in physical activity not only improves one's physical and mental health, but it also has psychological benefits where people tend to have an increase in emotional well-being, finding their self-confidence and boosting their self-esteem in their daily lives.

Every education system in the world has their own custom-tailored curriculum that fits their society best. In regards to PA, each system uses PA in different forms and offers different intentions to the purpose of PA. In order to increase the significance of PA, applying a whole-day approach is suggested to increase the quality of adolescents' PA in a whole-day time frame (Haapala et al., 2016). While Finland primarily focuses on the integration of PA in school hours, Macau leans more towards incorporating PA through activity clubs and sporting organisations in contribution to students' active lifestyles. Both education systems of Finland and Macau have their strengths that offer the best for their students, in which these aspects can be considered in an international context to be applied to other education systems.

In this study, there are many factors related to the occurrence and effects of PA that we have not covered in our discussions. Firstly, we have only referred to PA set inside the classroom and school, which does not cover activities outside of school

hours, such as extracurricular activities held by organisations other than schools. This also includes activities taken place with family and friends, for instance playing beach volleyball in a family trip by the beach. These factors and examples hold influence on people's active lifestyles, which can affect their productivity in work (or academic performance for students) and emotional well-being. In addition, we focused on the impact of PA only on students' learning outcomes and well-being; there is a possibility that PA does affect other factors concerning students and schools, in which further research is needed. Students' well-being can be determined by factors of the individual's daily life and family background, taken into consideration their dietary intake and daily activities, which are not mentioned in our discussions. Further research can be conducted on considering these external factors in regards to how it is related to the effect of PA in students' learning outcomes and well-being, as well as focusing on the direct and indirect links between PA and student learning outcomes and well-being. The mechanisms underlying this relationship requires further study in order to promote PA in people's daily lives. The scope of this literature review is limited to the studies we were able to access.

6 Reflections

Prior to the conducting of this literature review, we as the authors were interested in the purpose and integration of physical activity in students' lives. Branching from our interest, we began reading and discovered the extent of the importance of PA, its purpose in school and how many different ways it can be incorporated. This literature review offers conceptual knowledge and practical suggestions, which becomes beneficial for our future careers as aspiring teachers in the classroom. This thesis solidifies our stance of consistently trying to incorporate PA in our lessons, now and in the future.

The integration of PA can affect many factors surrounding students' lives, in which we chose to focus solely on students' learning outcomes and well-being. The aspects of these factors can overlap, thus as teachers it is our responsibility to design activities that allow students to enhance their cognitive skills and emotional regulation either simultaneously or individually. We want to build a rich learning environment where students can flourish and expand their knowledge on specific fields of interest. Through the case studies of Finland and Macau, we wanted to discover how different two education systems in the world could be. To our surprise, we found quite a number of similarities as well as a variety of differences. Studying the integration of PA taken place in Finland and Macau respectively has allowed us to reflect on how different parts of the world approach different situations. While our focus was on the impact of PA on students, the research offered us further understanding that education systems are conducted based on the society, culture, and goals. Learning about the construction of education systems and curricula broadened our knowledge on education in an international context.

The writing process challenged our abilities in time management, coworking skills, and determination of the credibility of sources. Collaborating together allowed us to balance our respective strengths and weaknesses to form a piece of work of standard. Overall, this process has been demanding and required a great deal of time and effort, but the learning journey has been informational and rewarding.

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