Systematic Literature Review of the Implementation Levels of Teaching and Learning Physical Education and its Effects on Students' Physical Fitness

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ABSTRACT

This study examines the effects of Physical Education (PE) teaching and learning (T&L) on students' physical fitness. An Ex Post Facto design assessed differences in the National Physical Fitness Standard for Malaysian School Students (SEGAK) test scores based on PE implementation levels, considering gender and age factors. Data were collected in two phases: the first phase involved 27 head teachers of Physical and Health Education assessing PE implementation using the Malaysian Education Quality Standards Questionnaire Wave 2 (SKPMg2) questionnaire, while the second phase involved 630 students from Forms 1 to 3 across three schools with varying implementation levels. Data were analyzed using ANCOVA in SPSS version 27.0. Findings revealed significant differences in SEGAK scores based on PE implementation levels ($F = 7.666$, $p = 0.001$). Bonferroni post-hoc analysis confirmed significant differences between high and medium levels ($p = 0.000$) and high and low levels ($p = 0.022$), but no significant difference between medium and low levels ($p = 0.112$). Gender significantly influenced SEGAK scores, whereas age did not ($F = 0.012$, $p = 0.913$). The results suggest moderate PE implementation enhances students' physical fitness more effectively.

Keywords—Physical Education Curriculum, Implementation Level, Teaching and Learning (T&L), Physical Activity, Healthy Lifestyle, Physical Fitness

INTRODUCTION

Those who teach or work in an educational setting understand that teaching is a noble profession. However, teachers also have to face various obstacles in their daily lives, especially in the school environment. This is especially true when teaching Physical Education (PE) to primary school students or at the secondary school level, which has its challenges (Sortwell et al., 2022). The challenges of today's borderless world are very challenging to the authority of teachers. Therefore, the duties and responsibilities of teachers are increasing. Teachers who teach PE are no exception. Those who teach PE need to equip themselves with all the skills required in the syllabus of this subject (NASPE, 2004). The question is, are teachers who are currently teaching PE prepared? Are special PE teachers needed in schools? If so, how do they need to be equipped? The PE subject is now experiencing many changes, whether in terms of concept or content development. However, the acceptance and recognition of this subject are still disputed. It is still considered unimportant because it is not a subject of examination in Malaysia. PE is a core subject that every student must study and follow, just like other core subjects. PE is taught to all students starting from preschool (aged 5 to 6 years), primary school, which is Year 1 to Year 6 (aged 7 to 12 years) until students graduate from secondary school, which is Form 1 to Form 5 (aged 13 to 17 years) in schools that use the national education curriculum under the supervision of the Ministry of Education Malaysia (KPM, 2017).

Teachers are implementing agents at the school level who are the most important elements in pedagogy to produce quality education (Syed Kamaruzaman et al., 2017). Syuhada et al., 2018 explained that the National

Education Philosophy has emphasized that education is a continuous effort to produce a balanced individual in terms of physical, emotional, spiritual, intellectual and personality. Education is also an essential and primary process in building a balanced and reasonable individual who can achieve the aspirations and direction of the country. Teachers are often expected and trained to combine various teaching approaches, differentiate teaching, plan carefully, consider student needs and assess students to provide perfect and smooth T&L. Even experienced PE teachers sometimes struggle with attracting students' attention, increasing motivation and ensuring they are actively involved in meaningful and educational activities (Williams et al., 2022).

A PE approach can achieve Many of these (Siedentop et al., 2022). PE is part of the curriculum in Malaysia. PE promotes and improves students' physical fitness levels (Johari Surif et al., 2007). PE T&L aims to develop students' motor skills, physical fitness and overall well-being by providing structured and planned physical activity opportunities. The effects of PE T&L on students' physical fitness are many and widespread, and they also positively impact their health and academic performance. PE has become one of the subjects taught at least once or twice a week to improve students' physical fitness levels at both primary and secondary school levels.

Siedentop (2022) introduced the PE, Sports, and PE model to provide young individuals with a more authentic and engaging sports experience in PE. This model was developed with three primary objectives: enhancing student competence, literacy, and enjoyment (Siedentop, 2011). Student competence refers to the skills and knowledge acquired in various sports. Meanwhile, a deeper understanding of sports rules, customs, and traditions strengthens the literacy component. Finally, enthusiastic students are likelier to appreciate and enjoy sports and physical activities.

Teaching & Learning of Physical Education in Schools

The government's intention in the Malaysian Education Development Plan 2013-2025 (KPM, 2013) is for student potential to be honed with student potential and further developed with academic potential in various appropriate aspects. Academic excellence is also essential, but its achievement needs to be filled with the development of students' competitive personalities so that their potential can be honed and polished in physical and sports activities (Md Suhaimi et al., 2018). This is because the T&L of PE should be recognized by instilling personal values that can be formed through physical and sports activities so that students can fill their time with something beneficial, which is also suitable for health. T&L is important because it plays a significant role in improving student performance. One of the rationales for improving student performance is structured T&L planning at the teaching management level. Providing effective T&L is also important to achieve teaching objectives. Apart from that, T&L management can also improve effective classroom control.

In addition, T&L management also functions in determining the delivery of knowledge based on the Annual Syllabus and Daily Lesson Plans in the Standard Primary School Curriculum, Standard Secondary School Curriculum and Standard Curriculum and Assessment Documents programs or systems. Given the growing concern about the level of physical activity of adolescents, especially schoolchildren, and the possible health consequences, targeted efforts to encourage physical activity seem appropriate through the PE curriculum. In this regard, promoting physical activity in schools and the PE curriculum have attracted increasing interest in recent years. Schools have been recognized as the leading institutions responsible for promoting activity among young people (McBride et al., 1999; Sallis & Owen, 1999; Cardon & Bourdeaudhuij, 2002; Tambalis, 2022). More specifically, PE has been recognized as having an important role as the most appropriate medium to promote an active and healthy lifestyle among schoolchildren. According to Stone et al. (1998) and Berrigan et al. (2022), school-based physical activity interventions have distinct advantages over interventions in other settings because programs can be institutionalized into regular school curricula, staff development, and other infrastructure.

Furthermore, the role of schools in promoting PE to foster physical fitness and the link between health and education is increasingly recognised by governments in Malaysia and abroad, such as the United Kingdom (UK). Harris and Penney (2000) and Sortwell et al. (2022) noted how official and semi-official government announcements have identified PE as 'critical in educating and providing opportunities for young people to be active independently throughout their lives', while Green (2004) and Williams et al. (2022) reported that the encouragement of lifelong participation in sport and physical activity is an implicit and explicit theme in

government policies on health promotion in general. T&L in PE in schools promotes students' physical fitness, overall well-being, and lifelong engagement in physical activity.

There are several key aspects to the PE T&L process; first, a well-designed curriculum design provides a more structured and organized T&L framework (Mohanasundaram, 2018). It includes clear learning objectives, content standards, and the development of skills and knowledge across grade levels. The curriculum should include various activities, including fitness training, sports, games, and skill development, catering to students' diverse interests and abilities.

Secondly, PE teachers use a variety of teaching strategies to engage students and facilitate learning (Muhammad Faizal A. Ghani, et al., 2014). These may include demonstrations, direct instruction, guided practice, cooperative learning, and inquiry-based approaches. Teachers should use effective communication, provide clear instructions, and offer constructive feedback to students to enhance their understanding and skill development.

Third, in terms of differentiation and inclusion of students, effective PE programs recognize and address the needs and abilities of diverse students (Bender, 2012). Teachers should differentiate instruction to accommodate students with varying skill levels, physical abilities, and learning styles. Inclusive practices ensure that all students, including those with disabilities or special needs, can participate in and benefit from PE classes.

Fourth, active student participation in PE classes emphasizes active participation, providing ample opportunities to engage in physical activities (McGowan, A.L., et al., 2023). Teachers should create a supportive and inclusive environment where all students feel comfortable and motivated to participate. They can combine individual, small-group, and whole-class activities to meet different learning preferences and maximize student engagement.

The five main aspects of the T&L process in PE are skill development, motor skills development, coordination, and physical literacy (Rudd et al., 2020). PE teachers design activities and drills that target specific skills and provide opportunities for students to practice and refine them. Progression in skill development is important, with lessons building on previously acquired skills to challenge and support students' continued improvement.

Sixth, Health and Fitness Education in PE classes is essential in educating students about health-related topics (Harold J. Cornacchia et al., 1984; Anspaugh, D.J. & Ezell, 2001; Ferkel, R. C. et al., 2017). Through PE, teachers can integrate knowledge about nutrition, exercise physiology, injury prevention, and the benefits of an active lifestyle into their lessons. This approach helps students understand the importance of maintaining good health, making informed choices, and developing lifelong habits for physical well-being.

In addition, the seventh and key aspect of the T&L process in PE is assessment and feedback. Assessment and feedback in PE (López-Pastor et al., 2013; Ozan, C., & Kıncal, R. Y., 2018; Andrade, H. L., 2019) goes beyond traditional testing and may include observations, skill assessments, fitness tests, self-assessments, and reflective journals. Teachers provide feedback to students on their progress, highlighting areas of strength and areas for improvement. Assessment should be formative, providing information for teachers and students to guide future learning and skill development (Webster, B. S., 2014).

The final aspect is integration with other subjects. PE can be integrated with other subjects (Malinović-Jovanović, N., & Ristić, M., 2018), creating connections across the curriculum and reinforcing learning in different domains. For example, teachers can incorporate mathematical concepts in measuring distances or angles during sports activities or explore the science behind the human body's response to exercise (Akerson, V. L., & Flanigan, J., 2000; Haydn-Davies, D., Kaitell, E., Randall, V., and Shaughnessy, J., 2010; Cotič, N., Cotič, M., Felda, D., & Krmac, N., 2021). Integration helps students understand the interconnectedness of knowledge and promotes a holistic educational experience.

Implementing effective T&L strategies in PE enables schools to achieve student outcomes, namely, developing students' physical fitness and improving cardiovascular health, muscle strength, flexibility, and overall wellness. Strategies include regular exercise, strength training, and flexibility routines. In acquiring basic motor skills, students learn basic movement (e.g., running, jumping, throwing) and object control skills. Practice, repetition, and skill development improve motor skills. Students' health and well-being knowledge is gained by gaining

insights into nutrition, hygiene, injury prevention, and mental health. Teaching strategies include health education, safety awareness, and emotional well-being. The lifelong enjoyment of students' physical activity in fostering positive attitudes toward exercise encourages lifelong participation. Creating a supportive environment, offering choice, and celebrating progress contribute to enjoyment and beyond skills in fostering holistic well-being and a love of movement.

Implementation of Physical Education Teaching and Learning in Schools

Implementing PE T&L in schools today appears less effective in engaging students optimally. This may be due to several factors, including the lack of a long-term vision and insufficient emphasis on fostering lifelong physical exercise habits among students (Lynch & Soukup, 2017; Mohamed et al., 2019). Additionally, the lack of understanding among PE teachers regarding the importance of various competencies, such as planning, teaching materials, creating a conducive learning environment, and assessing the outcomes of T&L implementation, can hinder the effectiveness of PE in improving students' physical fitness levels (Mat Som, 2020; Zhang, 2019). As a result, the poorly structured implementation of T&L leads to low student participation in physical activities, which can negatively affect their physical development (Keejoon Yoon, 2019; Bigozzi et al., 2018).

It is crucial to note that assessing the level of T&L implementation is also essential to ensure students' progress in physical fitness (Ali et al., 2020). Factors influencing the effectiveness of T&L include providing adequate sports facilities and equipment, balanced curriculum design, and appropriate teaching strategies (Guan, 2020). Without a well-organized and systematic approach to T&L implementation, students' participation in physical activities may be limited, impacting the overall success of PE programs (Marshall & Hardman, 2000). Therefore, to ensure the success of T&L, PE teachers must possess a comprehensive understanding of the necessary skills and knowledge required to teach this subject (Marshall & Hardman, 2000).

Furthermore, assessing students' physical fitness levels through tests like the National Physical Fitness Standards for Malaysian School Students (SEGAK) since 2008 provides valuable information to identify areas that need improvement in the curriculum and teaching (Rahmansyah et al., 2020). This assessment offers more profound insights into the relationship between student engagement and their physical fitness levels, which can be used to develop more tailored approaches to enhance the effectiveness of T&L (Vaskov, 2022). Other factors such as Body Mass Index (BMI), extracurricular physical activity, and physical growth and maturation should also be considered when assessing students' physical fitness and planning appropriate interventions (Ługowska et al., 2022; Sun et al., 2020). Implementing PE T&L can holistically and comprehensively enhance students' physical fitness levels (Ferraz et al., 2021).

Teaching and Learning of Physical Education and Its Benefits to Students

There are many studies on the effects of single physical training sessions on cognitive performance in young individuals. However, few studies have examined the long-term (or chronic) effects of additional physical activity over several months on cognitive function (Webster et al., 2021). Including this information in this review is essential because each PE or sports activity session reflects physical activity that may affect learning on that day and over time. Cognitive function is often assessed using computer tests, including memory, attention, perceptual abilities, and IQ tests. PE is a process that aims to improve human performance through physical activity that is closely related to the acquisition and refinement of motor skills, the development and maintenance of fitness for optimal health and well-being, the acquisition of knowledge, and the development of positive attitudes towards physical activity (Ong et al., 2021). PE can also provide education through physical activity, and its goal is to influence all physical development, including mental and social development (Wan Azlan & Tajul Ariffin, 2019).

Three preliminary meta-analyses (statistical analyses of many previous studies) on physical exercise and its influence on adolescent cognitive processes have been conducted. Examining the effects of long-term and acute exercise on cognition, they found an overall effect size of 0.25 after reviewing 134 studies (in this case, the effect size refers to the effect of physical activity on cognition with 0.2, 0.5, and 0.8, respectively) (Vilchez et al., 2021). It refers to low, moderate, and high impacts on cognition. They concluded that physical activity slightly

positively influences different cognitive elements. However, the authors observed that as the trials became more controlled, the magnitude of the effect decreased (less than a positive effect) (Webster et al., 2021).

Due to the resurgence of research and interest in the issue, Sibley and Etnier (2003) released a second meta-analysis assessing the association between physical activity and cognition in children in 2003. The authors examined 44 trials and found an overall effect size of 0.32. The strongest link between physical exercise and cognition was found in middle and elementary school students (effect size = 0.40). Scientists determined a significant and beneficial relationship between physical activity and cognition (Demchenko, 2021). The positive effects were task-dependent, with the most considerable effect sizes finding perceptual skills (effect size = 0.49) and IQ (effect size = 0.34). No changes were detected between acute and chronic therapy. It is therefore confirmed that unpublished studies had larger effect sizes than published ones, indicating that no bias had arisen towards disclosing non-significant data. However, only nine studies were published in peer-reviewed journals, and many used questionable methodologies (Norboew, 2021). Furthermore, Tomporowski et al. (2008) found that systematic exercise programs can promote the development of specific mental processes necessary for academic achievement and cognitive function across an individual's lifespan.

Teaching and Learning of Physical Education and Its Impact on Student's Physical Fitness

Regular engagement of students in T&L of PE helps to improve their cardiovascular fitness (Dunton et al., 2012 & Hebert et al., 2017). PE classes often include aerobic exercises such as running, jogging, cycling, and jumping rope. These activities increase heart rate and oxygen consumption, promote cardiovascular endurance, and strengthen the heart muscles. Regular participation in aerobic exercise during PE classes helps improve the cardiovascular system's efficiency and overall cardiovascular fitness (Patel H. et al., 2017). PE classes may incorporate interval training, alternating between high-intensity exercise training and active recovery periods. This training challenges the cardiovascular system by forcing students to work more intensely. Interval training improves cardiovascular fitness by increasing the heart’s capacity to pump blood and increasing the body’s ability to use oxygen (Campbell et al., 2019). Gottlieb, R., Shalom, A., & Calleja-Gonzalez, J. (2021) stated that students who participate in sports and games during PE classes often involve continuous movement, including running, sprinting, and changing directions. These activities involve the cardiovascular system, requiring sustained effort and an increased heart rate. Regular participation in sports and games helps improve cardiovascular endurance and stamina.

The PE curriculum in Malaysia includes structured fitness activities such as circuit training, where students rotate through different exercise stations targeting specific muscle groups (KPM, 2017). Nuñez et al. (2019) investigated the metabolic effects of two high-intensity circuit training protocols and found that the sequence of exercises plays a crucial role in optimizing fitness outcomes. Similarly, Ballesta-García et al. (2019) reported that low-volume high-intensity interval training (HIIT) and circuit training significantly enhance maximal oxygen uptake. A study by Jitwil et al. (2019) demonstrated that HIIT and high-intensity resistance training effectively improve aerobic fitness and reduce body fat percentage among overweight women. Meanwhile, Kusnanik et al. (2021) confirmed the effectiveness of HIIT in enhancing aerobic capacity, further supporting the role of high-intensity training in physical fitness development. Circuit training can also improve muscle strength and endurance by stimulating growth and adaptation. Circuit training is a time-efficient and effective way to improve physical fitness and health. Circuit training typically involves cardiovascular exercises (e.g., jumping jacks, burpees, and shuttle runs) and strength training. The combination of cardiovascular and resistance training in circuit training helps improve overall fitness, including cardiovascular fitness (Tian, D., & Meng, J., 2019; Pinckard, K., Baskin, K. K., & Stanford, K. I., 2019). Circuit training can increase metabolic rate so that you can burn more calories during and after exercise (Benito P. J. et al., 2016.) Additionally, it can keep students motivated and interested in their workouts by varying the exercises, intensity, and duration. Students can also customize their circuit training to suit their preferences and goals.

PE T&L promotes the use of muscular strength and endurance. PE classes typically involve exercises and activities that target different muscle groups, such as push-ups, sit-ups, and weightlifting (Krzysztofik, M., Wilk, M., Wojdała, G., & Gołaś, A., 2019). Regular practice of these activities helps students build muscular strength, essential for performing daily tasks and preventing injuries (Yusof, S., Abdul Razak, M., & Ismail, E., 2021). Increased muscular endurance allows students to engage in physical activities for more extended periods without

experiencing fatigue. Muscular strength and endurance are essential aspects of physical fitness and health. They can also improve students' sports performance and prevent chronic diseases. PE classes can help students develop their muscular strength and endurance by providing various exercises and activities that challenge the muscles and make them stronger and more resilient.

Muscular strength is the ability of a muscle or group of muscles to exert force against resistance in an effort. Muscular endurance is the ability of a muscle or group of muscles to sustain repeated contractions or to apply force to a fixed object continuously. Both muscle strength and endurance depend on factors such as muscle fibre type, muscle size, nerve activation, and blood supply (Pate, R., Oria, M., and Pillsbury, L., eds., 2012). Muscular strength and endurance can be measured by one-repetition maximum (1RM), maximal voluntary contraction (MVC), isometric strength testing, and muscular endurance testing. These methods can assess the strength and endurance of a specific muscle or muscle group, such as the chest, arms, legs, and core muscles. Muscular strength and endurance can be improved with various types of resistance training, such as free weights, machines, bands, body weight, and functional training. Resistance training can increase muscle mass, muscle fibre size, recruitment, and efficiency. Resistance training can also increase bone density, joint stability, and metabolic rate (Zouita A. et al., 2023).

Furthermore, in PE, students' flexibility and mobility are improved. Flexibility and mobility are essential components of physical fitness and health and can improve sports performance and prevent chronic pain (Zhang Q. et al., 2020). Stretching exercises can be done before, during, or after PE classes, depending on the goals and preferences of students and teachers. Stretching and movement exercises during PE classes help increase joint range of motion and muscle flexibility. Dynamic stretching is an activity that involves moving joints and muscles through their full range of motion in a controlled manner. Dynamic stretching can increase blood flow, warm up muscles, and prepare the body for more intense activities. Some dynamic stretches are arm circles, leg swings, and lunges. Static stretching is an activity that involves holding a position that stretches a specific muscle or muscle group for a while, usually 10 to 30 seconds. Static stretching can increase flexibility, relax muscles, and reduce muscle soreness. Some static stretches are hamstring stretches, quadriceps stretches, and shoulder stretches. PNF stretching is an activity that brings about proprioceptive neuromuscular facilitation, and it involves contracting and relaxing muscles while stretching them. PNF stretching can increase flexibility, range of motion, and muscle strength (Hindle, K. B., et al., 2012). Stretching exercises should be performed with proper technique, breathing, and alignment. By incorporating a stretching routine, students develop greater flexibility, reduce the risk of musculoskeletal injuries, and promote better posture and alignment.

When appropriate, PE teachers should incorporate fitness elements into team sports and/or adjust rules to encourage more mobility (Vilchez et al., 2021). Teachers must keep up with fitness trends to create programs incorporating learning skills and fitness principles while increasing student activity levels (Lambert, 2000). Research has shown that using mind maps, cooperative learning activities, and problem-solving allows students to understand the concept of aerobic fitness while engaging in skill tasks (Norboev, 2021). Along with the exercise and fitness health components, textbooks should be included in the PE curriculum. Textbooks can be used not only for classroom instruction but also for students to use at home (Nornoew, 2021). Textbooks can supplement the PE curriculum by covering topics such as fitness analysis, personal fitness programs, nutrition and weight management, effects of exercise on body systems, stress reduction, and exercise and sports injuries.

Providing a broader curriculum to schoolchildren can increase physical exercise (Mears, 2008). Elementary and secondary school PE curricula should target lifelong interests such as golf or tennis, recreational or outdoor excursions, and fitness activities such as walking or rollerblading (Webster et al., 2021). In addition to being encouraged to participate in cardiovascular exercises such as jogging or swimming, students should also engage in resistance training, sometimes known as strength training (Demchenko et al., 2021).

Improving PE teaching may begin by listening to student feedback and collaborating with them on the needs to help students become healthier and more active. Collaboration occurs when teachers implement student suggestions, which helps improve students' attitudes toward physical fitness and their motivation to continue engaging in the activity (Berrigan et al., 2022). This may keep them engaged because they can provide feedback based on their fitness interests. Many students participate in extracurricular activities, the most common being athletics. Students allowed to share the fitness skills learned in the PE program have more purpose and personal

ownership (Tambalis, 2022). Increasing student income for physical fitness activities in the PE curriculum increases student engagement and motivation (Berrigan et al., 2022).

PE teachers should regularly administer fitness tests and report physical fitness levels to students and their parents or guardians to determine their fitness levels. This provides students with an awareness of being active in physical activity. Parents should also be fitness partners, for example, by jogging together or providing the equipment they need for physical activity. PE teachers can also provide parents or guardians with information about physical fitness and extra credit to students whose parents participate in fitness activities with them. PE teachers can help students understand their fitness levels by relating each physical activity to a fitness component (Silverman et al., 2008). Because fitness test results can be linked to extracurricular sports, extending fitness test findings to students outside of school activities can be a smart way to integrate fitness testing and health-related fitness into the PE program (Stockel et al., 2022).

However, the relationship with cardiovascular disease risk factors is less clear, with physical activity having little effect on children's blood pressure or blood lipid levels (Despres et al., 1990). It has been suggested that this may be partly because many young people are already healthy, and most disease endpoints emerge later in life (Biddle et al., 2004). In addition, the role PE and Sport (PESS) can play in combating the well-documented increase in childhood obesity (Baur, 2001; Reilly & Dorotsky, 1999) is unclear. There is some cross-sectional evidence that physical inactivity is associated with the development of obesity (Webster et al., 2021). However, studies investigating the role of physical activity in childhood obesity have been 'uninspiring' (Siedentop et al., 2022).

However, suppose schoolchildren are less active than they should be, for example. In that case, they are said to be expending less energy than their counterparts 50 years ago (Sortwell et al., 2022), and this explains why the case for lifelong physical activity behaviours starts earlier in life. In life, it is now widely accepted (William et al., 2022). It is argued that not only are pupils less active than before, but their levels of physical activity decline, often significantly, as they move into and through adolescence. Male pupils are generally more active than female pupils, and some polarisation is seen between active and inactive (Tambalis, 2022).

MATERIALS AND METHODS

This study employs a quantitative research design consisting of two main components. The first component aims to assess the extent of implementing PE T&L in schools across the Federal Territory of Kuala Lumpur (WPKL), focusing on factors influencing its execution, such as facilities, equipment, and the learning environment. The second component examines the effectiveness of the implementation level of PE T&L on students' physical fitness by comparing their fitness levels across different implementation categories.

The implementation level of PE T&L was assessed using a checklist-based questionnaire designed to collect information on key implementation aspects. These aspects included teacher profiles responsible for T&L, the availability of sports facilities and equipment, the location of PE classes, management regulations, and the safety and maintenance of sports fields and storage facilities. Factors such as school leadership, the adequacy of allocated PE instruction time, student teaching opportunities, and financial provisions for PE were considered. 27 schools out of 89 identified within the study area were selected. The selection was stratified to ensure representation from schools with high, moderate, and low levels of T&L implementation.

This study adopts an ex-post-facto research design, which is causal-comparative. In this approach, respondents are grouped based on differences in T&L implementation levels without manipulating the study variables. This design allows researchers to assess the natural effects of T&L implementation on students' physical fitness without direct intervention. According to Landman (1988), the ex-post-facto design is appropriate for studies investigating causal relationships where the researcher cannot directly control changes in the independent variable.

The effectiveness of T&L implementation on students' physical fitness was evaluated using a pre-test and post-test design without equivalent groups. This design employs a two-factor (2×3) approach, where school category (high, medium, low) and student age are independent variables. Students from schools with high levels of T&L

implementation were compared with those with medium and low levels of implementation to determine whether a higher level of T&L implementation significantly impacts students' physical fitness.

In addition to comparing students' physical fitness levels based on T&L implementation categories, the study also considers several covariates to control for existing differences between groups. These include the age and gender of the student, which can affect physical fitness. The study aims to accurately represent the relationship between T&L implementation and students' physical fitness outcomes by accounting for these variables.

Sample

To determine the required sample size, Miller (2006) suggests that selecting 30% of the total population is sufficient for a robust research study. Based on this principle, 27 secondary schools were selected from a total of 89 schools in the WPKL, ensuring adequate representation of the level of implementation of PE T&L.

The process of determining the study population was conducted in two phases. In the first phase, a random selection of schools was performed from three districts, namely Bangsar/Pudu, which consists of 46 schools; Keramat, with 21 schools; and Sentul, with 22 schools. Following Miller's (2006) recommendation of selecting 30% of the population, 27 schools, representing 30.34% of the total, were identified to reflect different levels of PE T&L implementation.

To collect data, 27 heads of PE panels from the selected schools voluntarily participated in completing the Malaysian Education Quality Standards Questionnaire Wave 2 (SKPMg2) checklist questionnaire. This purposive sampling approach, as suggested by Lodico et al. (2006), ensured that only respondents with in-depth knowledge and experience in PE T&L provided insights, thereby enhancing the reliability and validity of the collected data.

The study's second phase focused on determining the student sample size across different levels of PE T&L implementation. Cohen et al. (2001) emphasize the importance of selecting an appropriate sample size to ensure research reliability and validity. Insufficient sample sizes may lead to biased results, reduced statistical power, and inaccuracies in research findings. To provide statistical robustness, sample size determination was based on a significance level of 0.05, a statistical power of 0.80, and an effect size of 0.50, which is categorized as moderate. Based on these parameters, a minimum of 30 students per age group for both male and female categories was required. The final sample included three age groups—13, 14, and 15 years—corresponding to Form 1, Form 2, and Form 3. The total sample size consisted of 630 students, with an equal distribution of 35 male and 35 female students per age group across the selected schools.

The study adopted an ex-post-facto research design commonly applied in causal-comparative research (Cicciarella, 1997). Unlike experimental designs, ex-post-facto research does not manipulate independent variables but examines naturally occurring differences (Landman, 1988). This approach is particularly suitable for educational research, where ethical and practical constraints prevent direct intervention. This study grouped students based on pre-existing differences in their school's PE T&L implementation levels. This research design objectively evaluated whether students in schools with higher PE T&L implementation exhibited significantly better physical fitness than those with moderate or low implementation levels.

This methodological approach ensures that the study effectively captures the impact of PE T&L implementation on students' physical fitness while maintaining rigorous sampling procedures and controlling for potential external variables. The combination of random sampling in the selection of schools and purposive sampling in selecting teacher respondents enhances the study's validity and reliability, contributing to a robust and comprehensive understanding of the relationship between PE T&L implementation and student fitness levels in secondary schools in WPKL.

Instrument

This study employs two questionnaires and one physical fitness test to collect relevant data. The SKPMg2 questionnaire was utilized in the first phase to assess the level of implementation of PE T&L. Additionally, a

self-reported questionnaire was administered to gather demographic information. In the second phase, the Standard Physical Fitness Test for National Secondary School Students (SEGAK) was conducted to evaluate students' physical fitness levels.

The instruments were selected meticulously to ensure the accuracy and reliability of the measurements for all variables under investigation. Each instrument was carefully chosen based on its validity and appropriateness for assessing the specific constructs within the study. The details of the instruments employed in this research are elaborated in the following sections.

Pilot Study

A pilot study was conducted with 30 PE teachers (15 male and 15 female) willing to participate in the current study. These teachers were distributed across different secondary schools in WPKL. The pilot study ensured that all participating teachers were from the same population examined in the current research. This pilot study was conducted to obtain ethical approval and to provide the researcher with further ideas and insights to increase the chances of obtaining more precise results. Accordingly, the researcher amended the questionnaire based on the comments and suggestions submitted by the pilot subjects, and some questions were omitted because they were not relevant to the field of PE teaching.

Validity is the degree to which a test effectively measures what it is intended to measure (Malina et al., 2004; Lodico et al., 2006). It is difficult to determine the validity of a test or instrument when it is not there. The majority of tests are considered valid. On the other hand, reliability is the consistency of a test or instrument's results when repeated. Lodico et al. (2006) described reliability as the consistency of measurement. As a result, the intra-day and inter-day reliability of the SEGAK test was estimated at around 10% of participants. Then, the correlation between the best and second-best trials was used to determine the intra-day reliability. Inter-day reliability was calculated on measurements taken one week apart. Miller (2006) suggested that a test with a validity coefficient of 0.60 is traditionally appropriate. For a test to be considered highly valid, it must have a high level of reliability (Miller, 2006). Based on the concepts and percentages of the data in Table 1, strong correlations and consistency were observed between the two SEGAK tests and the range was considered acceptable.

Table 1: Pre And Post Correlation For Within-Day And Between-Day Segak Tests

	Pre		Post	
	Within Day	Between Days	Within Day	Between Days
Up and Down the Bench	0.95	0.95	0.96	0.97
Push-up/ modified push-up	0.96	0.96	0.96	0.95
Partial Curl-up	0.97	0.98	0.98	0.97
Sit and Reach	0.94	0.93	0.96	0.95

FINDING

The current study data was analyzed using the Statistical Package for the Social Sciences version 27.0 (SPSS) application based on answering the research questions.

Research Question: Do the SEGAK test scores differ between the PE T&L implementation levels considering gender and age?

To answer this question, an Analysis of Covariance (ANCOVA) analysis will be conducted to determine if there is a difference in students' SEGAK test scores between subjects in gender and age but different levels of implementation without controlling for covariate variables. Bonferroni post hoc tests and pairwise comparison mean will also be conducted to determine the specific factors influencing SEGAK test scores. During the

ANCOVA analysis, students' SEGAK test scores will be included as the dependent variable, while implementation level, gender and age will be included as independent variables.

To study the effect of level on SEGAK test scores, taking into account gender and age as covariates, ANCOVA tests were conducted. The results of descriptive analysis showed in Table 2 that the medium implementation level recorded the highest mean of the pre-dependent variable (M = 12.881, SD = 2.674), followed by the low implementation level (M = 12.467, SD = 2.788) and the high implementation level (M = 11.867, SD = 2.658).

Table 2: Descriptive Analysis Of Segak Test Scores For Gender And Age Between Physical Education Teaching And Learning Implementation Levels

Implementation Levels	***Mean***	***SD***	***N***
High	11.867	2.658	210
Medium	12.881	2.674	210
Low	12.467	2.788	210
Total	12.405	2.735	630

The Bonferroni post-hoc test showed a significant mean difference between high and medium implementation levels (p= 0.000), with high implementation levels having lower pre-test scores than medium implementation levels. However, pre-test scores between high and low implementation levels were statistically similar (p= 0.070), and there was no significant difference between medium and low implementation levels (p= 0.352).

Levene's Test of Equality of Error Variances

The results of Levene's Test of Equality of Error Variances test show an F value of = 0.090 with df1 = 2 and df2 = 627 and a p-value of = 0.914. Since the p-value is > 0.05, there is no significant difference in the error variance of the dependent variable (Pre) across the high, medium, and low implementation levels.

Table 3: Levene's Test Of Equality Of Error Variances Analysis Of Segak Test Scores For Gender And Age Between The Levels Of Physical Education T&L Implementation

Dependent Variable:			
F	***df1***	***df2***	***Sig.***
0.090	2	627	0.914
Tests the null hypothesis that the error variance of the dependent variable is equal across groups.			
a. Design: Intercept + Gender + Age + Level			

The results of this study show that the assumption of homogeneity of variance is met, allowing the use of ANCOVA and post-hoc Bonferroni with more confidence without concern for violating statistical assumptions. The analytical model used in this test includes the variables gender, age, and level of implementation as factors in the study design.

The ANCOVA results showed that the model as a whole was significant (F = 8.816, p < 0.001), with R-squared = 0.053 (Adjusted R-squared = 0.047), indicating that the variables involved in this model could explain only 5.3% of the variance in the pre-test scores. Gender significantly affected the test scores, according to the control variables studied. In contrast, age had no significant effect (F = 0.012, p = 0.913, Partial Eta Squared = 0.000).

Furthermore, the independent variable, implementation level, significantly affected pre-test scores (F = 7.666, p = 0.001, and Partial Eta Squared = 0.024), indicating a significant difference in pre-test scores between implementation levels. Although this model was considered significant, the low R-squared value (5.3%) suggests that other, more important factors not included in this model influenced the test scores. Therefore, additional

analyses, such as post-hoc tests, may be necessary to distinguish very different implementation levels from each other.

The test scores differed at different implementation levels, according to the post hoc results of the ANCOVA test. The minimum pre-test score for the high implementation level was 11.867 (SE = 0.184, 95% CI [11.505, 12.228]), medium was 12.881 (SE = 0.184, 95% CI [12.519, 13.243]), and low was 12.467 (SE = 0.184, 95% CI [12.105, 12.828]).

High and medium implementation levels had a significant difference (p = 0.000), and low and high implementation levels had a significant difference (p = 0.022), indicating that the pre-test scores in both implementation levels were lower. However, no significant difference was found between medium and low implementation levels (p = 0.112), indicating that the pre-test scores of the two groups were almost the same.

Table 4: Ancova Analysis Of Segak Test Scores For Gender And Age Between The Implementation Levels T&L Of Physical Education

Source	***Type III Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***	***Partial Eta Squared***	***Noncent. Parameter***	***Observed Power[b]***
Corrected Model	251.221[a]	4	62.805	8.816	0.000	0.053	35.263	0.999
Intercept	4723.214	1	4723.214	662.991	0.000	0.515	662.991	1.000
Gender	141.906	1	141.906	19.919	**0.000**	0.031	19.919	0.994
Age	0.086	1	0.086	0.012	0.913	0.000	0.012	0.051
Implementation Level	109.229	2	54.614	7.666	**0.001**	0.024	15.332	0.948
Error	4452.565	625	7.124					
Total	101647.000	630						
Corrected Total	4703.786	629						
a. *R Squared* = .053 (Adjusted R Squared = .047)								
b. *Computed using alpha* = .05								
Dependent Variable: SEGAK Test Independent Variable: Implementation Level Control Variable: Age and Gender								

These results suggest that level affects test scores, with the high-level group showing lower scores than the other groups.

Table 5: Post-Hoc Analysis Of Ancova Test Segak Test Scores For Gender And Age Between The Levels Of Implementation T&L Of Physical Education

Level	***Mean***	***SE***	***95% CI***		***Comparison***	***Sig***
			LB	***UB***		
High	11.867[a]	0.184	11.505	12.228	High Vs Medium	**0.000**
Medium	12.881[a]	0.184	12.519	13.243	High Vs Low	**0.022**
Low	12.467[a]	0.184	12.105	12.828	Medium vs Low	0.112

The graph in Figure 1 shows the relationship between the level of implementation and the marginal mean of the pre-test performance score, or pre-score, "Estimated Marginal Means of Score." The X-axis shows the three levels of implementation: high, medium, and low. In contrast, the Y-axis shows the estimated median mean value for the pre-score. The results show that the pre-score is lowest at high implementation, increases to the highest at medium implementation, and decreases again at low implementation. The medium implementation provides the best performance compared to high or low implementation, according to this pattern. According to this interpretation, the medium-level implementation may be more effective in improving initial performance. At the same time, implementation at too high or too low levels may not have the optimal effect. This study may indicate that a balance of implementation is important to achieve the best results regarding education or training.

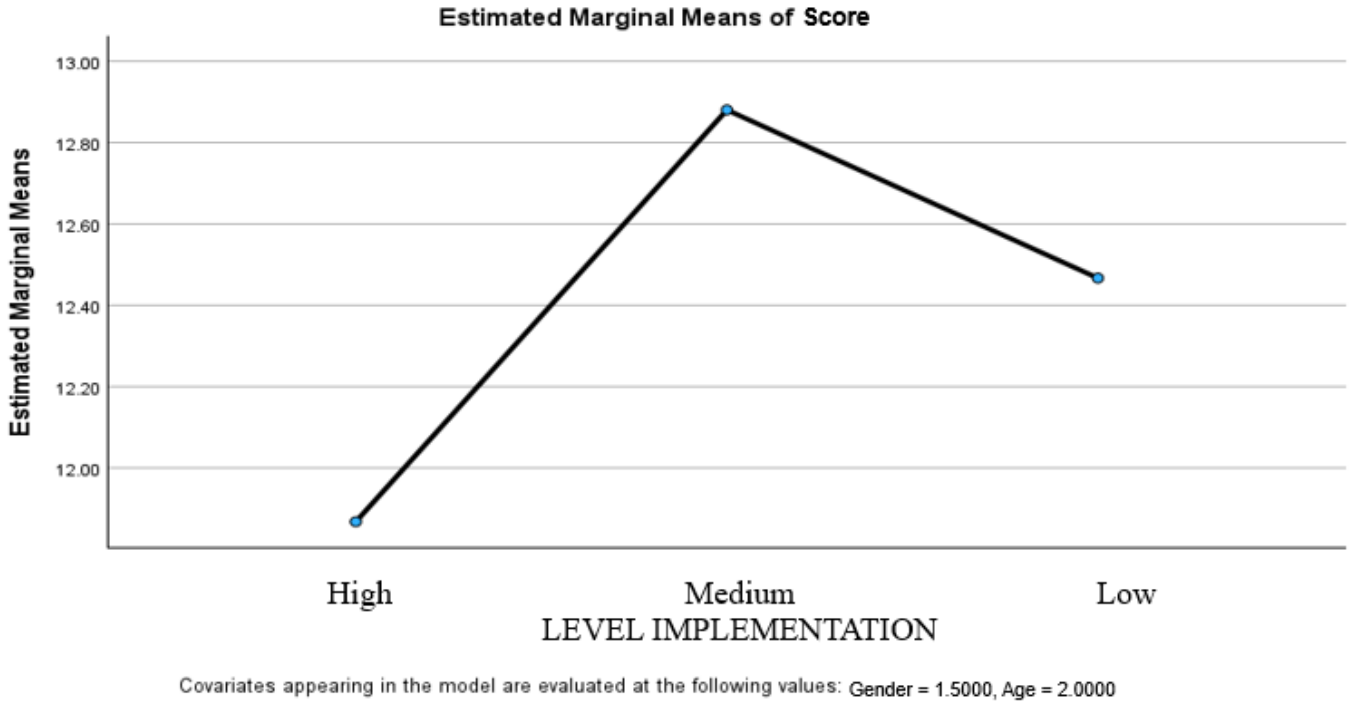

Figure 1: Graph of Estimated Marginal Means Scores Based on Implementation Level

Objective Hypothesis: There is a significant difference in scores based on the level of implementation with age and gender as covariates

SUMMARY

Physical health should be part of any PE curriculum so that students, especially secondary school students, fully understand the importance of having several ways to relate what they are learning to their lives. With more choices in the PE curriculum, students can comfortably participate in fitness activities that suit their needs. Listening to students' views and what they want as part of their fitness plan can only lead to positive participation in PE and a positive attitude about the importance of physical health in their lives. PE teaching allows students to explore and freely move and do activities according to their creativity based on the suggestions and theories presented by teachers before they start the activity. Students in school are bound to be more interested and attracted to PE because they can move without sitting for a long time on a chair and facing a book, which is naturally not their interest as they grow up.

Many factors influence the level of student involvement during PE teaching in doing physical activities. This study found that the factors that hinder physical activity are poor health, parents, exams, and the environment. In addition, interests, peers, and equipment facilities influence participation (Cristina et al., 2019). This is further exacerbated by the lack of equipment and other facilities the school does not give attention to. Students' awareness of the importance of physical activity is only due to factors of interest and peers. The study's results were also supported by Mohd Jaflus (2008) who found that the main factor that hinders student participation in PE T&L in sports activities is the factor of facilities.

The results of the ANCOVA analysis showed significant differences in the SEGAK test scores based on the implementation level of PE, considering age and gender as covariates. The results showed that the medium implementation level recorded higher test scores than the high and low implementation levels. Significant differences were found between the high and medium implementation levels and between the high and low ones. However, there was no significant difference between the medium and low implementation levels.

In addition, gender was found to have a significant effect on test scores, while age did not have a significant effect. Although the overall model was significant, the low R-squared value (5.3%) indicates that other factors not included may also affect test scores.

These findings suggest that moderate implementation levels in PE T&L may improve initial performance on the SEGAK test more effectively than high or low implementation levels. Therefore, teaching and training strategies emphasising balance in implementing PE T&L may help improve students' physical performance more optimally.

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