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# Differentiated Instruction in Physical Education: Influences on Student Passion, Study Habits and Fitness Levels

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**ABSTRACT**

**Background**: Literature has reported that the use of teaching models is becoming more popular in physical education (PE) learning activities increasing in learning activities in physical education (PE). However, research examining the differentiated learning model (DMI) in PE is still very limited, and its impact on passion learning (PL), study habits (SH), and physical fitness (PF) is still unclear. **Objective:** This study aims to determine the effects of DMI program during physical education (PE) towards PL, SH, and PF among students. Methods: Sixty students from junior high schools were involved, and assigned into DMI ($n$ = 30), and control (CG) groups ($n$ = 30). The assessment of PL was conducted by using harmonious passion (HP), obsessive passion (OP), SH with habits towards myself (HTM), habits towards others (HTO), PF with countermovement jump (CMJ), flamingo balance test (FBT), 20 m sprint test (20-mST), agility t-test (ATT), hand grip strength (HGS) were conducted in pre-, mid-, and post-test. **Results:** There are three main findings in this study. First, there were main effects of teaching, time, and interaction on HP ($p$<.001), and OP ($p$<.001). Second, we also found that there was a main effects of teaching, time, and interaction on HTM ($p$<.001), and HTO ($p$<.001). Lastly, there were main effects of teaching, time, and interaction on CMJ ($p$<.001), FBT ($p$<.001). And the same time was also found on 20-mST ($p$<.001), ATT ($p$<.001), and HGS ($p$<.001). **Conclusions:** We concluded that DMI integrated into PE for 11 weeks improved PL, SH, and PF aspects among students.

**Key words:** Habits, Physical Fitness, Physical Education and Training, Passion

## INTRODUCTION

Nowadays, physical education (PE) plays an important role for students at the junior high school level, because it can promote several positive things such as the development of learning knowledge (Coimbra et al., 2021), cognitive function (Gilbert et al., 2023), and academic performance through sports activities carried out at school (Canli et al., 2024). While several previous study reported that PE had been proven effective in improving sports performance, and certain technical skills, promoting a more physical fitness (Reis et al., 2024), and active lifestyle (Silva et al., 2023). Therefore, to ensure that PE was held optimally for students, it is important to design curriculum content in an interesting, challenging, and has the potential to improve several important aspects, for example related to passion learning (PL), study habits (SH), and physical fitness (PF).

According to the dualistic model of passion, which was initially explained by Vallerand (Sverdlik et al., 2022), PL describes a student who has a desire to have an interest, and be involved in a certain enjoyable activity (e.g., sports) (Zhang et al., 2024). PL is described in two dimensions, namely: harmonious passion (HP) is a type of positive passion that is created when students feel free or do not feel forced to participate in a sports activity (Castillo et al., 2020). While obsessive passion (OP) is a type of passion that is created when the activity controls another aspect of the student, and ignores other activities (Kovácsik et al., 2021). In other words, OP causes students forced to do sports activities that are incessant (Peixoto et al., 2021). The popularity of PL has increased, and gained attention from several researchers around the world (Mylonopoulos & Theoharakis, 2023; Uğraş et al., 2024; Yukhymenko-Lescroart, 2022),

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due to its correlation with motivation (Bento et al., 2024; Yukhymenko-Lescroart, 2021), engagement, and academic achievement (Ariani, 2021; Shen, 2024).

Conceptually, SH is interpreted as students' habitual behavior that is often repeated in the school environment (Teixeira et al., 2022). The popularity of SH is currently increasing, and has been widely studied by several world researchers in various fields, especially education (Dubuc et al., 2020; Iqbal et al., 2022; Aquines Gutiérrez et al., 2022). In learning, SH has a vital role as a method to identify variables that increase or decrease the development of academic activities. A previous study explained that SH in the learning activities in schools is an important factor, because it has the potential to foster good learning habits, and ultimately has the opportunity to achieve high academic achievement (George-Reyes et al., 2023). A well-developed SH provides benefits for students, for example, it can be easier to acquire knowledge, and learn a skill (Walck-Shannon et al., 2021). In addition, other studies reported that SH is the main predictor the possibility of students succeeding in their academics (Magulod, 2019). If PL, and SH are well developed among students, it will has a potential to trigger a high level of PF.

PF is another important factor that contributes to students to successfully undergo a long PE process in school. PF is a comprehensive movement ability aspect related to the components of speed, strength, agility, power, balance, flexibility, and endurance (Wang et al., 2023; Zheng et al., 2023), all of these components are needed by students to do sports activities (e.g., running, hitting, kicking, jumping, throwing) in PE class (Hasyim et al., 2024). Data shows that high levels of PF encourage students to get higher levels of sports participation, while low PF results in lower sports activities (Gea-García et al., 2020). Meanwhile, recent research highlights that PF is an important element in influencing academic achievement among students (Canli et al., 2024). Given the importance of PL, SH and PF variables for academic development among students, a curriculum that integrates differentiated model instruction (DMI) is needed.

Currently, there are still different definitions of DMI, but in general DMI is interpreted as a pedagogical approach that presents inclusive learning, and focuses on responding to the diversity of students' learning needs, and interests (Blegur & Hardiansyah, 2024). According to Langelaan et al. (2024), DMI aims to understand students' learning needs, so that learning objectives, curriculum content, teaching methods, learning assignments must be adjusted to the abilities of each student. In addition, DMI has been considered as one of the approaches in the modern learning process that has an important, and effective role fulfilling the different needs of students (Alsalhi et al., 2021). Previous studies have reported several benefits of DMI, for example DMI has a positive impact on academic progress among students (Pozas et al., 2021; Pozas et al., 2023; Ziernwald et al., 2022). Similar results were also reported by a recent study which showed that the positive effects of implementing the DMI program can be a major force in improving students' academic achievement (Taş & Minaz, 2024).

Although DMI has been studied, and applied in educational systems in several countries, to the best of our knowledge, study about DMI in order to improve PL, SH, and PF among students in the context of PE classroom learning still not yet available. In addition, although research on DMI offers some benefits, there is still a real gap, where the comprehensive DMI program is only used in nursing courses, and science courses, so its benefits are not clear in PE classes. Thus, this study seeks to address the gap by evaluating the long-term impact of DMI integrated into PE classes. Thus, the purpose of our current study was to investigate the effects of a DMI program during PE on improving PL, SH, and PF among students. Our hypothes stated that the implementation DMI during PE can improve PL, SH, and PF among students better than the traditional learning group.

## MATERIALS AND METHODS

### Study Design and Participants

The current study was an 11-week experimental to determine how DMI affects PL, SH, and PF among students. This study involved participants who were students (140 males, 80 females) in the first year from three junior high schools located in Karawang City (Indonesia) with a total of 220 students. They were recruited with the following inclusion criteria: (i) students in their first year of study, (ii) did not have chronic diseases (e.g., asthma, heart disease, injury) that could hinder data collection, (iii) did not use any medication that could affect the results of the study, (iv) did not participate in any national or international sporting events. Students who did not meet the inclusion criteria were excluded from the study with reference to the following exclusion criteria: (i) students in their second, and third years, (ii) did not interest in participating in this study, (iii) did not have parental consent, and (iv) having chronic diseases.

A priori sample size calculation was adopted to identify the required sample in this experimental study. G∗Power software (v. 3.1.9.6., Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) was used considering effect size f = 0.30 (medium effect) (ELBanna et al., 2024), power (1-β err prob = 0.80), and p-values = 0.05, two groups, and three measurement times (pre-test, mid-test, and post-test). The calculation results found that the total recommended sample size was at least 20 students. Therefore, 60 first-year students representing three schools were selected, and they were divided through an online randomizer (https://www.randomizer.org/) into the experimental group (DMI, n = 30), and the control group (CG, n = 30) (Table 1). Participants were informed about the procedures of experimental research in accordance with the Declaration of Helsinki (2013). After the participants understood, and agreed, they, and their respective parents must sign a consent form to be fully involved as participants in this experimental study. The Ethics Committee of the Karawang Regency Education Office (registration number: 674-20.09.2024) approved all protocols used in this study.

**Table 1.** Demographic characteristics of each group

| Groups | Biological sex *(n)* | Age (years) | Height (cm) | Weight (kg) | BMI (kg/m$^2$) |
|---|---|---|---|---|---|
| DMI | Boys (15) | 12.2±0.67 | 146±4.31 | 42.9±1.68 | 21.4±0.82 |
| | Girls (15) | 12.0±0.65 | 145±2.88 | 42.3±1.63 | 21.2±1.15 |
| CG | Boys (15) | 12.5±0.51 | 144±2.31 | 44.3±1.33 | 21.9±0.70 |
| | Girls (15) | 11.7±0.45 | 145±2.88 | 41.6±1.59 | 20.7±0.70 |

MDI: Model differentiated instruction; CG: Control group; *n*: Number of participants; BMI: Body mass index

## Instrument

### *Passion learning (PL)*

The instrument adopted to assess the level of passion for learning used the passion scale from previous studies (Castillo et al., 2020). This instrument has 12 question items from two dimensions, namely: (i) harmonious passion (6 items), for example "the learning process in PE makes me have an unforgettable experience", (ii) obsessive passion (6 items), for example "I have almost an obsessive feeling for being in PE classes". Participants responded to all question items using a Likert scale from 1 (strongly disagree) to 5 (strongly agree). The highest score indicates high passion. In our current study, the PL reliability score was reported with an intraclass correlation coefficient (ICC) value of 0.95, and the validity value is 0.81.

### *Study habits (SH)*

Based on previous studies to measure SH in sports, the Self-Report Behavioral Automaticity Index (SRBAI) can be used (Teixeira et al., 2022), but in this study the SRBAI was modified specifically for the PE learning context. The SRBAI has 4 question items from two dimensions: (i) self-study habits (2 items), for example, the question "I can learn the subject matter much better than others", (ii) study habits in others (2 items), for example, the question "I always help friends who have difficult learning in PE class". Participants can answer the SRBAI using a Likert scale ranging from 1 = "totally disagree" to 7 = "totally agree". The behavioral habit score was obtained by calculating the total of all items. In the present study, test-retest reliability scores were shown to be good with an ICC of 0.82, and the validity value of 0.79.

### *Physical fitness (PF)*

*Countermovement jump (CMJ)*

CMJ was used to measure vertical jump height (Kurnaz et al., 2024). This test was conducted with the following instructions. First, the participant stood upright, and hands on the waist. After the whistle sounds, the participant bent their knees until 90°, then pushed their feet to do the highest vertical jump. Each participant conducted this test three times, with a passive recovery time of 45 seconds for each try. The highest vertical jump from the three trials was recorded in centimeters (cm) by the research team which was calculated for statistical analysis (Hasyim et al., 2024).

*Flamingo balance test (FBT)*

FBT was adopted in our study to assess the participants' body balance levels. According to Kurnaz et al. (2024), participants must take off their shoes, and stand on a block. Then one leg was bent backwards, and held by one hand while the other hand was straightened to the side, this standing position imitated flamingo (Figure 1). Participants got three times opportunities to carry out FBT. The assessment was conducted by calculating the total times participants fell or lost balance in 60 seconds (s). If the number of falls increases, then the score would be decrease.

*20m Sprint test (20-mST)*

Running speed ability was assessed through a 20-m sprint test (Jumareng et al., 2024). Participants stood behind the starting line (cone A), and after the whistle sounded, participants ran as fast as possible towards the finish line (cone B) at a distance of 20 m. When participants started to run from the starting line, the stopwatch started counting, and when they reached the finish line the stopwatch was stopped. This sprint test must be carried out twice, with a rest period between trials (Kurnaz et al., 2024). The assessment was carried out by calculating the fastest travel time (s) from the starting line to the finish line.

*Agility T-test (ATT)*

ATT has been documented by previous studies as a valid in-strument to assess agility ability (Kurnaz et al., 2024). The procedure of ATT is as follows. First, participants stood on the starting line (cone one), and after the whistle sounded, the participants ran towards cone two then ran sideways to cone three, and after that ran towards cone four, then ran sideways to cone two, and then ended by running back to the finish line. ATT must be performed by participants three times. Assessment was conducted by calculating the travel time from the starting line to the finish line. From three trials, the fastest score in seconds (s) was recorded for statistical analysis purposes.

Hand Grip Strength (HGS) strength assessment involved a digital hand dyna-mometer (T.K.K. 5401 Grip-D; Takey, Tokyo, Japan) (Cocca et al., 2020; Kurnaz et al., 2024). Participants stood upright holding the digital hand dynamometer and after a whistle, the participant squeezed the device as hard as possible with the most dominant hand. This test was carried out three times and the best result was recorded in kilograms (kg). A high score indicates a high level of grip strength.

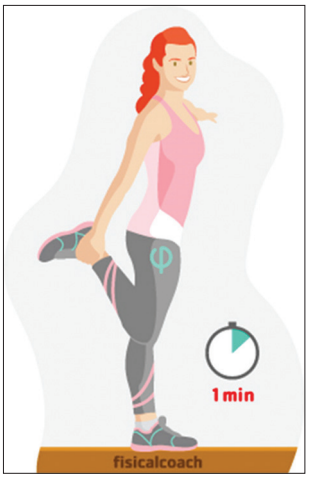


**Figure 1.** Flamingo balance test

This study reported that CMJ, FBT, 20-mST, ATT, and HGS had reliability scores tested by ICC consisting of 0.84, 0.91, 0.81, 0.88, 0.93, and the validity value is 0.97, 0.85, 0.77, 0.85, 0.90, respectively.

### Procedures

An 11-week experimental study was conducted from September until November 2024 with details of three meetings a week, namely on Tuesday, Thursday, and Saturday at a junior high school in Karawang, Indonesia. This study has four stages of activities, namely dcpre-test, intervention program, mid-test, and post-test. The pre-test stage was carried out in the first week, while the intervention program (DMI, CG) was carried out in the second until fifth weeks, the mid-test was carried out in the sixth week, then the intervention program was continued in the seventh to tenth weeks, and ended with a post-test in the eleventh week. All activities were carried out during the regular PE class schedule with the teacher's permission. The activities carried out in the pre-test, mid-test, and post-test were conducted with a passion measurement session from 07:00-08:00 am, study habits from 09:00-10:00 am, and finally a physical fitness measurement session (e.g., CMJ, FBT, 20-mST, ATT, and HGS) was carried out from 11:00-12:00 pm. Participants were required to warm up (10 min), and end with a cool-down (10 min). The research timeline is presented in Figure 2.

### MDI and Control Program

The implemention of DMI program aims to encourage an optimal learning climate, and improve PL, SH, and PF among students. The DMI program was integrated during the morning PE schedule. The teacher who teaches in the DMI group with the initials "RAG", has 15 years teaching experience in PE, while the teacher with the initials "RH", who has 10 years teaching experience as PE teacher, teaches in CG used traditional learning system. Before the program for both groups began, all participants were required to do a warm-up (10 min). DMI used 4 strategies in its learning process, namely: (i) content (what students learn), (ii) process (how students learn), product (how students demonstrate their learning), and the physical learning environment (Table 2). While the control group used a traditional learning model that is usually conducted in daily PE class. The duration of learning activities for both classes was carried out from 07:00-08:30 am. After the learning activities had been completed, all participants from the DMI, and control groups carried out cool-down (10 min).

### Statistical Analysis

Descriptive statistical testing including mean ± standard deviation was performed, and presented in the form of (M±SD). Data normality was performed using Shapiro-Wilk analysis, and the results showed a normal distribution. ICC was used to assess the reliability of each dependent variable. The delta percentage (Δ%) was calculated with the formula: mid-test score – pre-test score/pre-test score x 100 + post-test score – mid-test score/mid-test score x 100/2.

A 2-Way repeated measures ANOVA was used to test the main effect of time (pre- vs mid- vs post-test), the main effect of teaching (DMI vs CG), and the interaction (teaching vs time) on PL, SH, and PF. If a significant interaction effect (teaching vs time) was found, a Bonferroni-adjusted post-hoc test was performed. The effects were calculated by converting partial eta square to Cohen's (d): trivial (<0.2), small (0.2–0.59), medium (0.60–1.19), large (1.2–1.99), and very large (>2.0) (Cohen, 2013). All data were analyzed using Jamovi v.2.3.2 (The Jamovi Project, Sydney, Australia). For all procedures, p<0.05 was set to indicate statistical significance.

## RESULTS

### Effects of DMI and Control on PL

The results of the 2-Way ANOVA repeated measure analysis showed that there were significant main effects of teaching ($F_{[1.58]}$ = 39.8; $p$<.001; $\eta^2p$ = 0.578), time ($F_{[1.58]}$ = 448.5; $p$<.001; $\eta^2p$ = 0.939), and interaction ($F_{[1.58]}$ = 100.1; $p$<.001; $\eta^2p$ = 0.775) on HP, and at the same time, there were significant main effects of teaching ($F_{[1.58]}$ = 95.2; $p$<.001; $\eta^2p$ = 0.766), time ($F_{[1.58]}$ = 451.2; $p$<.001; $\eta^2p$ = 0.940), and interaction ($F_{[1.58]}$ = 103.2; $p$<.001; $\eta^2p$ = 0.781) on OP.

In addition, Bonferroni post hoc showed significant differences in pre-, mid-, and post-test between groups ($p$<.001) (Figure 3), but the magnitude of change was greater in the DMI group (HP Δ: boys = +25.95, girls = +26.89; OP Δ: boys = +26.48, girls = +26.40) compared to CG (HP Δ: boys = +8.96; girls = +11.38; OP Δ: boys = +9.62, girls = +10.87) (Table 3).

### Effects of DMI and Control on SH

The results of the 2-Way ANOVA repeated measure analysis showed that there were significant main effects of teaching ($F_{[1.58]}$ = 7.50; $p$ = 0.010; $\eta^2p$ = 0.205), time ($F_{[1.58]}$ = 628.57; $p$<.001; $\eta^2p$ = 0.956), and interaction ($F_{[1.58]}$ = 8.06; $p$ = 0.002; $\eta^2p$ = 0.217) on HTM. at the same time, there were significant main effects of teaching ($F_{[1.58]}$ = 6.96; $p$ = 0.013; $\eta^2p$ = 0.194), time ($F_{[1.58]}$ = 707.31; $p$<.001; $\eta^2p$ = 0.961), and interaction

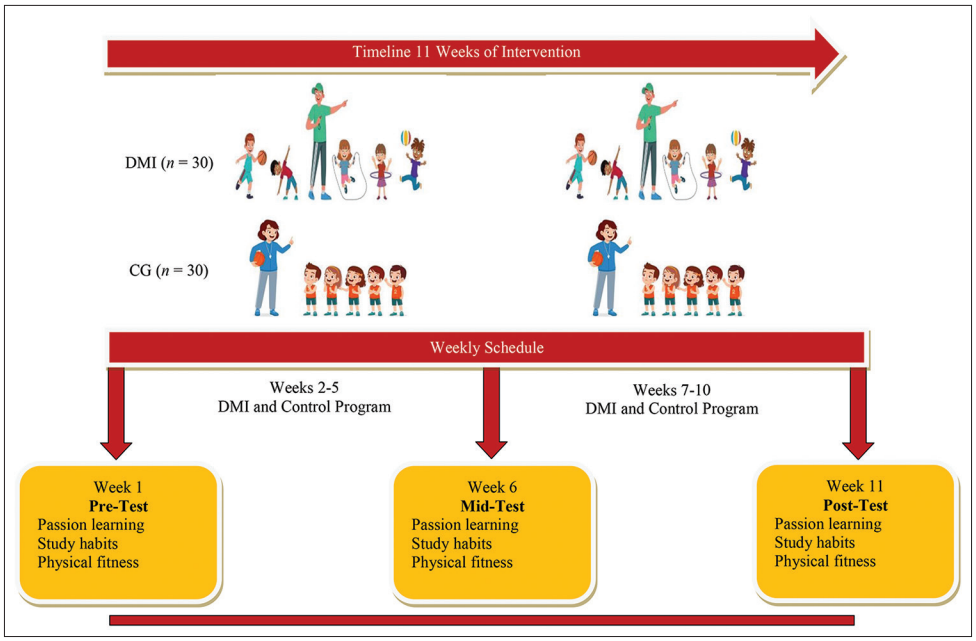


**Figure 2.** Study design

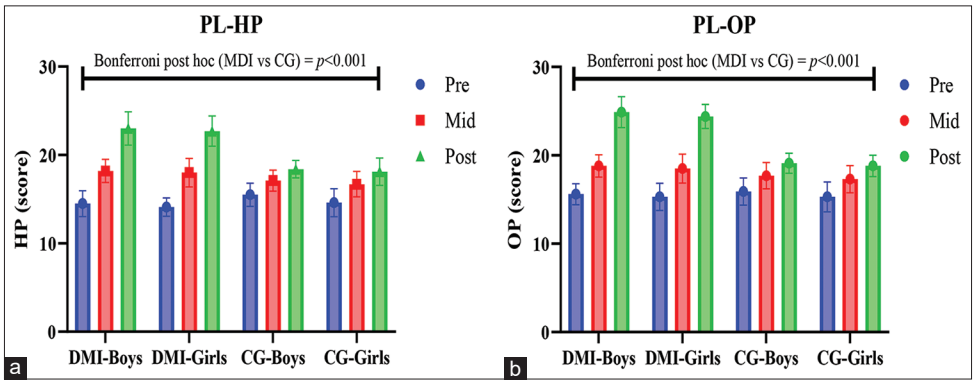


**Figure 3.** Significant differences in pre-, mid-, and post-test on PL [a] HP, [b] OP between teaching

($F_{[1.58]}$ = 35.86; $p$<.001; $\eta^2p$ = 0.553) in HTO. In addition, Bonferroni post hoc showed significant differences in pre-, mid-, and post-test between DMI and CG groups ($p$<0.001) (Figure 4), but the magnitude of change was greater in the DMI group (HTM Δ: boys = +48.92, girls = +40.81; HTO Δ: boys = +47.97, girls = +40.37) compared to CG (HTM Δ: boys = +36.39; girls = +31.53; HTO Δ: boys = +29.97, girls = +24.03) (Table 4).

### Effects of DMI and Control on PF

The results of the 2-Way ANOVA repeated measure analysis showed that there were significant main effects of teaching ($F_{[1.58]}$ = 24.9; $p$<.001; $\eta^2p$ = 0.480), time ($F_{[1.58]}$ = 503.8; $p$<.001; $\eta^2p$ = 0.949), and interaction ($F_{[1.58]}$ = 64.7; $p$<.001; $\eta^2p$ = 0.705) on the CMJ component. At the same time, there were significant main effects of teaching ($F_{[1.58]}$ = 13.4; $p$<.001; $\eta^2p$ = 0.316), time ($F_{[1.58]}$ = 387.1; $p$<.001; $\eta^2p$ = 0.930), and interaction ($F_{[1.58]}$ = 10.3; $p$<.001; $\eta^2p$ = 0.262) on FBT. In the 20-mST component, the main effects of teaching were found ($F_{[1.58]}$ = 19.8; $p$<.001; $\eta^2p$ = 0.405), time ($F_{[1.58]}$] = 411.4; $p$<.001; $\eta^2p$ = 0.934), and interaction ($F_{[1.58]}$ = 12.5; $p$<.001; $\eta^2p$ = 0.301), the ATT component had the main effects of teaching ($F_{[1.58]}$ = 38.13; $p$<.001; $\eta^2p$ = 0.568), time ($F_{[1.58]}$ = 328.94; $p$<.001; $\eta^2p$ = 0.919), and interaction ($F_{[1.58]}$ = 4.69; $p$<.001; $\eta^2p$ = 0.139). Meanwhile, HGS showed the main effects of teaching ($F_{[1.58]}$ = 7.32; $p$<.001; $\eta^2p$ = 0.201), time ($F_{[1.58]}$ = 383.59; $p$<.001; $\eta^2p$ = 0.930), and interaction ($F_{[1.58]}$ = 3.50; $p$<.001; $\eta^2p$ = 0.108). In addition, Bonferroni post hoc showed significant differences in pre-, mid-, and post-test between groups (p<0.001), but the magnitude of change was greater in the DMI group (CMJ Δ: boys = +13.84, girls = +11.86; FBT Δ: boys = -31.96, girls = -31.65; 20-mST Δ: boys = -29.24, girls = -26.54; ATT Δ: boys = -8.63, girls = -12.19; HGS Δ: boys = +11.57, girls = +10.50) compared to CG (CMJ Δ: boys = +8.26, girls = +6.13; FBT Δ: boys = -34.58, girls = -35.12; 20-mST Δ: boys = -31.77, girls = -31.34; ATT Δ: boys = -9.58, girls = -8.01; HGS Δ: boys = +9.39, girls = +9.39) (Table 5).

## DISCUSSION

This study aims to investigate the effects of the DMI program during PE on improving PL, SH, and PF among stu-

**Table 2.** 11-week DMI and control program

| Weeks | DMI | CG (Traditional) |
|---|---|---|
| 1 | Pre-Test: Passion learning; Study habits; Physical fitness | |
| 2-3 | Content: Physical fitness<br>The teacher explains the physical fitness material verbally, and presents a video of physical fitness exercises performed by a professional. Then the students do a warm-up. | Initial activities:<br>Students do a warm-up, including: muscle stretching activities. |
| | Process:<br>Process:<br>The teacher presents a variety of physical activities, including: Bulgarian bag training, yoga, circuit, parkour, pilates, and strength training. The teacher allows students to choose what type of exercise they want to do during the PE class period. | Lesson:<br>The teacher explains, and demonstrates basic techniques in basketball, such as dribbling, shooting, passing, and lay-up to students.<br>Students do the exercises together, and are guided by the teacher |
| | Products:<br>The product is a culminating project that asks students to practice, apply, and extend what they have learned in a unit. In small groups (3-5), students plan, and carry out an exercise that demonstrates knowledge, and understanding.<br>Students can use assessments, and data to highlight progress, and growth in fitness as a final project. | Final activities:<br>The teacher gives positive feedback on the results of the students' exercises. In addition, the teacher provides corrections to the students' performances. |
| | Learning environment:<br>The PE teacher creates an environment that focuses on individual growth, and progress, so that each student feels confident, and comfortable wherever they are (group practice). Then, the session ended with a cool-down. | Final activities:<br>The teacher gives instructions to students to do a cool-down. |
| 4-5 | Content: gymnastics<br>The teacher explains the gymnastics material verbally, and presents a video of gymnastics exercises performed by a professional. Then the students do a warm-up. | Initial activities:<br>Students do a warm-up including: muscle stretching activities. |
| | Process:<br>The teacher presents a variety of exercise activities, including: dance aerobics, tabata or rhythm. The teacher allows students to choose what type of exercise they want to do during the PE class. | Lesson:<br>The teacher explains, and demonstrates basic techniques in volleyball, such as serving, passing, blocking, and smashing to students. Students do the exercises together, and guided by the teacher. |
| | Products:<br>In small groups (3-5), students plan a workout.<br>Students can use assessments, and data to highlight progress, and growth in gymnastics skills as a final project. | Evaluation:<br>The teacher gives positive feedback on the results of students' exercises. In addition, the teacher provides corrections to the students' performances. |
| | Learning environment:<br>The PE teacher creates an environment that focuses on individual growth, and progress, so that each student feels confident, and comfortable wherever they are (group practice). This session ends with a cool-down. | Final activities<br>The teacher gives instructions to students to do a cool-down. |
| 6 | Mid-Test: Passion learning; Study habits; Physical fitness | |
| 7-8 | Content: Self-defense<br>The teacher explains self-defense material verbally, and presents a video of self-defense training done by a professional. Then the students do a warm-up. | Initial activities:<br>Students do a warm-up in the form of muscle stretching activities |
| | Process:<br>The teacher presents various types of martial arts, including: pencak silat, karate, taekwondo, and muay thai. The teacher allows students to choose what type of training they want to do during the PE class period. | Lesson:<br>The teacher explains, and demonstrates several forms of physical fitness exercises: push-ups, sit-ups, pull-ups, 5 m sprints, squads, planks.<br>Students do the exercises together, and are guided by the teacher. |
| | Products:<br>In small groups (3-5), students plan, and carry out exercises. Students use assessments, and data to highlight progress, and growth in self-defence skills as a final project. | Evaluation:<br>The teacher provides positive feedback on the results of the students' fitness training. In addition, the teacher provides corrections to the students' performance. |
| | Learning environment:<br>The PE teacher creates an environment that focuses on individual growth, and progress, so that each student feels confident, and comfortable wherever they are (group practice). This session ends with a cool-down. | Final activities:<br>The teacher gives instructions to students to do a cool-down. |

(*Contd...*)

**Table 2.** *(Continued)*

| Weeks | DMI | CG (Traditional) |
|---|---|---|
| 9-10 | Content: Water activities<br>The teacher explains the water activity material verbally, and presents a video of the type of exercise done by a professional. Then, the students do a warm-up. | Initial activities:<br>Students do a warm-up in the form of muscle stretching activities. |
| | Process:<br>The teacher presents various types of water activities, including: water polo, swimming, diving, aqua jogging. The teacher allows students to choose type of exercise during the PE class. | Lesson:<br>The teacher explains, and demonstrates basic swimming techniques including: freestyle, backstroke and breaststroke. Students do the exercises together, and are guided by the teacher. |
| | Products:<br>In small groups (3-5), students plan, and execute exercises. Students can use assessments, and data to highlight progress, and growth in self-defense skills as a final project. | Evaluation:<br>The teacher provides positive feedback on the results of the students' fitness training. In addition, the teacher provides corrections to the students' performance. |
| | Learning environment:<br>The PE teacher creates an environment that focuses on individual growth, and progress, so that each student feels confident, and comfortable wherever they are (group practice). The session ends with a cool-down. | Final activities:<br>The teacher gives instructions to students to do a cool-down. |
| 11 | Post-Test: Passion learning; Study habits; Physical fitness | |

**Table 3.** Effects of teaching [diferentiated model instruction vs control] on passion learning

| Parameters | Teachings | Sex [n] | Pre- | Mid- | Post- | Δ (%) | 2-Way ANOVA repearted measure | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Main Effects | | Interactions |
| | | | | | | | Teaching | Time | Teaching vs Time |
| PL | | | | | | | | | |
| HP (score) | DMI | Boys [15] | 14.5±1.46 | 18.2±1.32 | 23.0±1.89 | +25.95 | $F_{[1.58]} = 39.8$ $p<.001$ $\eta^2p=0.578$ | $F_{[1.58]} = 448.5$ $p<.001$ $\eta^2p=0.939$ | $F_{[1.58]} = 100.1$ $p<.001$ $\eta^2p=0.775$ |
| | | Girls [15] | 14.1±1.03 | 18.0±1.60 | 22.7±1.71 | +26.89 | | | |
| | CG | Boys [15] | 15.5±1.30 | 17.1±1.19 | 18.4±0.98 | +8.96 | | | |
| | | Girls [15] | 14.6±1.59 | 16.7±1.44 | 18.1±1.55 | +11.38 | | | |
| OP (score) | DMI | Boys [15] | 15.6±1.18 | 18.8±1.26 | 24.9±1.75 | +26.48 | $F_{[1.58]} = 95.2$ $p<.001$ $\eta^2p=0.766$ | $F_{[1.58]} = 451.2$ $p<.001$ $\eta^2p=0.940$ | $F_{[1.58]} = 103.2$ $p<.001$ $\eta^2p=0.781$ |
| | | Girls [15] | 15.3±1.54 | 18.5±1.64 | 24.4±1.35 | +26.40 | | | |
| | CG | Boys [15] | 15.9±1.55 | 17.7±1.49 | 19.1±1.13 | +9.62 | | | |
| | | Girls [15] | 15.3±1.68 | 17.3±1.54 | 18.8±1.21 | +10.87 | | | |

PL: Passion learning; HP: Harmonious passion; OP: Obsessive passion; DMI: Diferentiated model instruction; CG: Control group; Δ (%): Delta percentage. Significance level at $p<0.05$

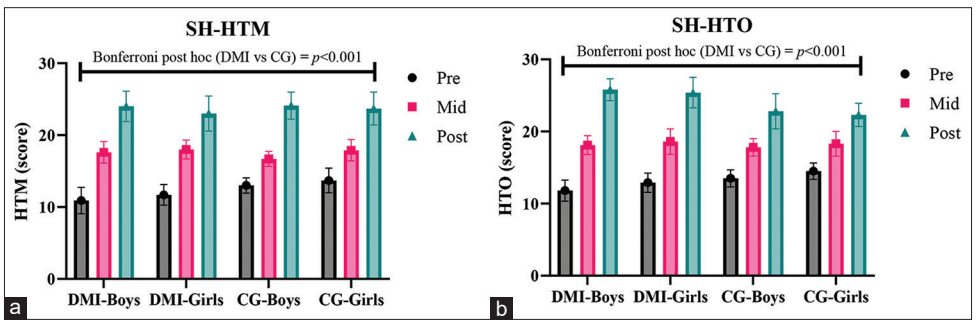


**Figure 4.** Significant differences in pre-, mid-, and post-test on SH [a] HTM, [b] HTO between teaching

dents. The first finding confirms the proposed hypothesis, that this is the first study to provide new information that DMI, and CG both have the same effect on improving PL. However, the DMI group showed a greater increase than the CG group. This is because the DMI program has the advantage of presenting a various learning activity process that is suitable to the interest, and needs of each student (Pozas et al., 2020; Achmad et al., 2024; Langelaan et al., 2024). Stu-

**Table 4.** Effects of teaching [diferentiated model instruction vs control] on study habits

| Parameters | Teachings | Sex [*n*] | Pre- | Mid- | Post- | Δ (%) | 2-Way ANOVA repearted measure | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Main Effects | | Interactions |
| | | | | | | | Teaching | Time | Teaching vs Time |
| SH | | | | | | | | | |
| HTM (score) | DMI | Boys [15] | 10.9±1.83 | 17.6±1.50 | 24.0±2.10 | +48.92 | $F_{[1.58]}$ = 7.50 p=0.010 $\eta^2$p=0.205 | $F_{[1.58]}$ = 628.57 *p*<.001 $\eta^2$p=0.956 | $F_{[1.58]}$ = 8.06 p=0 0.002 $\eta^2$p=0.217 |
| | | Girls [15] | 11.7±1.45 | 18.0±1.31 | 23.0±2.45 | +40.81 | | | |
| | CG | Boys [15] | 13.0±1.07 | 16.7±1.03 | 24.1±1.88 | +36.39 | | | |
| | | Girls [15] | 13.7±1.71 | 17.9±1.49 | 23.7±2.29 | +31.53 | | | |
| HTO (score) | DMI | Boys [15] | 11.8±1.47 | 18.1±1.30 | 25.8±1.52 | +47.97 | $F_{[1.58]}$ = 6.96 p=0.013 $\eta^2$p=0.194 | $F_{[1.58]}$ = 707.31 *p*< .001 $\eta^2$p=0.961 | $F_{[1.58]}$ = 35.86 *p*< .001 $\eta^2$p=0.553 |
| | | Girls [15] | 12.9±1.33 | 18.6±1.76 | 25.4±2.10 | +40.37 | | | |
| | CG | Boys [15] | 13.5±1.19 | 17.8±1.21 | 22.8±2.43 | +29.97 | | | |
| | | Girls [15] | 14.5±1.13 | 18.3±1.71 | 22.3±1.62 | +24.03 | | | |

SH: Study habits; HTM: Habits towards myself; HTO: Habits towards others; DMI: Diferentiated model instruction; CG: Control group; Δ (%): Delta percentage. Significance level at $p<0.05$

dent heterogeneity was clearly observed in every learning process around the world (e.g., gender, interests, motivation, learning development stage), which became attention, and can be overcome by every teacher through the MDI program (Blegur & Hardiansyah, 2024). The findings in this study were supported by previous literature studies which explain that MDI can be used by teachers as a method to encourage psychological aspects (motivation) of students, which is better than traditional learning (Utami et al., 2024; Ziernwald et al., 2022). On the other hand, Liou et al. (2023) reported that integrated MDI in PE would be an appropriate pedagogical tool for teachers to improve the level of learning interests among students. Thus, by integrating MDI in PE, a teacher could encourage students to be more active, and enthusiastic in learning. Based on our observation, implementing this strategy improved psychological aspects such as PL (e.g., HP, OP) among students every week.

The next finding from this study is the 11-week MDI program was proven to be effective in ninfluencing students' SH than the CG group. This is because MDI encourages, and presents a diverse learning experience that can be chosen according to students' interests. For example, in physical fitness material, students can choose several physical activity programs that they want to do such as Bulgarian bag training, yoga, circuit, parkour, pilates, and strength training. With multiple movement experiences gained by students, it is believed to be an effective way to improve learning habits in PE classes. This is aligns with previous studies, which mentioned that various sports activity programs during PE classes can have a positive impact on behavior changes in sport participation (Coimbra et al., 2021; Sayyd et al., 2021). Another study reported similar results, in education MDI practices support the development of emotional behavior, and ultimately affect students' academic achievement (Pozas et al., 2021). Basically, MDI presents student-centered learning, thus providing greater opportunities for students to change their learning behavior (Ismail & Al Allaq, 2019; Liou et al., 2023). Thus, several previous studies agreed that MDI offers the best learning opportunities for students, and ultimately has a positive effect not only on academic achievement (Hasanah et al., 2022; Meutstege et al., 2023; Ziernwald et al., 2022), but also on the SH aspect which has been confirmed in this study. The latest findings showed that MDI had also proven effective in improving PF levels among students. These results were confirmed by several previous studies, PE programs that presented various types of sports activities such as handball, volleyball, Frisbee, wrestling (Reis et al., 2024), and rhythm is an effective way to increase PF levels (Wang et al., 2023). In addition, the findings of Silva et al. (2023), showed that physical fitness experienced higher changes when students were involved in a PE program with diverse, interesting, and rich physical vehicles for movement experiences such as plank shoulder taps, Russian twists or horizontal impulses. A similar result was also reported by Sepúlveda-Figueroa et al. (2023), that circuit training activities such as isometric push-ups, and sit-ups during PE were positive efforts and had great potential to increase PF.

## Strength and Future Implications

The main strength of this research is designed MDI program during PE that presents a fun, challenging, easy, and rich learning process for students. In addition, this program was created specifically to improve several important aspects such as PL, SH, and PF during PE for junior high school students. However, this study still has limitations, including: (i) the participants involved only came from one junior high school in Karawang district (Indonesia), (ii) the MDI program was specifically designed for students at the junior high school level. It is recommended that future research needs to be done by considering adding participants from several junior high schools or involving students from senior high schools in Indonesia. In addition, the DMI program must continue to be evaluated so that it can be used by students in all levels of education such as senior high schools.

**Table 5.** Effects of teaching [diferentiated model instruction vs control] on physical fitness

| Parameters | Teachings | Sex [*n*] | Pre- | Mid- | Post- | Δ (%) | 2-Way ANOVA repearted measure | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Main Effects | | Interactions | Bonferroni *post hoc* |
| | | | | | | | Teaching | Time | Teaching vs Time | |
| PF | | | | | | | | | | |
| CMJ (cm) | DMI | Boys [15] | 19.2±1.21 | 20.6±1.35 | 24.8±1.21 | +13.84 | $F_{[1.58]} = 24.9$ $p < .001$ $\eta^2p = 0.480$ | $F_{[1.58]} = 503.8$ $p < .001$ $\eta^2p = 0.949$ | $F_{[1.58]} = 64.7$ $p < .001$ $\eta^2p = 0.705$ | MDI vs CG [$p<0.001$] |
| | | Girls [15] | 19.2±0.94 | 20.8±1.01 | 24.0±1.13 | +11.86 | | | | |
| | CG | Boys [15] | 18.6±1.45 | 20.1±1.06 | 21.8±1.15 | +8.26 | | | | |
| | | Girls [15] | 19.0±1.25 | 20.1±1.36 | 21.4±1.45 | +6.13 | | | | |
| FBT (s) | DMI | Boys [15] | 4.93±0.88 | 3.60±0.73 | 2.27±0.59 | -31.96 | $F_{[1.58]} = 13.4$ $p < .001$ $\eta^2p = 0.316$ | $F_{[1.58]} = 387.1$ $p < .001$ $\eta^2p = 0.930$ | $F_{[1.58]} = 10.3$ $p < .001$ $\eta^2p = 0.262$ | MDI vs CG [$p<0.001$] |
| | | Girls [15] | 4.87±0.74 | 3.60±0.63 | 2.26±0.58 | -31.65 | | | | |
| | CG | Boys [15] | 5.47±0.74 | 4.20±0.86 | 2.27±0.59 | -34.58 | | | | |
| | | Girls [15] | 5.46±0.64 | 4.00±0.75 | 2.26±0.57 | -35.12 | | | | |
| 20-mST (s) | DMI | Boys [15] | 5.07±0.79 | 3.80±0.77 | 2.53±0.64 | -29.24 | $F_{[1.58]} = 19.8$ $p < .001$ $\eta^2p = 0.405$ | $F_{[1.58]} = 411.4$ $p < .001$ $\eta^2p = 0.934$ | $F_{[1.58]} = 12.5$ $p < .001$ $\eta^2p = 0.301$ | MDI vs CG [$p<0.001$] |
| | | Girls [15] | 5.20±0.56 | 4.00±0.65 | 2.80±0.41 | -26.54 | | | | |
| | CG | Boys [15] | 5.93±0.79 | 4.47±0.74 | 2.73±0.79 | -31.77 | | | | |
| | | Girls [15] | 6.00±0.75 | 4.53±0.99 | 2.80±0.67 | -31.34 | | | | |
| ATT (s) | DMI | Boys [15] | 12.7±1.07 | 11.8±0.95 | 10.6±0.61 | -8.63 | $F_{[1.58]} = 38.13$ $p < .001$ $\eta^2p = 0.568$ | $F_{[1.58]} = 328.94$ $p < .001$ $\eta^2p = 0.919$ | $F_{[1.58]} = 4.69$ $p < .001$ $\eta^2p = 0.139$ | MDI vs CG [$p<0.001$] |
| | | Girls [15] | 13.9±1.14 | 12.7±1.08 | 10.7±0.85 | -12.19 | | | | |
| | CG | Boys [15] | 13.7±1.04 | 12.3±0.85 | 11.2±0.78 | -9.58 | | | | |
| | | Girls [15] | 14.3±0.78 | 13.0±1.07 | 12.1±0.92 | -8.01 | | | | |
| HGS (kg) | DMI | Boys [15] | 23.7±2.45 | 26.4±1.21 | 29.5±1.01 | +11.57 | $F_{[1.58]} = 7.32$ $p < .001$ $\eta^2p = 0.201$ | $F_{[1.58]} = 383.59$ $p < .001$ $\eta^2p = 0.930$ | $F_{[1.58]} = 3.50$ $p < .001$ $\eta^2p = 0.108$ | MDI vs CG [$p<0.001$] |
| | | Girls [15] | 24.0±1.88 | 26.3±1.22 | 29.3±1.94 | +10.50 | | | | |
| | CG | Boys [15] | 23.4±0.91 | 25.5±1.32 | 28.0±1.44 | +9.39 | | | | |
| | | Girls [15] | 23.9±1.27 | 26.3±1.05 | 28.6±0.87 | +9.39 | | | | |

PF: Physical fitness; CMJ: Countermovement jump; FBT: Flamingo balance test; 20-mST: 20 m sprint test; ATT: Agility t-test; HGS: Hand grip strength; DMI: Diferentiated model instruction; CG: Control group; Δ (%): Delta percentage. Significance level at $p < 0.05$

## CONCLUSION

In conclusion, the DMI program integrated into PE for 11 weeks is proven to be effective in improving PL, SH, and PF aspects among junior high school students. This study contributes as important information for teachers to implement the DMI program in the long term in PE classes so that it is expected to achieve optimal improvements in PL, SH, and PF.

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We agreed there would be no acknowledgments.

## DATA AVAILABILITY

All authors declare that the data in this study are accessible from the corresponding author upon reasonable request.

## AUTHOR CONTRIBUTIONS

AA, WSS, AK, WS, and MFP contributed to the conception, design, data collection, supervision of the study, and drafting the manuscript, revising, and finalizing it for publication. Meanwhile, KB, AK, ZBK, JL, and ES contributed to conception, design, drafting the manuscript, revising, and data analysis. "All authors read, and approved the final version of the manuscript."

## ETHICAL APPROVAL

This study has been approved by the Committee of the Karawang Regency Education Office (registration number: 674-20.09.2024.

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## REFERENCES

Achmad, W. K. S., Rachman, S. A., Aras, L., & Amran, M. (2024). Differentiated instruction in reading in elementary schools: a systematic review. *International Journal of Evaluation and Research in Education*, *13*(3), 1997–2005. https://doi.org/10.11591/ijere.v13i3.27134

Alsalhi, N. R., Abdelrahman, R., Abdelkader, A. F. I., Ahmad Al-Yatim, S. S., Habboush, M., & Qawasmi, A. Al. (2021). Impact of Using the Differentiated Instruction (DI) Strategy on Student Achievement in an Intermediate Stage Science Course. *International Journal of Emerging Technologies in Learning*, *16*(11), 25–45. https://doi.org/10.3991/ijet.v16i11.22303

Aquines Gutiérrez, O., Hernández Taylor, D. M., Santos-Guevara, A., Chavarría-Garza, W. X., Martínez-Huerta, H., & Galloway, R. K. (2022). How the Entry Profiles and Early Study Habits Are Related to First-Year Academic Performance in Engineering Programs. *Sustainability (Switzerland)*, *14*(22), 1–19. https://doi.org/10.3390/su142215400

Ariani, D. W. (2021). The Relationship of Passion, Burnout, Engagement, and Performance: An Analysis of Direct and Indirect Effects among Indonesian Students. *The Journal of Behavioral Science*, *16*(3), 86–98.

Bento, T., Vitorino, A., Cid, L., Monteiro, D., & Couto, N. (2024). Analysing the Relation between Passion, Motivation, and Subjective Well-Being in Sport: A Systematic Review. *Sports*, *12*(10), 1–14. https://doi.org/10.3390/sports12100279

Blegur, J., & Hardiansyah, S. (2024). Differentiation instruction publications in physical education: bibliometric analysis of the last ten years. *Journal of Education and Learning*, *18*(3), 902–913. https://doi.org/10.11591/edulearn.v18i3.21307

Canli, U., Aldhahi, M. I., & Küçük, H. (2024). Association of Physiological Performance, Physical Fitness, and Academic Achievement in Secondary School Students. *Children*, *11*(4). https://doi.org/10.3390/children11040396

Castillo, I., Molina-García, J., Estevan, I., Queralt, A., & Álvarez, O. (2020). Transformational teaching in physical education and students' leisure-time physical activity: The mediating role of learning climate, passion and self-determined motivation. *International Journal of Environmental Research and Public Health*, *17*(13), 1–16. https://doi.org/10.3390/ijerph17134844

Cocca, A., Verdugo, F. E., Cuenca, L. T. R., & Cocca, M. (2020). Effect of a game-based physical education program on physical fitness and mental health in elementary school children. *International Journal of Environmental Research and Public Health*, *17*(13), 1–13. https://doi.org/10.3390/ijerph17134883

Cohen, J. (2013). *Statistical Power Analysis for the Behavioral Sciences*. Routledge Academic.

Coimbra, M., Cody, R., Kreppke, J. N., & Gerber, M. (2021). Impact of a physical education-based behavioural skill training program on cognitive antecedents and exercise and sport behaviour among adolescents: a cluster-randomized controlled trial. *Physical Education and Sport Pedagogy*, *26*(1), 16–35. https://doi.org/10.1080/17408989.2020.1799966

Dubuc, M. M., Aubertin-Leheudre, M., & Karelis, A. D. (2020). Lifestyle habits predict academic performance in high school students: The adolescent student academic performance longitudinal study (ASAP). *International Journal of Environmental Research and Public Health*, *17*(1), 1–15. https://doi.org/10.3390/ijerph17010243

ELBanna, M. M., Kamel, D. M., Shaaban, A., Botla, A. M., & Hamoda, R. E. (2024). Effect of Yoga Training and High Probiotic Food Supplements on Insulin-Resistance in Polycystic-Ovarian-Syndrome: A Randomized Controlled Trial. *International Journal of Kinesiology and Sports Science*, *12*(3), 52–61. https://doi.org/10.7575/10.7575/aiac.ijkss.v.12n.3p.52

Gea-García, G. M., González-Gálvez, N., Espeso-García, A., Marcos-Pardo, P. J., González-Fernández, F. T., & Martínez-Aranda, L. M. (2020). Relationship Between the Practice of Physical Activity and Physical

Fitness in Physical Education Students: The Integrated Regulation As a Mediating Variable. *Frontiers in Psychology*, *11*(July), 1–14. https://doi.org/10.3389/fpsyg.2020.01910

George-Reyes, C. E., Glasserman-Morales, L. D., Rocha-Estrada, F. J., & Ruíz-Ramírez, J. A. (2023). Study Habits Developed by Mexican Higher Education Students during the Complexity of the COVID-19 Pandemic. *Education Sciences*, *13*(6). https://doi.org/10.3390/educsci13060563

Gilbert, L. M., Dring, K. J., Williams, R. A., Boat, R., Sunderland, C., Morris, J. G., Nevill, M. E., & Cooper, S. B. (2023). Effects of a games-based physical education lesson on cognitive function in adolescents. *Frontiers in Psychology*, *14*(March). https://doi.org/10.3389/fpsyg.2023.1098861

Hasanah, E., Suyatno, S., Maryani, I., Badar, M. I. Al, Fitria, Y., & Patmasari, L. (2022). Conceptual Model of Differentiated-Instruction (DI) Based on Teachers' Experiences in Indonesia. *Education Sciences*, *12*(10). https://doi.org/10.3390/educsci12100650

Hasyim, H., Hakim, H., Kasmad, M. R., Ramli, R., Setiawan, I., Kurtoğlu, A., Govindasamy, K., Lobo, J., Poblete-Valderrama, F., & Setiawan, E. (2024). The Effect of Parkour Activities on Specific Physical Fitness and Grit in the Population of Healthy Youth Football Athletes. *Journal of Population and Social Studies*, *33*, 491–506. https://doi.org/10.25133/JPSSV332025.026

Iqbal, J., Asghar, M. Z., Ashraf, M. A., & Yi, X. (2022). The Impacts of Emotional Intelligence on Students' Study Habits in Blended Learning Environments: The Mediating Role of Cognitive Engagement during COVID-19. *Behavioral Sciences*, *12*(1). https://doi.org/10.3390/BS12010014

Ismail, S. A. A., & Al Allaq, K. (2019). The Nature of Cooperative Learning and Differentiated Instruction Practices in English Classes. *SAGE Open*, *9*(2). https://doi.org/10.1177/2158244019856450

Jumareng, H., Setiawan, E., Tannoubi, A., Lardika, R. A., Adil, A., Gazali, N., Gani, R. A., Ahmedov, F., Kurtoğlu, A., & Alexe, D. I. (2024). Small Sided Games 3vs3 Goalkeeper-Encouragement: Improve the Physical and Technical Performance of Youth Soccer Players. *European Journal of Human Movement*, *52*(6).

Kovácsik, R., Tóth-Király, I., Egorov, A., & Szabo, A. (2021). A Longitudinal Study of Exercise Addiction and Passion in New Sport Activities: the Impact of Motivational Factors. *International Journal of Mental Health and Addiction*, *19*(5), 1511–1526. https://doi.org/10.1007/s11469-020-00241-z

Kurnaz, M., Flôres, F., Altınkök, M., Esen, H. T., & Silva, A. F. (2024). A 10-week play-based after-school program to improve coordinative abilities and physical fitness capabilities among adolescents: a randomized trial. *Scientific Reports*, *14*(1), 1–10. https://doi.org/10.1038/s41598-024-61275-0

Langelaan, B. N., Gaikhorst, L., Smets, W., & Oostdam, R. J. (2024). Differentiating instruction: Understanding the key elements for successful teacher preparation and development. *Teaching and Teacher Education*, *140*(January), 104464. https://doi.org/10.1016/j.tate.2023.104464

Liou, S. R., Cheng, C. Y., Chu, T. P., Chang, C. H., & Liu, H. C. (2023). Effectiveness of differentiated instruction on learning outcomes and learning satisfaction in the evidence-based nursing course: Empirical research quantitative. *Nursing Open*, *10*(10), 6794–6807. https://doi.org/10.1002/nop2.1926

Magulod, G. C. (2019). Learning styles, study habits and academic performance of Filipino university students in applied science courses: Implications for instruction. *Journal of Technology and Science Education*, *9*(2), 184–198. https://doi.org/10.3926/jotse.504

Meutstege, K., Vrielink, M., van Geel, M., & Visscher, A. J. (2023). A cognitive task analysis of the teacher skills and knowledge required for differentiated instruction in secondary education. *Frontiers in Education*, *8*(October), 1–14. https://doi.org/10.3389/feduc.2023.1171554

Mylonopoulos, N., & Theoharakis, V. (2023). Passion for an activity and its role on affect: Does personality and the type of activity matter? *Frontiers in Psychology*, *13*(January), 1–8. https://doi.org/10.3389/fpsyg.2022.1047257

Peixoto, E. M., Pallini, A. C., Vallerand, R. J., Rahimi, S., & Silva, M. V. (2021). The role of passion for studies on academic procrastination and mental health during the COVID-19 pandemic. *Social Psychology of Education*, *24*(3), 877–893. https://doi.org/10.1007/s11218-021-09636-9

Pozas, M., Letzel-Alt, V., & Schwab, S. (2023). The effects of differentiated instruction on teachers' stress and job satisfaction. *Teaching and Teacher Education*, *122*, 103962. https://doi.org/10.1016/j.tate.2022.103962

Pozas, M., Letzel, V., Lindner, K. T., & Schwab, S. (2021). DI (Differentiated Instruction) Does Matter! The Effects of DI on Secondary School Students' Well-Being, Social Inclusion and Academic Self-Concept. *Frontiers in Education*, *6*(December), 1–11. https://doi.org/10.3389/feduc.2021.729027

Pozas, M., Letzel, V., & Schneider, C. (2020). Teachers and differentiated instruction: exploring differentiation practices to address student diversity. *Journal of Research in Special Educational Needs*, *20*(3), 217–230. https://doi.org/10.1111/1471-3802.12481

Reis, L. N., Reuter, C. P., Burns, R. D., Martins, C. M. de L., Mota, J., Gaya, A. C. A., Silveira, J. F. de C., & Gaya, A. R. (2024). Effects of a physical education intervention on children's physical activity and fitness: the PROFIT pilot study. *BMC Pediatrics*, *24*(1), 1–11. https://doi.org/10.1186/s12887-024-04544-1

Sayyd, S. M., Zainuddin, Z. A. Bin, Ghabban, F. M., & Altowerqi, Z. M. (2021). Influence of sports facilities and programs on sports participation at saudi universities. *Journal of Physical Education and Sport*, *21*(4), 2302–2307. https://doi.org/10.7752/jpes.2021.s4293

Sepúlveda-Figueroa, F., Bezerra, A., de Freitas, L. C., Cristi-Montero, C., Hurtado-Almonácid, J., Páez-Herrera, J., Carrasco-Beltrán, H., Zavala-Jara, M.,

Ibarra-Mora, J., Mendoza, E., & Reyes-Amigo, T. (2023). Effect of a physical activity program on fitness perception of 9 to 11-year-old schoolchildren. *Cultura, Ciencia y Deporte*, *18*(58), 129–137. https://doi.org/10.12800/ccd.v18i58.2061

Shen, Y. (2024). Harmonious passion and academic achievement in higher education: The mediating influence of exploratory and exploitative learning strategies. *Heliyon*, *10*(9), e29943. https://doi.org/10.1016/j.heliyon.2024.e29943

Silva, A., Ferraz, R., Branquinho, L., Dias, T., Teixeira, J. E., & Marinho, D. A. (2023). Effects of applying a multivariate training program on physical fitness and tactical performance in a team sport taught during physical education classes. *Frontiers in Sports and Active Living*, *5*(November), 1–12. https://doi.org/10.3389/fspor.2023.1291342

Silva, D. R., Araujo, R. H. O., Werneck, A. O., Ballarin, G., Andricciola, F., dos Santos, L., & Brazo-Sayavera, J. (2023). Are more physical education classes related to less time in leisure-time sedentary behavior? An analysis including adolescents from 73 countries. *BMC Public Health*, *23*(1), 1–7. https://doi.org/10.1186/s12889-023-16703-7

Sverdlik, A., Rahimi, S., & Vallerand, R. J. (2022). Examining the role of passion in university students' academic emotions, self-regulated learning and well-being. *Journal of Adult and Continuing Education*, *28*(2), 426–448. https://doi.org/10.1177/14779714211037359

Taş, H., & Minaz, M. B. (2024). The Effects of Learning Style-Based Differentiated Instructional Activities on Academic Achievement and Learning Retention in the Social Studies Course. *SAGE Open*, *14*(2), 1–14. https://doi.org/10.1177/21582440241249290

Teixeira, D. S., Rodrigues, F., Cid, L., & Monteiro, D. (2022). Enjoyment as a Predictor of Exercise Habit, Intention to Continue Exercising, and Exercise Frequency: The Intensity Traits Discrepancy Moderation Role. *Frontiers in Psychology*, *13*(February). https://doi.org/10.3389/fpsyg.2022.780059

Uğraş, S., Mergan, B., Çelik, T., Hidayat, Y., Özman, C., & Üstün, Ü. D. (2024). The relationship between passion and athlete identity in sport: the mediating and moderating role of dedication. *BMC Psychology*, *12*(1), 1–12. https://doi.org/10.1186/s40359-024-01565-4

Utami, A., Sujarwo, Fauziyah, Puji, Y., Muatadi, A., Hidayat, R., & Rofiki, I. (2024). Bibliometric Analysis of Research Developments on Differentiated Instruction. *European Journal of Educational Research*, *13*(3), 1421–1439. https://doi.org/10.12973/eu-jer.13.3.1421

Walck-Shannon, E. M., Rowell, S. F., & Frey, R. F. (2021). To what extent do study habits relate to performance? *CBE Life Sciences Education*, *20*(1), 1–15. https://doi.org/10.1187/cbe.20-05-0091

Wang, G., Zeng, D., Zhang, S., Hao, Y., Zhang, D., & Liu, Y. (2023). The Effect of Different Physical Exercise Programs on Physical Fitness among Preschool Children: A Cluster-Randomized Controlled Trial. *International Journal of Environmental Research and Public Health*, *20*(5). https://doi.org/10.3390/ijerph20054254

Wang, N., Wang, Q., Liu, X., Mahfooz, M., & Savila, Z. (2023). Examining the impact of physical education and physical skills development on preschoolers' physical and mental health. *Frontiers in Psychology*, *13*(January), 1–9. https://doi.org/10.3389/fpsyg.2022.1000653

Yukhymenko-Lescroart, M. A. (2021). The role of passion for sport in college student-athletes' motivation and effort in academics and athletics. *International Journal of Educational Research Open*, *2*(June), 100055. https://doi.org/10.1016/j.ijedro.2021.100055

Yukhymenko-Lescroart, M. A. (2022). Sport-to-School Spillover Effects of Passion for Sport: The Role of Identity in Academic Performance. *Psychological Reports*, *125*(3), 1469–1493. https://doi.org/10.1177/00332941211006925

Zhang, W., Zhu, Y., Jiang, F., & Song, H. (2024). The relationship between self-oriented perfectionism and exercise participation: based on the dualistic model of passion. *Frontiers in Psychology*, *15*(June). https://doi.org/10.3389/fpsyg.2024.1373844

Zheng, W., Shen, H., Belhaidas, M., Zhao, Y., Wang, L., & Yan, J. (2023). The Relationship between Physical Fitness and Perceived Well-Being, Motivation, and Enjoyment in Chinese Adolescents during Physical Education: A Preliminary Cross-Sectional Study. *Children*, *10*(111). https://doi.org/10.3390/children10010111

Ziernwald, L., Hillmayr, D., & Holzberger, D. (2022). Promoting High-Achieving Students Through Differentiated Instruction in Mixed-Ability Classrooms—A Systematic Review. *Journal of Advanced Academics*, *33*(4), 540–573. https://doi.org/10.1177/1932202X221112931