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# Evaluation of Several Factors that Affect the Learning Outcomes of Physical Education

**Kamal Firdaus[1,*], Setiyo Hartoto[2], Agus Hariyanto[3], Irmantara Subagya[3], Nikmatullaili[1], Deby Tri Mario[1], Zulbahri[1]**

[1]Department of Sports Education, Faculty of Sport Science, Universitas Negeri Padang, Indonesia
[2]Department of Sports Education, Faculty of Sport Science, Universitas Negeri Surabaya, Indonesia
[3]Department of Sports Coaching Education, Faculty of Sport Science, Universitas Negeri Surabaya, Indonesia

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**Abstract** Success in learning Physical Education (PE) is a benchmark for students to apply health values throughout their lives. Therefore, this study aims to investigate and evaluate factors related to the achievement of PE learning outcomes, namely Body Mass Index (BMI), Physical Fitness (PF), and learning motivation. A total of 75 male students from Madrasah Tsanawiyah (junior high school) in the city of Padang, West Sumatra, Indonesia participated in this study. Characteristics of the participants were grade eight aged ± 14.4 years, body height ± 152.9 cm, and body weight ± 53.5 kg. Data collection procedures consisted of anthropometric measurements, Indonesian physical fitness tests, questionnaires for learning motivation, and student report card scores for PE learning outcomes. Then, data were analyzed using path analysis. The results showed that BMI, PF, and learning motivation are several important factors to consider in achieving PE learning outcomes ($P<0.05$). Total overall direct and indirect influence through learning motivation is 72.42%. Of these three factors, learning motivation is the dominant factor affecting PE learning outcomes (24.90%), without neglecting PF (8.47%) and BMI (4.62%). In conclusion, students who have a good BMI and PF, are not enough to obtain optimal learning results without high learning motivation. Future research is important to analyze other factors that affect the learning outcomes of PE.

**Keywords** Physical Education, Body Mass Index, Physical Fitness, Learning Motivation, Learning Outcomes

## 1. Introduction

PE is one of the lessons taught in schools to promote a physically active lifestyle [1–3], develop cognitive abilities [4], improve PF [5], and develop basic physical qualities, and motor skills [6,7]. In short, PE aims to develop students' potential, both from cognitive, affective, and psychomotor aspects. Specifically for physical activity, only 20% of adolescents meet the recommendations from the World Health Organization (WHO) [8], that children and adolescents aged 5-17 should engage in at least 60 minutes of moderate to vigorous physical activity each day [9]. That is to say, the total amount of physical activity carried out by most adolescents is not sufficient [10], and leads to a sedentary lifestyle [11]. Then, the percentage of students who meet this target is less than 50% in non-PE classes [12,13]. Therefore, schools as places of learning and playing play an important role in facilitating students to be actively involved in physical activities.

In this regard, physical activity and PF are often recommended as a way to prevent overweight and obesity in childhood and adolescence [14]. The national basic health research survey shows that data on malnutrition in Indonesia is quite large. More than 1/4 of the adolescent

population aged 13-15 years is stunted (around 26%), and 9% is underweight (thin) [15]. Among adolescents aged 16-18 years, 27% are stunted and 8% are underweight, while data for 2013 shows the prevalence of anemia in adolescents aged 13-18 years is 12.4% for young men, and 22.7% for young women [16]. The main risk factor associated with being overweight among adolescents in Indonesia is due to lack of physical activity [16]. Other evidence also shows that the obesity of adolescents is caused by a lack of physical activity that they should do every day [17,18]. A qualitative-quantitative study on nutritional intake and physical activity conducted by UNICEF in 2017, found that physical activity in schools was minimal, and rarely lasted more than 90 minutes a week. Then, the diversity of food for teenagers in Indonesia turned out to be poor, and only 25% consumed sources of iron and micronutrients, such as food from animal and vegetable sources [16].

In addition to the BMI factor, and physical activity related to PF, the psychological element that needs to be questioned to achieve the goals of PE is students' learning motivation. Self-Determination Theory (SDT) conceptualizes motivation as a multidimensional entity that may be ranked on a continuum based on how much it is self-determined (or autonomous): amotivation (unintentional), extrinsic motivation, or intrinsic motivation (self-determining) [19]. Amotivation is the absence of a student's intention to act for a variety of reasons, such as a lack of the necessary information or abilities. Extrinsic motivation is motivation that comes from beyond oneself, such as the desire to avoid punishment, receive rewards, or be noticed. The SDT classifies extrinsic motivation into four categories: external regulation, introjection regulation, identifiable regulation, and integrated regulation. Each category has a different level of self-determination. Contrarily, intrinsic motivation relates to students' enjoyment and satisfaction with a certain activity [19].

The results of a survey on students of Madrasah Tsanawiyah (junior high school) in the city of Padang, West Sumatra, Indonesia, found that many students did not achieve PE learning outcomes with a minimum completeness limit (i.e., a score of 75) for the January-June semester 2020. This was also due to the impact of the COVID-19 pandemic, where WHO declared a global COVID-19 Pandemic (11 March 2020) related to school closures, and restrictions on freedom in public places [20]. This restriction had an impact on physical activity [21,22], and the decrease in students' learning motivation towards PE. In addition, the national basic health research survey shows that data on malnutrition in Indonesia is quite large and concerning (aged 13-18 years) [15].

This study aims to investigate and evaluate whether BMI, PF, and motivation to learn have an influence on PE learning outcomes. This research is expected to be useful for PE teachers, principals, and parents of students to consider these factors, so that the objectives of PE can be achieved optimally.

# 2. Materials and Methods

### 2.1. Study Design

This study employs a quantitative associative path analysis methodology. Multiple linear regression is extended by path analysis, which enables study of more complicated models [23]. This study will examine BMI, PF and learning motivation on PE learning outcomes.

Based on Figure 1, it explains the path diagram of the causal relationship between the factors that affect PE learning outcomes, so the procedure in this study consists of two stages of testing the structural model to obtain the path coefficient value of each variable studied. The first model (structural 1), namely BMI, PF, and learning motivation. The second model (structural 2), namely BMI, PF, learning motivation, and PE learning outcomes (Figure 2).

Note

$X_1$ = BMI
$X_2$ = PF
$X_3$ = Learning motivation
$Y$ = PE learning outcomes
$p_3$ = Path coefficient $X_1$ to $X_3$
$p_{3}^{1}$ = Path coefficient $X_2$ to $X_3$
$p_{y}^{2}$ = Path coefficient $X_1$ to Y
$p_{y}^{1}$ = Path coefficient $X_2$ to Y
$p_{y}^{2}$ = Path coefficient $X_3$ to Y
$e_{1}^{3}$ = Standard error one
$e_2$ = Standard error two

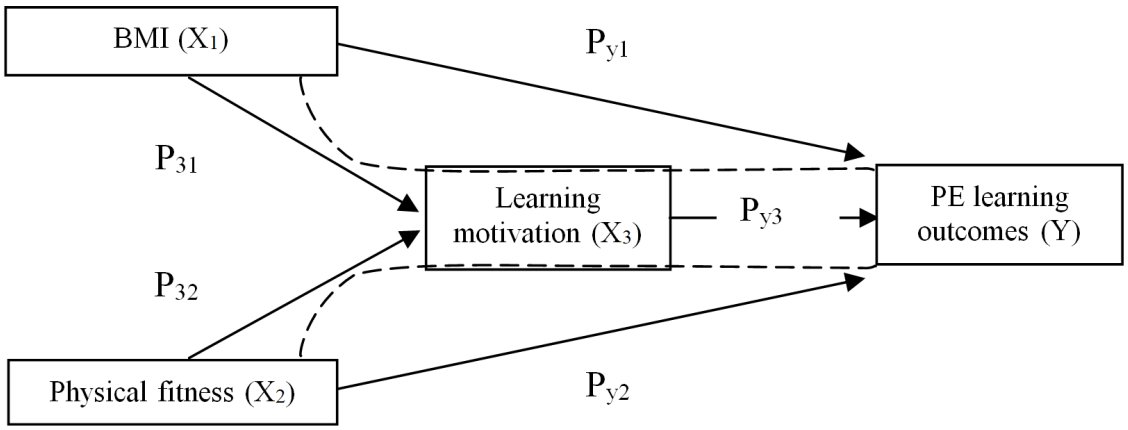


**Figure 1.** Research path diagram

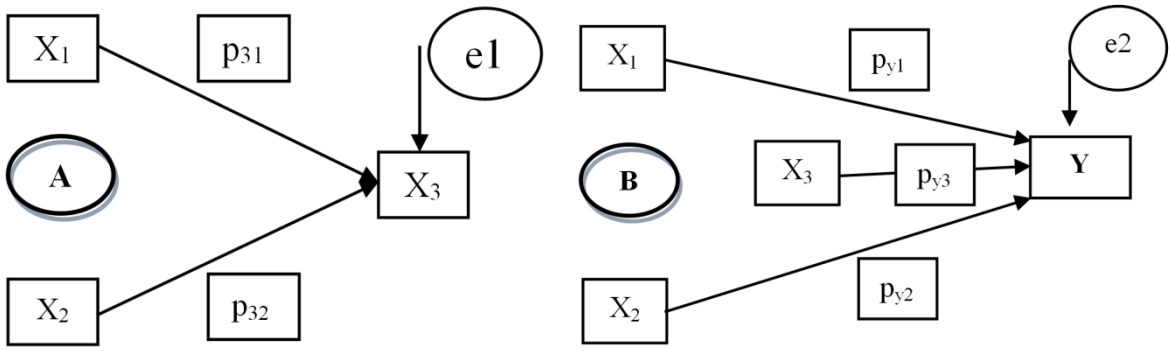


**Figure 2.** A) Structural model path diagram one, B) Structural model path diagram two

## 2.2. Participant

A total of 75 students from Madrasah Tsanawiyah (junior high school) in the city of Padang, West Sumatra, Indonesia participated in this study. The average age of the participants was 14.4 years, body height 152.9 cm, and body weight 53.5 kg. Participants were also recruited based on several considerations, including: participants were male, participants were class eight (age range 14-15 years), and participants voluntarily agreed. This research received approval from the Faculty of Sports Science, Padang State University, with number: 3109/UN35.3/LT/2021.

## 2.3. Instruments and Data Collection Procedures

### 2.3.1. Body Mass Index

The BMI was obtained from anthropometric measurements, namely body weight (kg)/body height $(m)^2$. After the results of the BMI were obtained, then to determine the classification was by looking at the calculation table based on the index of weight according to height of children aged 5-18 years [24] (Table 1).

**Table 1.** Classification of BMI

| Index | Classification | Threshold* |
|---|---|---|
| BMI by age 5-18 years | Very thin | ≤ (3 SD) |
| | Thin | (-3 SD) - (≤ 2SD) |
| | Normal | (-2 SD) - (1 SD) |
| | Fat | (>1 SD) - ( 2 SD) |
| | Obesity | > (2SD) |

Note.*The assessment is based on the BMI table from the Indonesian health department.

### 2.3.2. Physical Fitness

PF was obtained from the Indonesian physical fitness test for the 13-15 year age group [25]. This test consisted of: running 50 meters, pull ups, sit ups, vertical jumps, and running 1.000 meters (Table 2).

Then, for each test item in Table 2 the results were summed up as a whole and classified into levels of PF as Table 3.

### 2.3.3. Learning Motivation

Motivation to learn PE was obtained from a questionnaire with a total of 30 items (Table 4). These statements were prepared based on several operationally defined indicators [26]. Each statement had a different

rating weight, namely very often (score 4), often (score 3), sometimes (score 2), and never (score 1). Then, the results were classified as Table 5 (achievement score/ideal score*100%).

2.3.4. PE Learning Outcomes

PE learning outcomes were obtained from student report cards for one semester. This data was obtained from the student's homeroom teacher. The criteria for PE learning outcomes are based on the provisions determined by the school (Table 6).

## 2.4. Statistical Analysis

Data were analyzed using descriptive statistics and path analysis to calculate the coefficient values of each variable, while the regression analysis was used to test the significance of the relationship. All these stages were analyzed using the statistical program IBM SPSS version 24.

**Table 2.** Physical fitness test items

| Run 50 m* | Pull ups* | Sit ups* | Vertical jumps* | Run 1.000 m* | Score | Classification |
|---|---|---|---|---|---|---|
| ≤ 6.7” | ≥ 16 | ≥ 38 | ≥ 66 | ≤ 3’04” | 5 | Very good |
| 6.8-7.6” | 11-15 | 28-37 | 53-65 | 3’05-3’53” | 4 | Good |
| 7.7”-8.7” | 6-10 | 19-27 | 42-52 | 3’54-4’46” | 3 | Enough |
| 8.8”-10.3” | 2-5 | 8-18 | 31-41 | 4’47-6’04” | 2 | Less |
| ≥ 10.4” | 0-1 | 0-7 | 0-30 | ≥ 6’05” | 1 | Very less |

Note.*Units for running 50 m (seconds), pull ups (repetitions), sit ups (repetitions), vertical jump (cm), running 1.000 m (minutes).

**Table 3.** Assessment of total physical fitness test items

| Total | Classification |
|---|---|
| 22-25 | Very good |
| 18-21 | Good |
| 14-17 | Enough |
| 10-13 | Less |
| 5-9 | Very less |

**Table 4.** Learning motivation

| Variable | Indicator | Indicator section | Number of items |
|---|---|---|---|
| Learning motivation | Perseverance in learning | Concentration and focus in learning | 1-4 |
| | | Optimistic in learning | 5-9 |
| | | Not easily discouraged in learning | 10-13 |
| | Tenacious in the face of learning difficulties | The challenge of facing difficulties in learning | 14-17 |
| | | Creative | 18-22 |
| | Perseverance doing the task | Able to do the job well | 23-26 |
| | | Find the latest stuff. | 27-30 |

**Table 5.** Classification of learning motivation

| Percentage | Classification |
|---|---|
| 81-100 | Very good |
| 61-80 | Good |
| 41-60 | Enough |
| 21-40 | Less |
| 0-20 | Very less |

**Table 6.** Classification of achievement of PE learning outcomes

| Score | Classification |
|---|---|
| 91-100 | Very good |
| 81-90 | Good |
| 70-80 | Enough |
| < 70 | Less |

# 3. Result

Before the hypothesis is analyzed, it is necessary to present the characteristics of each data. This aims to determine the distribution of data and classification of data BMI, PF, learning motivation, and PE learning outcomes.

Table 7 shows that the average value for BMI is 0.95 or normal classification, the average value for PF is 14.21 or enough classification, the average value for learning motivation is 81.16 or very good classification, and the average value for PE learning outcomes is 77.98 or enough classification (Figure 3).

Then, the results of testing structural model one obtained that the path coefficient of BMI with learning motivation ($p_{31}$) was P<0.05, the path coefficient of PF with learning motivation ($P_{32}$) was P<0.05, while the results of the structural model two test obtained that the BMI path coefficient with PE learning outcomes ($p_{y1}$) was P<0.05, the PF path coefficient with PE learning outcomes ($p_{y2}$) was P<0.05, and the learning motivation path coefficient with PE learning outcomes ($p_{y3}$) was P<0.05. The results of the regression significance test for the one and two structural models also obtained P<0.05. In other words, there is an effect of BMI, PF, and learning motivation on the PE learning outcomes. The results of this test are significant with the regression model for structural model one which is $Y = 0.625X_1 + 0.756X_2 + 0.656\varepsilon1$ and for structural model two is $Y = 0.215X_1 + 0.291X_2 + 0.499X_3 + 0.744\varepsilon2$ (Table 8).

**Table 7.** Statistics descriptive

| Variable | N | Min | Max | ẋ | SD |
|---|---|---|---|---|---|
| BMI | 75 | 0.14 | 2.23 | 0.95 | 0.49 |
| PF | 75 | 11.00 | 18.00 | 14.21 | 2.00 |
| Motivation learning | 75 | 60.00 | 96.67 | 81.16 | 9.26 |
| PE learning outcomes | 75 | 70.00 | 89.00 | 77.98 | 5.50 |

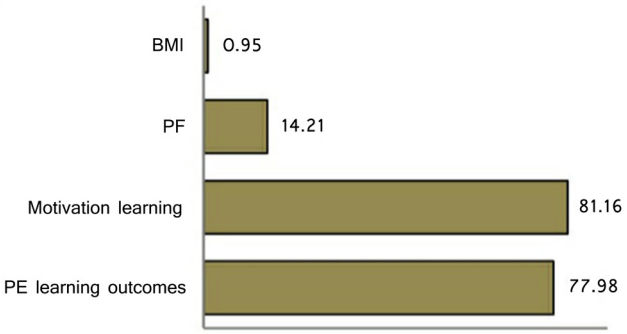


**Figure 3.** Average of data on BMI, PF, learning motivation, and PE learning outcomes

**Table 8.** Summary of structural models one and two

| Structural | Coefficient | B | P. coeff | P. regression | Regression models | Conclusion |
|---|---|---|---|---|---|---|
| One | $X_1.X_3$ ($p_{31}$) | 0.625 | 0.004 | 0.013 | $Y = 0.625X_1 + 0.756X_2 + 0.656\ \varepsilon_1$ | Significant |
| | $X_2.X_3$ ($p_{32}$) | 0.756 | 0.002 | | | |
| | $\varepsilon_1$ | 0.656 | | | | |
| Two | $X_1Y$ ($p_{y1}$) | 0.215 | 0.003 | 0.023 | $Y = 0.215X_1 + 0.291X_2 + 0.499X_3 + 0.744\varepsilon_2$ | Significant |
| | $X_2Y$ ($p_{y2}$) | 0.291 | 0.001 | | | |
| | $X_3Y$ ($p_{y3}$) | 0.499 | 0.002 | | | |
| | $\varepsilon_2$ | 0.744 | | | | |

Note.*Path and regression coefficients are significant (P<0.05).

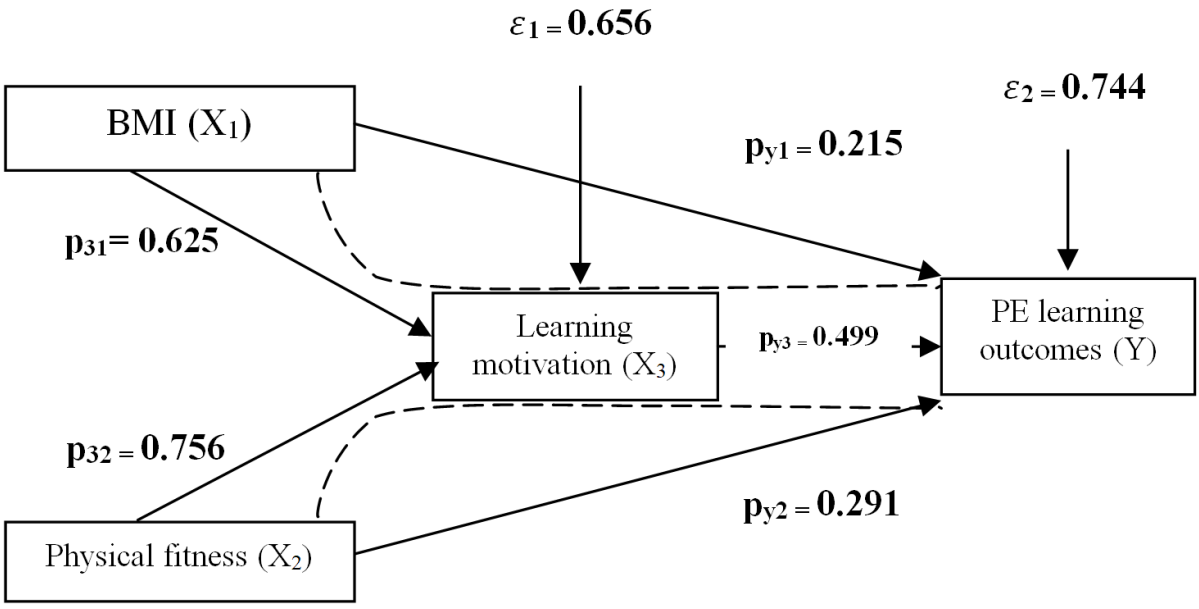


**Figure 4.** Combined results of the path coefficient structural model

**Table 9.** Summary of total influence

| Path coeff | Direct influence | | | Indirect influence | | | | Total direct + indirect influence | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff | Coeff$^2$ | % | Intervening | Coeff | Coef$^2$ | % | Total coeff | Coeff$^2$ | Total (%) |
| $X_{1Y}$ ($P_{y1}$) | 0.215 | 0.0462 | 4.62 | $X_1 \rightarrow X_3 \rightarrow Y$ | 0.312 | 0.0973 | 9.73 | 0.5269 | 0.2776 | 27.76 |
| $X_{2Y}$ ($P_{y2}$) | 0.291 | 0.0847 | 8.47 | $X_2 \rightarrow X_3 \rightarrow Y$ | 0.377 | 0.1423 | 14.23 | 0.6682 | 0.4466 | 44.66 |
| $X_{3Y}$ ($P_{y3}$) | 0.499 | 0.2490 | 24.90 | | | | | | | |
| Total direct + indirect influence | | | | | | | | | 0.7242 | 72.42 |
| Influence of other factors | | | | | | | | | 0.2758 | 27.58 |

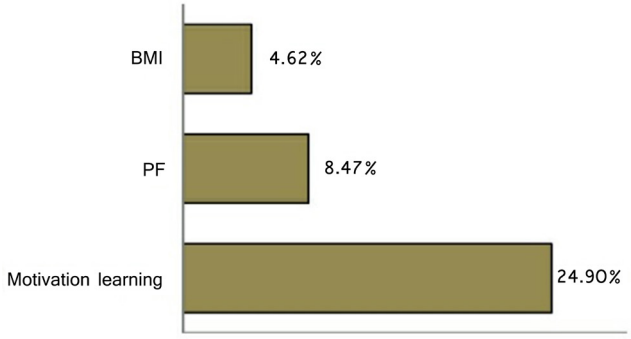


**Figure 5.** Percentage of influence of BMI, PF, and learning motivation on PE learning outcomes

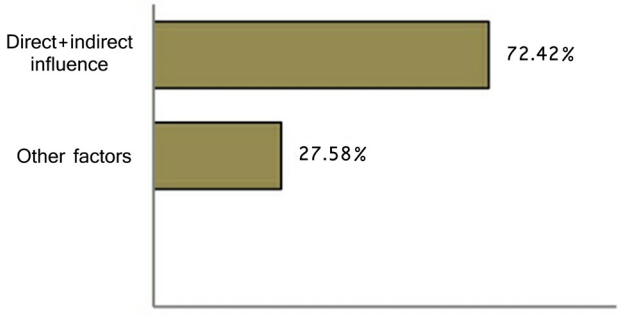


**Figure 6.** Total influence of direct, indirect, and other factors

Figure 4 is the result of each path coefficient value (structural one and two). From the results of testing this model, the total effect of each variable can be calculated to see how much it influences the PE learning outcomes (Table 9). The effect of BMI on PE learning outcomes ($\rho_{y1}$ x 100% = 4.62%), the effect of PF on PE learning outcomes ($\rho_{y2}$ x 100% = 8.47%), the effect of learning motivation on PE learning outcomes ($\rho_{y32}$ x 100% = 24.90%), the effect of BMI on PE learning outcomes through learning motivation ($p_{31}.p_{y3} = 0.312 > p_{y1} = 0.215$ or a total effect of 27.76%), and the effect of PF on PE learning outcomes through learning motivation ($p_{32}.p_{y3} = 0.377 > p_{y2} = 0.291$ or a total effect of 44.66%). From these results, it can be concluded that learning motivation has a significant effect compared to other variables on PE learning outcomes (24.90%) (Figure 5).

Table 9 explains that the total direct and indirect influence through learning motivation is 72.42%, while the remaining 27.58 is another factor not discussed in this study (Figure 6).

# 4. Discussion

The results of this study indicate that BMI, PF, and learning motivation are several important factors to consider in achieving PE learning outcomes (P<0.05). Total overall direct and indirect influence through learning motivation is 72.42%. Of these three factors, learning motivation is the dominant factor affecting PE learning outcomes (24.90%), without neglecting PF (8.47%) and BMI (4.62%).

### 4.1. Effect of BMI on PE Learning Outcomes

Based on these findings, the BMI has an influence on the PE learning outcomes (P<0.05). The results of this study are consistent with previous studies. Students' consumption of nutritious food has an impact on doing exams at school. They show better behavior (e.g., school attendance and complete assignments accurately), compared to students who do not consume nutritious food [27]. Other studies also report that obesity has been shown to have a poor impact on academic achievement [28–30]. Cognitive abilities are affected by obesity, and the likelihood of obesity is influenced by the quality of nutrition, so malnutrition is associated with academic achievement [31]. Then, adequate nutritional intake and regular physical activity will have an impact on health [32–35]. Evidence also shows that adolescents who are obese signify less physical activity than those who are not obese [17,18]. They tend to spend more time, such as watching television and using other electronic media [36,37].

### 4.2. Effect of PF on PE Learning Outcomes

Based on these findings, PF has an influence on the PE learning outcomes (P<0.05). The results of this study are consistent with previous studies, which reported that there is a positive relationship between PF and academic achievement or other cognitive performance measures [38–40]. A good level of PF has a positive relationship with mental health, and a better quality of life [41]. Another study also reported that PF is considered a fundamental health indicator for adolescents (males and females aged 11 to 17 years) [5].

Students who have PF can certainly carry out their daily activities productively [42], including in PE learning. Systematic reviews and meta-analyses report that physical activity is one of the most effective strategies for improving PF during PE learning [43]. In general, the impact of physical activity is the release of calories, weight loss, reducing stress, social interaction, avoiding the risk of bad health, and improving self-image [44,45]. In addition, PF has also been shown to have a positive relationship with student motivation in PE learning [46]. Thus, it is not surprising that students who have a level of PF are more productive and enthusiastic in PE, so it has an impact on their PE learning outcomes.

### 4.3. Effect of Learning Motivation on PE Learning Outcomes

Based on these findings, learning motivation has an influence on the PE learning outcomes (P<0.05). The results of this study are consistent with previous studies, that learning motivation has a significant influence on learning outcomes [47,48,50]. Other studies also report that students who have high motivation tend to be more active during learning [51]. Motivation is the starting point to move students throughout the school years [52]. Regardless of the learning method applied, the PE teacher needs to apply specific strategies to improve students' psychology [53]. Sun et al., explored that the impact of SDT on PE learning is related to the cognitive, psychomotor, and affective domains [54].

The results of this study are consistent with previous studies, that there is a positive and significant relationship between academic motivation and academic achievement [55], and motivation are the most important factors influencing academic success or failure [52]. Then, intrinsic motivation has an impact on achievement indirectly through class or student behavioral engagement (e.g., actively engaging in class discussions and focusing on what is being taught) [56]. Motivation is an important concept, both for teachers and students in perceiving the causes of success or failure of education [57]. Thus, it is not surprising that learning motivation is the dominant factor that has a significant effect on the PE learning outcomes.

This study has several limitations that need to be validated for future research. This research was conducted on 75 male students of Madrasah Tsanawiyah (junior high school), so it needs to be validated on female students, and compare the results of each variable studied. The sample size used is still limited, so it needs to be validated with a wider sample size. Then, the factors/variables are still limited (BMI, PF, and learning motivation), so it is necessary to involve other factors using a more complex statistical analysis.

# 5. Conclusions

Based on these findings, we conclude that BMI, PF, and learning motivation are several important factors to consider in achieving PE learning outcomes ($P<0.05$). Total overall direct and indirect influence through learning motivation is 72.42%. Of these three factors, learning motivation is the dominant factor affecting PE learning outcomes (24.90%), without neglecting PF (8.47%) and BMI (4.62%). This means that students who have a good BMI and level of PF are not sufficient to obtain optimal PE learning outcomes without motivation to learn. This research is expected to be useful for PE teachers, school principals, and parents of students to provide motivation regarding the importance of PE for the survival of quality children (cognitive, affective, psychomotor). This research needs to be validated with a wider sample size and different gender (female students), and involves other factors not discussed in this study.

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# Conflict of Interest

The authors declare no potential conflicts of interest.

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