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**Original Article Research**

# Innovation in Physical Education to Raise Health Awareness in Elementary Schools

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## Abstract

This study uses a quantitative approach with SmartPLS 4 software to analyze the impact of Physical Education Learning Innovation on the physical activity of elementary school students located in the Indonesia-Papua New Guinea border region. In South Papua Province, Merauke, the results of the analysis using SmartPLS 4 software show that only certain indicators meet the test result requirements. Path coefficient test results, coefficient of 0.106, a t-value of 1.707, and a p-value of 0.088 ($p > 0.05$), so this hypothesis is rejected. However, only health awareness significantly influenced student activity, while physical education learning innovation did not. These findings highlight the crucial role of health awareness in encouraging physical activity among students.

Keywords: Physical Education Learning Innovation, NKRI–PNG Border.

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## 1. INTRODUCTION

Physical education plays a vital role in supporting students' physical development and overall health, particularly at the elementary school level, where growth processes and habit formation are at a critical stage (Sindiani, Schroeder, & Dunsky, 2025). Through physical education programs, students are not only encouraged to develop physical competence but are also introduced to knowledge and awareness regarding the importance of maintaining a healthy lifestyle (Hwang & Chang, 2025). This emphasis is especially important because childhood represents an optimal period for instilling health-related values that can be sustained into adulthood (Online et al., 2011). In border areas between the Republic of Indonesia and Papua New Guinea, particularly in South Papua Province, physical education faces distinctive challenges related to geographical isolation and diverse socio-cultural conditions (Waskito, Kalsum, & Lisapaly, 2024). These circumstances require learning approaches that are responsive not only to environmental limitations but also to local cultural values, enabling physical education to become more meaningful while addressing students' social and emotional development (Du Preez, 2024). Conventional approaches that focus solely on physical activity often prove less effective, as they tend to overlook the cultural and social contexts of the local community (Mligo, 2025). One promising innovation is the development of physical education programs grounded in local sports culture (Hadi Mogavi et al., 2024). Papuan sports culture, which is rich in traditions and local wisdom, plays an important role in shaping character and behavior. Traditional games and sports-related rituals passed down across generations can function as engaging and meaningful learning resources for students (Chim et al., 2024). By integrating local sports culture into physical education, students can develop a stronger connection to the learning material while becoming more motivated to participate actively in physical activities. Such integration not only enhances student

Interest and motivation but also strengthens cultural identity and a sense of pride in local heritage (Huang & Long, 2025). Consequently, students are expected to grow not only as physically healthy individuals but also as members of society who uphold positive cultural values (Meerits, Tilga, & Koka, 2025). Motivation that emerges from cultural awareness tends to be more sustainable than motivation driven solely by external factors (Wahyuniati et al., 2025). Beyond promoting physical activity, this learning innovation also aims to foster health awareness from an early age (Işıkgöz, 2025). Such awareness is essential in helping students recognize the importance of physical health as a valuable asset in daily life. Through this process, students are encouraged to adopt healthy lifestyle habits, including balanced nutrition, personal hygiene, and regular physical activity, which can positively influence their long-term quality of life. Numerous studies have demonstrated that consistent physical activity provides significant benefits not only for physical health but also for children's mental and social development (Chanal & Paumier, 2025). Physical activity contributes to improved motor skills, enhanced cardiovascular fitness, and the development of emotional and social competencies through peer interaction (Sheng et al., 2025). Therefore, innovative and engaging physical education programs are essential to encourage students to remain physically active on a daily basis (Khalilov et al., 2025). However, the reality in many border regions indicates limited facilities and environmental support, which restrict students' opportunities for optimal physical activity (Østerlie & Killian, 2025). The lack of sports fields, adequate equipment, and safe spaces presents significant obstacles that must be addressed (Martín-Rodríguez & Madrigal-Cerezo, 2025). Additionally, limited awareness among parents and community members regarding the importance of physical activity further compounds these challenges (Zhu et al., 2025). In response, learning innovations that integrate local cultural values with modern pedagogical approaches offer a viable solution (Paap et al., 2025). Collaborative and project-based learning strategies, for instance, can encourage students to work together, express creativity, and actively engage in physical activities that align with their cultural context and needs (Zhou et al., 2025). Such approaches simultaneously support the development of social and collaborative skills. Furthermore, problem-based and inquiry-based learning models can help students cultivate critical thinking and problem-solving abilities related to health and physical activity (Fraile-Martinez et al., 2025). Through these methods, students are encouraged to explore, analyze, and apply solutions to real-life challenges, making the learning experience more contextual and meaningful (Mayo-Rota et al., 2025). The integration of technology into physical education also offers valuable opportunities. Digital tools such as health and fitness applications, movement-based video tutorials, and interactive learning platforms can enhance student engagement and provide diverse learning experiences (Niu et al., 2025). Technology further enables students in remote areas to access broader educational resources (Zhou et al., 2025). In addition, differentiated learning approaches are crucial for accommodating individual differences in learning styles, physical abilities, and motivation levels. Flexible instructional strategies allow students to learn more effectively and comfortably according to their personal needs (Frikha, 2025). Finally, health education as an integral component of physical education is essential for equipping students with comprehensive knowledge about healthy lifestyles, disease prevention, and physical fitness maintenance. This knowledge must be delivered continuously and integrated into daily learning experiences so that it becomes an inherent part of students' everyday lives (Rodríguez-Martín & Fernández-Río, 2025). Furthermore, the involvement of families and local communities plays a crucial role in strengthening health awareness initiatives. A supportive home and social environment can enhance students' motivation and provide greater opportunities to adopt healthy lifestyle behaviors, including regular participation in physical activity (Ahmed & Al Salim, 2024). Effective collaboration among schools, families, and community stakeholders is therefore essential to ensure the successful implementation of these learning innovations (Antunes et al., 2024). The effectiveness of this

Innovative approach can be observed through increases in the intensity, diversity, and consistency of students' physical activity levels (Frikha et al., 2024). These improvements not only signal positive behavioral changes but also indicate that students are becoming more actively engaged in enjoyable and meaningful sport-related activities (Petrachkov et al., 2024). In this context, a supportive school environment characterized by adequate sports facilities and a positive learning atmosphere is fundamental in encouraging regular physical activity. As learning centers, schools must provide sufficient space, appropriate facilities, and adequate time for students to engage in physical exercise and movement-based activities (Sotos-Martinez et al., 2024). Innovation in sports-based physical education within the border regions of the Republic of Indonesia and Papua New Guinea represents a strategic effort to enhance both educational quality and student health outcomes. When implemented effectively, physical education extends beyond mere physical activity to become a medium for character development, cultural awareness, and the promotion of long-term healthy behaviors (Cui, Song, & Du, 2024). Consequently, this innovation is expected to foster a generation of young individuals who are not only physically active and healthy but also possess a strong awareness of the importance of sport and health from an early age (Garcia, 2025). Such a generation will serve as essential human capital for the sustainable and progressive development of border regions in the future.

## 2. METHOD

This study used a quantitative research approach with Partial Least Squares–Structural Equation Modeling (PLS-SEM) as the main analytical method. This approach was chosen to objectively examine the relationships between variables and to test the proposed research model empirically (Kantorski et al., 2020). Data were collected through structured questionnaires distributed to teachers and elementary school students located in the border region between Indonesia and Papua New Guinea, specifically in South Papua Province, Indonesia. The questionnaire measured three main constructs: Physical Education Learning Innovation, Health Awareness, and Student Activity. Each construct was represented by several indicators and assessed using a Likert-scale response format.

### 2.1 Population and Sample

The population used in this study was all educational elements involved in the physical education learning process in elementary schools located in the border region between the Republic of Indonesia (NKRI) and Papua New Guinea (PNG). This population included physical education teachers, school principals, and elementary school students.(Yildirim 2021),Meanwhile, the sample in this study was selected purposively (purposive sampling), namely sports teachers, principals, and students consisting of 250 samples from several elementary schools located directly in the border area,The selection of this sample is based on their direct involvement in physical education learning practices as well as their relevance to the research topic, namely sports culture-based learning innovation, health awareness, and student activities. This approach aims to dig up in-depth information from primary sources who have direct experience in the field.

### 2.2 Operational Definition of Variables

This study consists of three main variables, namely Physical Education Learning Innovation, Health Awareness, and Student Activities. The first variable has 6 components with codes: PK, PBP, PBM, PI, PBT, and PD. The second variable also consists of 6 components, namely: KK, PHS, ALK, PK, KK, and DSSK. Meanwhile, the third variable includes 6 components with codes: IAP, VAP, KAP, KAP (Consistency), MAB, and PLAP. In total, there are 18 components that support each other in measuring the effectiveness of learning innovation, increasing health awareness, and student activities in elementary schools in the border region of the Republic of Indonesia and PNG.

**Table.1**

*Variables, components, and interview codes in the study*

| No | Variables | Components and Component Code | |
|---|---|---|---|
| 1 | Innovation in Physical Education Learning Component | 1 | collaborative cearning (CL): A method that encourages students to work together in groups to achieve learning goals. |
| | | 2 | Project based bearning (PBL): An approach that requires students to engage in real projects, integrating multiple disciplines. |
| | | 3 | Problem-Based Learning (PBL): Teaches students to solve real-world problems through analysis and collaboration. |
| | | 4 | Inquiry Learning (ILC): A method that emphasizes questions and exploration, where students actively seek out and discover information. |
| | | 5 | Technology-Based Learning (TBL): Utilizing information technology to support the learning process, such as the use of online applications and platforms. |
| | | 6 | Differentiated Learning (PD): Adapting teaching methods to meet the different needs and learning styles of each student. |

| | | |
|---|---|---|
| 2 | Health Awareness | 1. Health Awareness (KK): Understanding the importance of maintaining health and preventing disease.<br>2. Healthy Living Behavior (PHS): Adopting habits that support health, such as a balanced diet and exercise.<br>3. Access to Health Services (HAS): the ability to obtain necessary health services.<br>4. Health Education (PK): Providing information and knowledge about health to individuals and communities.<br>5. Health Skills (KK): the ability to manage personal health, including skills in first aid.<br>6. Social Support for Health (DSSK): The role of family, friends, and community in supporting efforts to maintain health. |
| 3 | Student Activities | 1. Physical Activity Intensity (PIA): The level of effort expended during physical activity, such as light, moderate, or heavy.<br>2. Variety of Physical Activities (VAP): A variety of physical activities undertaken to maintain interest and diversity.<br>3. Quality of Physical Activity (QA): The effectiveness and safety of physical activity in achieving health goals.<br>4. Consistency of Physical Activity (PACT): Frequency and persistence in performing physical activity regularly.<br>5. Motivation to Activity (MAB): Factors that encourage individuals to engage in physical activity, such as health or social goals.<br>6. Environmental Influences on Physical Activity (PLAP): The impact of the physical and social environment in facilitating or hindering physical activity. |

## 3. RESULTS

### 3.1 Variable Analysis with Smart PLS-SEM-4

#### 3.1.1 Outer Model

In SmartPLS analysis, the outer model describes the relationship between latent variables, which cannot be measured directly (such as satisfaction or health), and their observable indicators (Asiyah et al., 2021). The outer model is generally classified into two types: reflective and formative. In a reflective model, the indicators are considered to be manifestations of the latent construct, so any change in the construct will be reflected in the indicators. Conversely, in a formative model, the indicators work together to create and define the construct itself (Yılmaz, 2023). During the initial evaluation, attention is given to outer loading values, as these values show how strongly each indicator is associated with its construct. Outer loadings of 0.70 or higher indicate strong indicator reliability, while values above 0.50 are still acceptable, particularly in exploratory studies.

**Figure 1**

Results of outer loading analysis stage 1

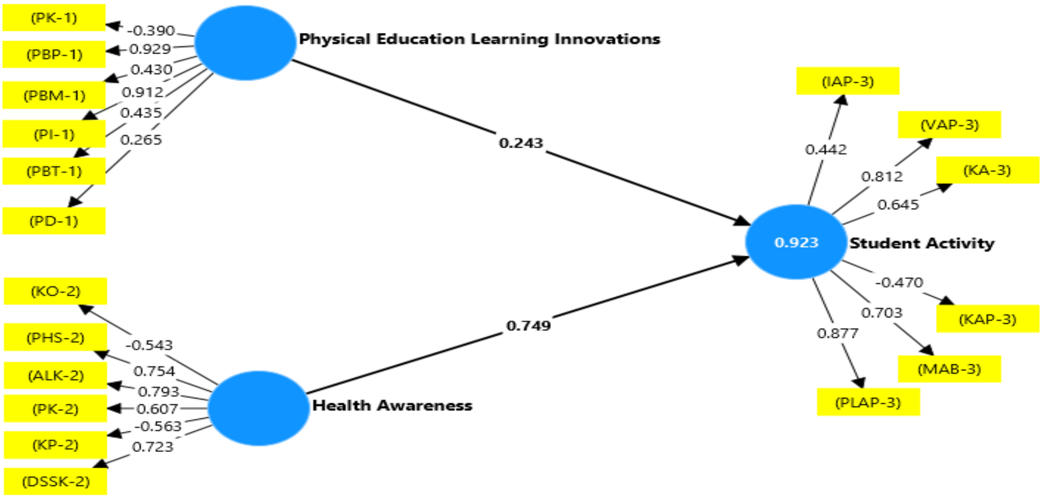


Figure 1 The findings from the initial stage of the outer loading analysis illustrate the extent to which each indicator represents its corresponding latent construct. Within the Physical Education Learning Innovation construct, most indicators demonstrate strong loading values. For instance, the PBP-1 indicator shows a loading of 0.929, while PBM-1 records a value of 0.912, indicating that these indicators validly and reliably reflect the construct. However, the PK-1 indicator exhibits a negative loading value (–0.390), suggesting that it does not adequately represent the construct and should be reconsidered or potentially excluded from the model, as it weakens construct validity. In the Health Awareness construct, several indicators show satisfactory contributions, including ALK-2 (0.754), KP-2 (0.723), and PHS-2 (0.793), which indicate strong relationships with the latent variable. Conversely, other indicators display lower or negative loading values, highlighting the need for further evaluation to ensure their suitability within the measurement model. For the Student Activity construct, all indicators meet acceptable loading criteria, with the highest loading observed for the KAP-3 indicator at 0.877, reflecting a strong association with the construct.

**Table 2**

| Components and Variables | Health Awareness | Physical Education Learning Innovations | Student Activity | Information |
|---|---|---|---|---|
| (PK-1) | | -0.390 | | Invalid |
| (PBP-1) | | 0.929 | | Valid |
| (PBM-1) | | 0.430 | | Invalid |
| (PI-1) | | 0.912 | | Valid |
| (PBT-1) | | 0.435 | | Invalid |
| ( PD -1 ) | | 0.265 | | Invalid |
| (KO-2) | -0.543 | | | Invalid |
| (PHS-2) | 0.754 | | | Valid |
| (ALK-2) | 0.793 | | | Valid |
| (PK-2) | 0.607 | | | Invalid |
| (KP-2) | -0.563 | | | Invalid |
| (DSSK-2) | 0.723 | | | Valid |
| (IAP-3) | | | 0.442 | Invalid |
| (VAP-3) | | | 0.812 | Valid |
| (KA-3) | | | 0.645 | Invalid |
| (KAP-3) | | | -0.470 | Invalid |
| (MAB-3) | | | 0.703 | Valid |
| (PLAP-3) | | | 0.877 | Valid |

*Results of outer loading analysis stage 1*

The first-stage outer loading analysis reveals that not all indicators achieved acceptable levels of validity. criteria for each construct. In the Physical Education Learning Innovation construct, PBP-1 demonstrated a strong loading value of 0.929 and PI-1 showed a loading of 0.912, confirming their validity as measurement indicators. In contrast, PK-1, PBM-1, PBT-1, and PD-1 were classified as invalid because their loading values were either below the acceptable threshold or negative, indicating weak associations with the construct. For the Health Awareness construct, several indicators were found to be valid, including PHS-2 (0.754), ALK-2 (0.793), and DSSK-2 (0.723), as they exhibited sufficient loading values. Meanwhile, indicators KO-2, PK-2, and KP-2 did not meet the required criteria and were therefore considered invalid. In the Student Activity construct, VAP-3 (0.812), MAB-3 (0.703), and PLAP-3 (0.877) were identified as valid indicators, whereas IAP-3, KA-3, and KAP-3 were deemed invalid due to insufficient loading values. The results of the second-stage outer loading analysis are presented in Table 3.

**Figure.2**

Result of outer loading analsis Stage 2

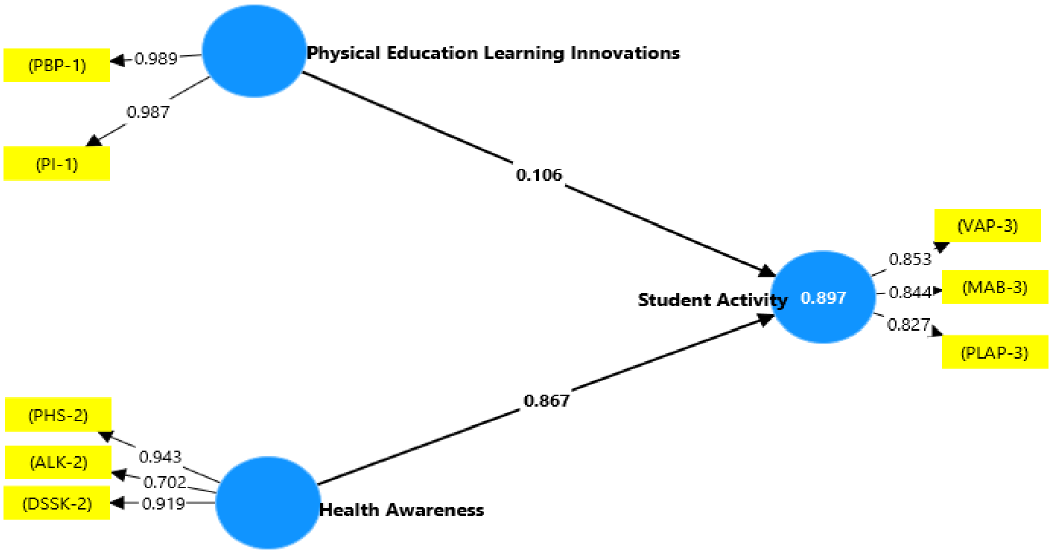


**Table.3**

*Outer loading analysis results for Stage 2*

| Components and Variables | Health Awareness | Physical Education Learning Innovations | Student Activity | Information |
|---|---|---|---|---|
| (PBP-1) | | 0.989 | | Valid |
| (PI-1) | | 0.987 | | Valid |
| (PHS-2) | 0.943 | | | Valid |
| (DSSK-2) | 0.919 | | | Valid |
| (VAP-3) | | | 0.853 | Valid |
| (MAB-3) | | | 0.844 | Valid |
| (PLAP-3) | | | 0.827 | Vald |

The second-stage outer loading analysis indicates that all retained indicators met the required validity criteria. criteria for their respective constructs. Within the Physical Education Learning Innovation construct, the indicators PBP-1 and PI-1 demonstrated very strong loading values of 0.989 and 0.987, respectively, confirming their excellent ability to represent the construct. For the Health Awareness construct, the indicators PHS-2 and DSSK-2 also showed high loading values, at 0.943 and 0.919, indicating strong indicator quality and construct representation. Similarly, in the Student Activity construct, the indicators VAP-3, MAB-3, and PLAP-3 were found to be valid, with loading values of 0.853, 0.844, and 0.827, respectively. These results suggest that the indicators effectively capture the underlying construct. Overall, the second-stage analysis demonstrates a clear improvement in indicator quality compared to the first stage.

### 3.2 Average variance extracted (AVE)

Average Average Variance Extracted (AVE) is a statistical measure used to evaluate the convergent validity of constructs within a measurement model (Arıkan, 2020). AVE reflects the proportion of variance in the indicators that is explained by the underlying latent construct relative to the total variance, including measurement error (Görücü & Cantav, 2017) An ave value greater than 0.50 is generally considered acceptable, as it indicates that more than 50% of the indicator variance is accounted for by the construct, demonstrating that the indicators adequately represent the latent variable. A high AVE value therefore suggests that the construct has good convergent validity and that the indicators used are reliable for measuring the intended concept. analysis are presented in Table 4.

**Table 4.**

*Results of Average Variance Extracted (AVE) Values*

| Variable | (AVE) | Information |
|---|---|---|
| Health Awareness | 0.742 | Valid |
| Physical Education Learning Innovations | 0.975 | Valid |
| Student Activity | 0.708 | Valid |

The results of the Average Variance Extracted (AVE) test indicate that the three variables in this study have good convergent validity. The Health Awareness variable has an AVE value of 0.742, Physical Education Learning Innovations of 0.975, and Student Activity of 0.708. All AVE values are above the threshold of 0.5, indicating that each construct is able to explain more than 50% of the variance in its indicator.

### 3.3 Cross-lending

Cross-lending is a financial practice in which funds or resources are temporarily transferred between units or institutions within the same organizational group to meet short-term liquidity or capital needs (Karataş & Bozkuş, 2022). This mechanism aims to improve the efficient use of internal funds by directing excess resources from one unit to another that requires support. As a result, organizations can reduce dependence on external financing and lower the costs associated with borrowing from outside sources. Furthermore, cross-lending encourages cooperation among internal units and increases flexibility in financial management. However, its application requires careful supervision to prevent liquidity imbalances and potential conflicts of interest. The findings related to cross-lending are summarized in Table 5.

**Table.5**
*Cross-lending Value Results*

| Components and Variables | Health Awareness | Physical Education Learning Innovations | Student Activity | Information |
|---|---|---|---|---|
| (PBP-1) | 0.738 | 0.989 | 0.754 | Valid |
| (PI-1) | 0.698 | 0.987 | 0.700 | Valid |
| (PHS-2) | 0.943 | 0.562 | 0.845 | Valid |
| (ALK-2) | 0.702 | 0.749 | 0.792 | Valid |
| (DSSK-2) | 0.919 | 0.563 | 0.786 | Valid |
| (VAP-3) | 0.710 | 0.510 | 0.853 | Valid |
| (MAB-3) | 0.940 | 0.568 | 0.844 | Valid |

The results outer loading analysis demonstrate that all indicators across the three constructsHealth Awareness, Physical Education Learning Innovation, and Student Activity meet the established validity criteria, as each loading value exceeds the commonly accepted threshold of 0.50. Indicators such as PBP-1 and PI-1 exhibit exceptionally high loading values on the Physical Education Learning Innovation construct, at 0.989 and 0.987, respectively. Similarly, indicators PHS-2, DSSK-2, and MAB-3 show strong loadings on the Health Awareness and Student Activity constructs. These high loading values indicate that each indicator consistently and accurately represents its corresponding latent construct. Therefore, all constructs and their associated indicators in this study can be considered valid and suitable for use in subsequent stages of model analysis.

### 3.4 Latent Variable Correlation Test

The Latent Variable Correlation Test is an analytical procedure used to examine the relationships or correlations among latent constructs within a research model, particularly in Structural Equation Modeling (SEM) analysis (Güngör, Kurtipek, & Tolukan, 2020). This test is essential for identifying the extent to which different latent variables are related, thereby facilitating a clearer understanding of the relationship patterns and the strength of associations among constructs in the model. Furthermore, the results of the latent variable correlation test are employed to assess discriminant validity, which refers to a construct's ability to be empirically distinct from other constructs in the model. Excessively high correlations between latent variables may indicate potential multicollinearity or conceptual overlap, both of which can compromise the clarity and accuracy of the research model. The results of the latent variable correlation analysis are presented in Table 6.

**Table 6.**

*Results of the Variable Correlation Test Values*

| Variables | Health Awareness | Physical Education Learning Innovations | Student Activity | Information |
|---|---|---|---|---|
| Health Awareness | 1,000 | 0.728 | 0.944 | valid |
| Physical Education Learning Innovations | 0.728 | 1,000 | 0.737 | valid |
| Student Activity | 0.944 | 0.737 | 1,000 | valid |

The results of the latent variable correlation analysis show that the three constructs Health Awareness, Physical Education Learning Innovation, and Student Activity are positively and significantly related to one another. The correlation coefficient between Health Awareness and Physical Education Learning Innovation is 0.728, while the correlation between Health Awareness and Student Activity reaches 0.944. Additionally, the relationship between Physical Education Learning Innovation and Student Activity is indicated by a correlation value of 0.737. These correlation coefficients reflect strong yet acceptable relationships among the constructs, suggesting that they are conceptually related without exhibiting excessive overlap. Consequently, the results indicate that all three constructs demonstrate adequate discriminant validity and can be appropriately retained in the research model.

### 3.5 Path coefficient test

The path coefficient test is used to evaluate the strength and direction of direct relationships between latent variables in a Structural Equation Modeling (SEM) framework. This coefficient shows the extent to which changes in an independent variable affect a dependent variable, with values generally ranging from −1 to 1. A positive coefficient indicates a positive relationship, whereas a negative coefficient reflects an inverse relationship. In addition to examining the coefficient value, statistical significance is assessed using measures such as t-values or p-values to determine whether the relationship is meaningful. Through this test, researchers can identify causal relationships among variables and assess the validity of the proposed hypotheses. The results of the path coefficient analysis are presented in Table 7.

**Table 7.**

*Path coefficient test results*

| Variables | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Information |
|---|---|---|---|---|---|---|
| Health Awareness -> Student Activities | 0.867 | 0.866 | 0.049 | 17,747 | 0.000 | Accepted |
| Physical Education Learning Innovations -> Student Activities | 0.106 | 0.108 | 0.062 | 1,707 | 0.088 | Not accepted |

The results of the path coefficient test show that the Health Awareness variable has a significant influence on Student Activity with a coefficient value of 0.867, a t-value of 17.747, and a p-value of 0.000 ($p < 0.05$), so the hypothesis is accepted. This indicates that health awareness positively and significantly increases student activity. Conversely, the Physical Education Learning Innovations variable has a smaller and insignificant influence on student activity, with a coefficient of 0.106, a t-value of 1.707, and a p-value of 0.088 ($p > 0.05$), so this hypothesis is rejected. Thus, physical education learning innovations do not have a significant influence on increasing student activity in this study.

## 4. DISCUSSIONS

The evaluation of the outer model shows a careful refinement process to ensure that each indicator properly represents its latent construct. In the initial outer loading assessment, several indicators did not meet the recommended loading threshold of 0.70 or showed negative values, indicating weak or inconsistent relationships with their constructs. Indicators such as PK-1, PBM-1, and PD-1 within the Physical Education Learning Innovations construct, as well as KO-2 and KP-2 within the Health Awareness construct, were therefore considered invalid. This result indicates that these indicators were not able to adequately capture the intended construct dimensions in the context of elementary schools in South Papua Province, highlighting the importance of contextual validation in quantitative educational studies.

After removing the invalid indicators, the second-stage outer loading analysis demonstrated a clear improvement in measurement quality. All remaining indicators showed strong loading values, ranging from 0.827 to 0.989. In particular, PBP-1 and PI-1 within the Physical Education Learning Innovations construct recorded very high loadings (0.989 and 0.987), suggesting that these indicators strongly reflect learning innovation practices. Similarly, the Health Awareness construct was well represented by PHS-2 (0.943) and DSSK-2 (0.919), while the Student Activity construct was adequately measured by VAP-3 (0.853), MAB-3 (0.844), and PLAP-3 (0.827). These findings confirm that the revised measurement model meets the requirements for convergent validity in PLS-SEM analysis.

Additional support for convergent validity is provided by the Average Variance Extracted (AVE) values. All constructs exceeded the minimum threshold of 0.50, with Physical Education Learning Innovations showing a very high AVE of 0.975, followed by Health Awareness (0.742) and Student Activity (0.708). These results indicate that more than half of the variance in the indicators is explained by their respective constructs, confirming the adequacy and consistency of the measurement indicators. This strong convergent validity supports the suitability of the model for further structural analysis. Discriminant validity was evaluated using cross-loadings, inter-construct correlations, and the Fornell–Larcker criterion. Although a relatively high correlation was found between Health Awareness and Student Activity (0.944), the square root of AVE for each construct remained higher than its correlations with other constructs. This suggests that, despite their close conceptual relationship, Health Awareness, Physical Education Learning Innovations, and Student Activity are empirically distinct constructs. The strong association between Health Awareness and Student Activity is in line with health behavior theories, which emphasize that awareness and understanding of health benefits play an important role in encouraging active behavior among children.

Reliability testing further supports the quality of the measurement model. Cronbach's alpha values ranged from 0.796 to 0.975, while composite reliability (rho_a) values ranged from 0.810 to 0.979, all exceeding the recommended threshold of 0.70. These results indicate strong internal consistency and reliability of the indicators within each construct. High reliability is particularly important in this study due to the varied characteristics of respondents and the challenging educational conditions in the Indonesia–Papua New Guinea border area, where measurement tools must be both stable and adaptable to local contexts. The structural model analysis provides important insights into the relationships among the studied variables. Health Awareness showed a strong and statistically significant effect on Student Activity ($\beta = 0.867$, $t = 17.747$, $p < 0.001$), indicating that higher health awareness is associated with increased levels of student physical activity. This finding emphasizes the key role of students' knowledge, attitudes, and awareness of health in motivating active behavior. In contrast, Physical Education Learning Innovations had a positive but non-significant effect on Student Activity ($\beta = 0.106$, $t = 1.707$, $p = 0.088$), suggesting that instructional innovation alone may not directly influence student activity levels, particularly in settings with limited facilities, teacher capacity, and learning resources.

Overall, the results indicate that Health Awareness is a more dominant factor influencing Student Activity than Physical Education Learning Innovations in elementary schools in South Papua Province. While innovative teaching approaches remain important, their impact appears to be indirect or dependent on supportive contextual conditions. These findings contribute to the physical education literature by highlighting the importance of internalized health awareness over instructional innovation in shaping student behavior, especially in border and under-resourced regions. Therefore, efforts to increase students' physical activity should prioritize strengthening health awareness alongside gradual and context-appropriate improvements in learning innovation.

## 5. CONCLUSIONS

This study concludes that the measurement model developed using PLS-SEM demonstrates strong validity and reliability after indicator refinement. Health Awareness has a significant and dominant influence on Student Activity, while Physical Education Learning Innovations do not show a significant direct effect. These findings indicate that students' internal health awareness plays a more crucial role in promoting physical activity than instructional innovation alone, particularly in elementary schools located in the Indonesia–PNG border region of South Papua Province. Therefore, initiatives to enhance student activity in border areas should prioritize strengthening health awareness while progressively improving physical education learning practices.

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