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Correlates of Physical Activity among Preadolescent Filipinos

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Abstract A resounding call for more contemporary research on the correlates of physical activity in low and middle-income countries has been documented over the years. It was, therefore, the aim of this study to examine the correlates of physical activity in terms of endurance, body mass index, and motivation. Study participants involved 257 students, specifically male (*n=137*) and female (*n=120*), ranging from 9 to 11 years old preadolescent Filipinos. The physical activity levels were determined by the Physical Activity Questionnaire for Children (PAQ-C), while the cardiorespiratory endurance was assessed by a 3-minute step test. A body mass index (BMI) was calculated and classified using the World Health Organization criteria. Both Behavioral Regulation in Exercise Questionnaire (BREQ) and the PAQ-C were used to measure motivation in physical activities. An interview was also conducted for data triangulation. This research yielded the following results: First, endurance (x1) had no direct positive effect on physical activity (y) (β=-.069). Second, BMI (x2) had no direct positive effect on Physical activity (y) (β=.023). Third, motivation (x3) had a direct positive effect on physical activity (y) (β=.237). Next, endurance (x1) had no direct positive effect on motivation (x3) (β=-.116). Subsequently, BMI (x2) had a direct negative effect on motivation (x3) (β =-.301). Finally, endurance (x1) had a direct positive effect on BMI (x2) (β =.515). Endurance-BMI was considered the most remarkable relationship, garnering the highest standard estimate score of .515. The results also showed that BMI (x1) positively affected endurance (x2). It suggests that higher levels of working heart rate are associated with higher BMI scores of overweight and obese Filipino preadolescents. They had a lower endurance level due to excess body weight.

Keywords Filipino Adolescents, Physical Activity Correlates, Endurance, BMI, Motivation

1. Introduction

There has been a global health concern about insufficient physical activity or physical inactivity. World Health Organization (WHO) member states have agreed to work with common agenda of reducing the prevalence of insufficient physical activity by 10% by 2025 [1]. However, the worldwide population-based surveys on the prevalence of insufficient physical activity revealed a slow progress and off-the-track status in reducing physical inactivity among the WHO member states [2]. WHO empirical data suggested that 70% of inactivity was due to modernization of transportation, technology integration, and urbanization, not to mention a lack of awareness and investment. The organization, therefore, re-emphasized the importance of physical activity with a global action plan for 2018 – 2030, aiming to transform people into more active individuals for a healthier world [3]. While debates on the ambiguity between the terms "physical inactivity" or "insufficient physical activity" are existing [4], this present research interchangeably used both to refer to people who do not engage in the WHO recommended 150-minute moderate aerobic activity per week threshold [31].

The factors that resulted in physical inactivity were analyzed in empirical studies, focusing on children's screen time, leading to sedentary behaviors and obesity [5-7]. The high levels of insufficient physical activity are particularly in high-income countries, and women are generally less active [2]. WHO [8] identified physical inactivity, alongside tobacco and alcohol use and unhealthy diets, increasing the probability of procuring noncommunicable diseases (NCDs) like heart attacks and stroke, cancers, chronic respiratory diseases, and diabetes. Similarly, an epidemiological study confirmed that insufficient physical activity could develop NCDs, leading to premature mortality [9]. There has been a widespread call for action to engage in regular physical activity to address this concern [10-12].

However, despite the campaigns for global awareness on public health initiatives toward regular exercise, there still had been no improvement in the physical activity levels across countries. Minimal improvement has been observed in reducing levels of inactivity worldwide. The problem is alarming, especially since NCDs are disproportionately higher in low and middle-income countries, such as the Philippines [14,15].

Research conducted in Asian countries has revealed that the Filipinos, Thais, and Malaysians are the people who engage in physical activity or exercise the least in the continent due to lack of time and motivation, and distractions from the modern world, and lack of venues for exercise [16]. Interestingly, the statistical analyses of data from 13,696 respondents in 18 countries during the first quarter of the COVID-19 pandemic revealed that respondents were arguably inactive by decreasing their exercise frequency (23.7%) despite having more time at home. A majority of the respondents (44.2%) maintained their exercise frequency levels, either inactive or active, as lockdown restrictions propelled the closing of venues for exercise (e.g., gyms, fitness clubs, etc.) [17]. In comparison to the findings on gender difference and exercise, Panenggak and colleagues [18] confirmed that male students spent more time exercising than female students during the pandemic. Another study in the Philippines found that lack of time was a factor that caused inactivity [19].

Philippine-based studies [20-22] have observed similar findings of sedentary lifestyle among Filipinos. Many communities, including gender-challenged members, have been marked inactive physically [23,24]. This national health crisis is indeed overly concerning since the country's obesity rate has increased [25]. Inactivity has even more pronounced among preadolescents who are now less active than their parents. It is even becoming a lifestyle characterized by little or no physical movement and low energy expenditure [26].

Preadolescent Filipino students, ranging from 9 to 11 years old, are more prone to becoming overweight arguably due to the sedentary nature of schooling, influencing their body mass index (BMI) and increasing their chances of developing NCDs. Yuchintat and colleagues [20] claimed that preadolescents between the ages of 9 and 12 are physically inactive, even during school days. While it seems valid to some, there is a research that examines the relationship between education and obesity, arguing against the certainty of the causal nature of the link between the two [27]. In a 2022 study [28], however, it was found that a large school environment where students aged 16-19 years hang around had a significant influence on their psychomotor and cognitive development. Inactivity can even be addressed through a wide range of curricular and extracurricular activities that incorporate health, fitness, sports, recreation, and wellness programs [29]. Furthermore, the Philippine K-12 Physical Education (PE) curriculum envisions an active and healthy lifestyle for its graduates, shifting from a skill-centered to a fitness-centered approach. Filipino adolescents' participation in physical activities needs to be examined. While varying methodological paths can be taken, it is preferable to investigate the correlates associated with physical activity. Correlates may involve socio-demographic, biological, psychological, behavioral, sociocultural, and environmental aspects.

This study operates within the hypothesis that endurance, BMI, and motivation can influence the physical activity participation of student participants. Existing literature has explored the correlates of physical activity, including biological (fitness/body fatness) and psychological (motivation), sociocultural, and environmental [30]. A resounding call for more contemporary research on the correlates of physical activity in low and middle-income countries has been documented [32-34]. While studies exploring factors influencing physical activity are available [35,36], little is known about the correlations of being physically active among preadolescents [37], particularly in the Philippines. It was, therefore, the aim of this research to expand the existing body of literature by examining the correlates of physical activity in terms of endurance, BMI, and motivation. This research examines the associations and uses a conceptual path model in Figure 1.

Figure 1 illustrates the hypothesis that endurance (x1), BMI (x2), and motivation (x3) have a direct effect on physical activity (y). The researcher also believed that endurance (x1) and BMI (x2) have a direct effect on motivation (x3), while endurance (x1) has a direct effect on BMI (x2).

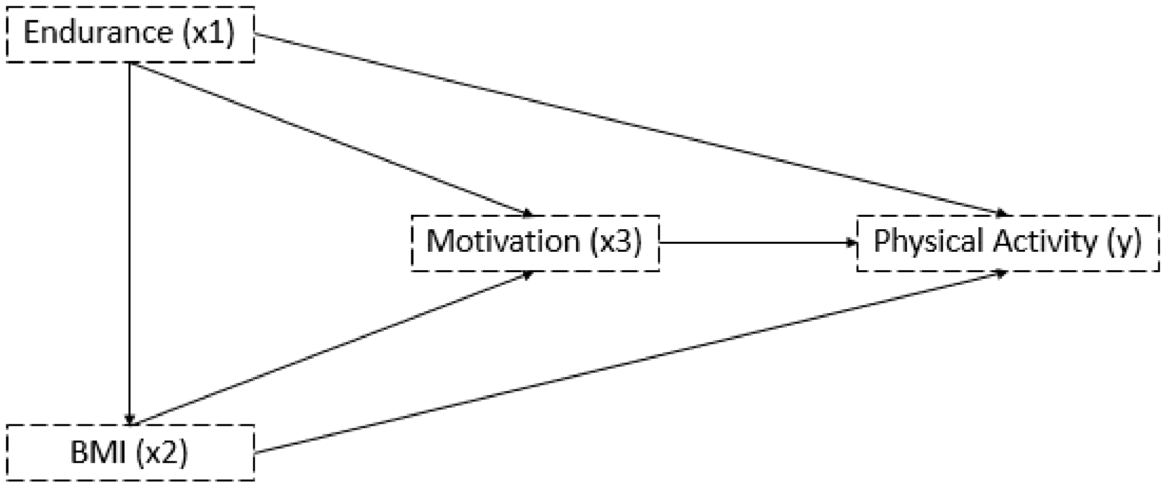

Figure 1. Hypothesized path model and its associations among endurance, BMI, Motivation, and physical activity

2. Materials and Methods

2.1. Research Design

This study was guided by the principles of correlation research design to examine the associations between endurance, BMI, motivation, and physical activity. The researcher analyzed statistical data using path modeling, a form of multiple regression that examines the causal connections of variables. SPSS analysis of a moment structure aids the researcher in the process. Regression analysis examines the influences between variables. It is likewise utilized to evaluate multiple variables in predicting a single dependent variable or outcome. An interview was also conducted for data triangulation, verifying, and cross-checking the dataset.

2.2. Study Area and Duration

The researcher conducted this study in the municipality of Alicia, Isabela, an area of mainly flat and fertile land in the Cagayan Valley, the Philippines. It has the largest irrigated rice fields in the region, making it the home of farmers producing crops. With its geographical description and living condition, residents' children are expected to live a regularly active life. The study began after the researcher adhered to research protocols in the third quarter of 2018.

2.3. Respondents and Sampling Technique

Filipino preadolescents (*n=257*) enrolled in Grades 4, 5, and 6 in both public and private elementary schools in the municipality of Alicia, Isabela, participated in this study. They represented physically active preadolescents, who were members of a sports team, drum and lyre, dance troupe, and less active preadolescents, described as overweight and obese by school nurses and physical education teachers. Initially, the researcher recruited 300 preadolescents; however, only those consented by their parents participated in this study.

Table 1. Demographic Profile of Student Respondents

Characteristics	Classifications	*n*	%
Sex	Male	137	53.31
	Female	120	46.69
Age	9	76	29.57
	10	99	38.52
	11	82	31.91
Type of School	Public	148	57.59
	Private	109	42.41
Body Mass Index	Wasted	7	2.72
	Normal	169	65.76
	Overweight	44	17.12
	Obese	37	14.40

Table 1 shows the demographic profile of the respondents. Preadolescents male (*n*=137) with 53.31% are relatively larger by sample size than preadolescents female students (*n*=120) with 46.69%. The highest reported percentage of age referred to ten years old (38.52 %), followed by eleven years old (31.01%), while nine years old received the least percentage (29.57). There were more preadolescents student respondents who studied in public elementary school (*n*=148) with 57.59% than in private school (*n*=109) with 42.41%. As regards BMI, preadolescents with normal weight comprises the largest number of respondents (*n*=169) with 65.76 %, followed by the overweight preadolescents (*n*=44) with 17.12 %, obese

(n=37) with 14.40 %, and wasted (n=7) with 2.72 %.

2.4. Measures

2.4.1. Physical Activity Questionnaire for Children (PAQ-C)

The Physical Activity Questionnaire for Children (PAQ-C) was used to determine the general physical activity levels of 8-14 years old children [38]. It shows good internal consistency, validity, and reliability for preadolescents whose age range is similar to the current study [39]. Its standardized Cronbach Alphas ranges from 0.72 to 0.88 [40]. The adapted PAQ-C had minor modifications in the activity checklist to fit to the activities of student respondents at the time of the study. It consists of nine items with a 20-minute completion time. Each is scored using a 5-point rating scale, wherein 1 for the lowest score and 5 for the highest score of observed physical activity [41].

2.4.2. 3-Minute Step Test for Endurance (x1)

The 3-minute step test was conducted to measure the cardiorespiratory endurance of the student respondents [42]. It likewise measured the aerobic fitness level based on how quickly the heartbeat returns to normal after the exercise. The Philippine Department of Education used it in elementary and secondary schools to measure cardiorespiratory endurance [43]. A stopwatch, bench (eight inches), and a metronome are necessary paraphernalia for this test. The following testing procedures were conducted: First, the initial fitness data were collected (e.g., height, weight, and resting heart rate) from student respondents' groupings. The researcher scheduled and set various stations in the venue for data collection. Group One was assigned to station one (height measurement), Group Two to station two (weighing station), and Group Three to station three (pulse rate station). Each group turned clockwise to proceed to the next station until all had gone through all stations. Second, the groups moved to the bench station where the step test was conducted. The facilitators checked the completeness of the data recorded in their score sheet before allowing the student respondents to take the test. This was done in groups of ten to closely monitor the activity. Third, a ten-second warning schedule was observed. The student respondents were asked to return to their positions at the back of the bench. At the given signal, they started to step up and down the bench for 3 minutes, following the set rhythm of the metronome at a rate of 24 steps up and down per minute. One step involved four beats: the up (left foot), up (right foot), down (left foot), and down (right foot). Immediately after the 3-minute activity, the student respondents rested on the bench, and the facilitators checked their pulse. After five seconds, their pulse rate was determined by putting the index and middle finger in their carpal or carotid artery for 60 seconds. This is the most practical method to count the pulse during the activity. The heart rate increased; however, immediately after the activity, it began to slow and return to normal. Results were recorded on the score sheet. Finally, after the test, the student respondents were given a break to drink water and eat bread, followed by a cool-down stretching activity. Due to the absence of a norm-referenced standard in the Philippines for cardiorespiratory endurance, the study referred to the developed reference system of the post-exercise heart rate with two age brackets of six to nine and ten to twelve [42]. The limits of the age brackets were set to at the age of 9 as it corresponds to the end of the juvenile pre-pubertal period and the beginning of the juvenile period (puberty and growth). Table 2 shows the classification of cardiovascular fitness adapted from Jankowski and colleagues [42].

Table 2. Classification of Cardiovascular Fitness

Cardiovascular Fitness	Boys 6-9 yrs. old	Boys 10-11 yrs. old	Girls 6-9 yrs. old	Girls 10-11 yrs. old
Excellent	<95	<93	<100	<102
Very Good	95-106	93-105	100-113	102-116
Good	107-115	106-116	114-123	117-128
Sufficient	116-126	117-128	124-134	129-141
Poor	127-142	129-147	135-152	142-157
Very Poor	>142	>147	>152	>157

2.4.3. Body Mass Index (x2)

The Body Mass Index (BMI) was used to determine the anthropometric height and weight characteristics, and classifications [44]. It is interpreted as the fatness index and is calculated by dividing an individual's mass in kilograms by the square of their height in meters. WHO provided values determining weight status, such as underweight scores below 18.5 kg/m2; normal weight scores between 18.5 and 23.9 kg/m2; overweight scores between 24 and 27.9 kg/m2; obese scores anything over 28 kg/m2 [45].

2.4.4. Behavioral Regulation in Exercise Questionnaire for Motivation (x3)

The Physical Activity Motivation Scale based on the Behavioral Regulation in Exercise Questionnaire (BREQ) was used to examine student respondents' motivation. Their exercise motivation scores, known as the relative autonomy index (RAI), were computed using the BREQ adapted from Mullan and colleagues [46]. The score was obtained by determining the mean of the responses for each subscale and then applying weights to each subscale. The final RAI score serves as the sum of the weighted subscale scores. A high positive score indicates greater relative autonomy, whereas lower negative scores indicate more controlled regulation. Sabire and colleagues [47] self-determination motivation for physical activity, which adapted a set of items appropriate for measuring students' intrinsic, identified, introjected, and external motivational regulations for physical activity based on the BREQ, was likewise used by this study. The items were selected for age-appropriateness, and the words were simplified to make them more understandable to preadolescents. The reliability or internal validity of the questions in BREQ were assessed using Cronbach's alpha.

Table 3 presents the motivation reliability results. The Cronbach's Alpha for physical activity and motivation are 0.68 and 0.76, respectively. This statistic is close to the minimum suggested Cronbach's Alpha of 0.7. The questions under the Physical Activity Questionnaire and BREQ measured the same underlying concept of respondents' motivation in physical activities.

Table 3. Motivation Reliability Statistics

	Cronbach's Alpha	*N* of Items
Physical Activity	0.68	9
Motivation	0.76	12

Table 4. Table of Specification (Grille Instrument)

Variables	Indicators	Item Placement	*N* of Items	%
Physical Activity Motivation Scale	Intrinsic Regulation	1, 5, 9	3	15%
	Identified Regulation	2, 6, 10	3	15%
	Introjected Regulation	3, 7, 11	3	15%
	External Regulation	4, 8, 12	3	15%
Physical Activity Questionnaire	Activities in a day	1	1	5
	During PE time	2	1	5
	During Break	3	1	5
	During Lunch time	4	1	5
	After-school hours	5	1	5
	During Nighttime	6	1	5
	During Weekends	7	1	5
	Description for the last 7 days	8	1	5
	Days of the week	9	1	5

2.4.4.1. Translation of Questionnaires

A Filipino language teacher translated the questionnaire from English to Filipino for their appropriateness to the student respondents. Two language specialists critiqued the translated questionnaires online. The questionnaire further went through another set of critiquing conducted by two more language professors. The final draft of the questionnaire was submitted to the English language professors. The researcher administered the questionnaire to selected elementary students for pilot testing in August 2018, checking whether items were confusing or difficult to answer. The questionnaire was revised and finalized while considering users' feedback and proposed changes.

There was an interval in answering two questionnaires to sustain eagerness in the activity. The researcher used the Table of Specifications to determine the physical activity and motivation of the respondents, as presented in Table 4.

2.5. Data Analyses

Statistical analysis was performed using SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to present the profile of student respondents using frequencies and percentages for categorical variables and means and standard deviations for quantitative variables. Spearman's Rank-order Correlation Coefficient ρ was used to measure the association between the different pairs of variables. It is the non-parametric version of the Pearson's Product-Moment Correlation Coefficient that measures the strength and direction of correlation between ranked variables. Also, the Kruskal-Wallis tests were performed to determine whether the scores in physical activity, endurance, and motivation vary across the levels of the nominal explanatory BMI variable. The Kruskal-Wallis test is a non-parametric test used to determine the statistically significant differences among the variables. With equal importance, the path analysis was conducted to determine whether a multivariate set of nonexperimental data fits well with a particular causal model. It provides an estimate of the magnitude of causal connections between variables. In this research, endurance is an exogenous variable, where its variability is assumed to be caused entirely by other variables outside the causal model. On the other hand, BMI, motivation, and physical activity were considered endogenous variables. Their variability is assumed to be partly explained by other variables presented in the causal model (Figure 1). Path analysis was employed to compare two or more causal models. This statistical tool examines the relationships between a dependent variable and two or more independent variables. The researcher further conducted interviews and used the responses to triangulate the statistical data. All study procedures, including the instruments, were approved by the University Institutional Ethics Review Board.

3. Results

Endurance (x1), BMI (x2), motivation (x3), and physical activity (y) variables were assessed. The results were presented using mean, standard deviation, and the minimum and maximum range of scores, as shown in Table 5.

Table 5. Summary of Data Description for the Variables of the Study

	Endurance (x1)	BMI (x2)	Motivation (x3)	Physical Activity (y)
Mean	117.84	19.87	4.15	2.95
Std. Deviation	21.40	4.70	.576	.617
Minimum	50.00	11.90	2.25	1.55
Maximum	190.00	38.60	5.00	4.55

3.1. Frequency Distribution of Endurance (x1)

The average endurance score of student respondents was 117.84, which ranged from 50 to 190. The post-exercise heart rate taken from the 3-minute step test can indicate cardiorespiratory fitness and is closely associated with endurance. The mean result implies that student respondents are within the range of sufficient to good endurance level. It is between the poor and excellent degrees, proving that their endurance level is enough to sustain the three-minute activity but not an assurance of sustaining a prolonged period of physical activity.

3.2. Frequency Distribution on Body Mass Index BMI (x2)

The BMI scores indicated that only a few respondents have high BMI scores, while most have less than the mean. The average BMI score of the respondents was 19.87, with 169 (65%) classified as normal. However, some respondents were classified as wasted (2.72%) and obese (14.40%).

3.3. Frequency Distribution of Motivation (x3)

The motivation score was around the mean of 3. The average mean motivation score of the respondents was 3.05, which suggests that student respondents have positive self-determination about physical activities. They have relative autonomy in doing their physical activities. On the other hand, the respondents were not controlled by others in their physical activity participation. In an interview with parents, teachers, and coaches/trainers, they strongly articulated that the preadolescents' drive for being active is that of enjoyment and having fun. Enjoyment of physical activity is a consistent predictor of physical activity outcome variable both for male and female preadolescents [39]. There have been various approaches to ensure enjoyment while doing physical activities as discussed by Urzha and Evstratova [57].

3.4. Frequency Distribution of Physical Activity (y)

The physical activity scores of student respondents had a mean of 2.95, suggesting that they are less physically active. Concerning physical activity participation, they engaged in running, tagging, and walking as part of their regular physical activity for the past seven days. They considered these activities fun and could be done both inside and outside the campus. While these activities are necessary, they should coalesce into a multi-component exercise program of strength, aerobic, high impact and/or weight-bearing training for better development [48]. However, most student respondents did not consider sports as their physical activity. Only a few were interested in playing basketball, badminton, table tennis, and lawn tennis. They were those whose parents were also into sports. They were given parental support in their chosen physical activity by providing exceptional training, accompanying them during practices and competitions, and buying the apparel needed in their sport. The other team sports (softball, soccer, football, and baseball) did not appeal to the interest of student respondents due to inadequacy of skills and low confidence. As regards water activities like swimming, student respondents had the least experience due to its absence from school grounds. Many public schools in the country had no swimming pools to accommodate the need. Thus, another barrier to physical activity engagement is socioeconomic status. In comparison to a relatively recent study [56], researchers found that there was a geographical association with height, body weight, and body mass index among children respondents. The data may lead to a new study that focuses on socioeconomic and geographical associations among inactive children. The respondents participated in the physical activities during their Physical Education time. The teachers relayed in an interview that students displayed a high level of being physically active during their PE time. They performed running and jumping activities aside from the lessons in dances and games. Some student respondents considered their PE time not appealing since they were not into physical activities. They noted that games and other physical activities in the class were both tiring and exhausting. The teachers described these inactive preadolescents as overweight and obese. During recess time, the respondents were less active, using this time for taking snacks. The lack of time hindered them from doing physical activities. Also, during lunchtime, they were less active since they would like to take the time to rest and be energized again for the afternoon classes. The parents expressed that they did not allow their children to do physical activities such as sports and games during lunchtime because of the hot weather condition in the area. After school hours, some preadolescents were less physically active because they attended their tutorials. Still, some student respondents performed physical activities such as running, jumping, and playing street games in the neighborhood, while others did household chores. At night after dinner, most of them conveyed in an interview that they were less physically active due to academic work (i.e., assignments and projects). Others preferred watching television programs and playing with their gadgets.

For many student respondents, they spent their weekends on physical activities like sports, street games, and household chores. Some attended table tennis and taekwondo practices because their parents influenced them. Together with their other siblings, they played sports during weekends. Unfortunately, a few found weekends as the time to be idle and did nothing. They shared that they spent weekends doing sedentary activities like watching a movie with family and relatives, playing computer games, and eating with family members in malls nearby the town.

3.5. Test Requirements Analysis Data

The standardized regression weight of the four variables in the study is shown in Table 6.

Table 6 presents the result of the multiple regression that examines the causal connections between dependent and independent variables. The hypothetical path model (Figure 1) indicates that physical activity (y) is directly affected by endurance (x1), BMI (x2), and motivation (x3). However, the result yielded the following findings: First, endurance has no direct positive effect on physical activity (β=-.069). Second, the BMI has no direct positive effect on Physical activity (β=.023). Third, motivation has a direct positive effect on physical activity (β=.237). Next, endurance has no direct positive effect on motivation (β=-.116). Subsequently, the BMI has a direct negative effect on motivation (β =-.301). Finally, endurance has a direct positive effect on BMI (β =.515). Endurance-BMI appears to be the most important among the possible relationships for having the highest standard estimate score of .515. The results have also shown that BMI was positively affected by endurance. It means that higher levels of working heart rate were associated with higher BMI scores (overweight and obese). The result in the developed model (Figure 2) shows some outliers (e1, e2, e3) that explain that the result is more affected by some extraneous variables.

Table 6. Standardized Regression Weights of Variables

Path	Estimates	SE	CR.	P	Standard Estimate
Endurance (x1) to Physical Activity (y)	-0.002	.002	-0.977	0.329	-.069
BMI (x2) to Physical Activity (y)	.003	.010	0.308	0.758	.023
Motivation (x3) to Physical Activity (y)	0.254	.070	3.645	***	.237
Endurance (x1) to Motivation (x3)	-0.003	.002	-1.713	.087	-.116
BMI (x2) to Motivation (x3)	-0.037	.008	-4.446	***	-.301
Endurance (x1) to BMI (x2)	0.113	.012	9.609	***	.515

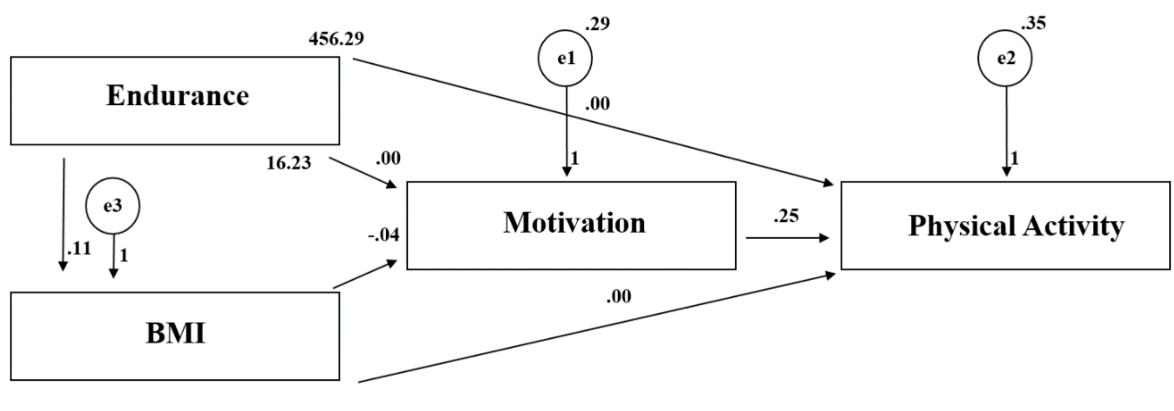

Figure 2. Developed Model

Table 7. Standardized Regression Weights of Variables

Variables	Direct Effect (95% CI)	Indirect Effect (95% CI)	Total Causal Effect (95% CI)
Endurance to BMI	.515 (.413 – .595)*	-	.515 (.413 – .595)*
Endurance to Motivation	-.116 (-.248 – .027)	-.155 (-.236 – -.085)*	-.271 (-.382 – -.150)*
Endurance to Physical Activity	-.069 (-.198 – .087)	-.053 (-.129 – .025)	-.122 (-.236 – -.008)*
BMI to Motivation	-.301 (-.426 – -.164)*	-	-.301 (-.426 – -.164)*
BMI to Physical Activity	.023 (-.116 – .171)	-.071 (-.134 – -.030)*	-.049 (-.189 – .097)
Motivation to Physical Activity	.237 (.107 – .358)*	-	.237 (.107 – .358)*

*Significant at 5 %

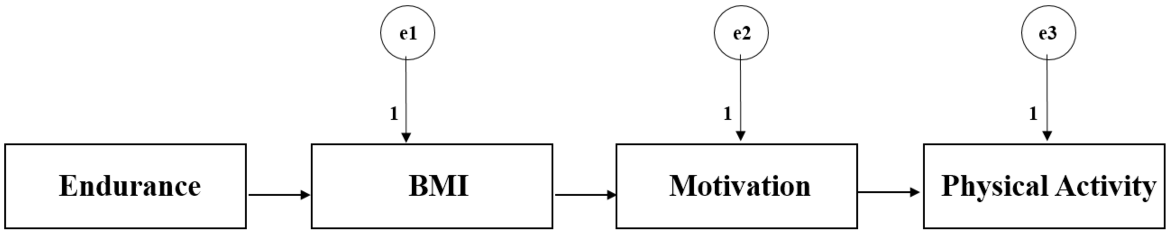

Figure 3. Final Framework for Physical Activity

Table 7 shows the standardized indices for direct, indirect, and total causal effects. As can be seen, endurance significantly and directly influences BMI, β = .515, 95% CI: .413 - .595. BMI also exhibits a similarly significant and direct influence on motivation, and motivation on physical activity, with β = -.301 and β = .237, respectively, and 95 percent CI not passing through zero. These direct effects are equivalent to total effects since no indirect paths were traversed through these variables. On the other hand, endurance indirectly and significantly impacts motivation flowing through the BMI, β = -.155, 95% CI: -236 **– -**.085, and BMI to physical activity, β = -.071, 95% CI: -.134 **– -**.030) through motivation. The total indirect effect index positing the indirect effect of endurance on physical activity bears non-significance, β = -.053, 95% CI: -.129 – .025. Specifying the indirect effect path using the estimate procedure of SPSS AMOS yielded a significant path out of the three possible indirect paths from endurance to physical activity. The path where BMI and motivation serve as intervening variables from endurance to physical activity generated a non-standardized estimate of -.001, the standard effect of -.046 with 95% CI of -.002 to -.001, p = .001. It signifies that endurance, although not directly influencing physical activity, indirectly affects physical activity through BMI and motivation. The next figure shows the modified model of the study.

3.6. Final Model and Its Model Fit

Figure 3 illustrates that endurance directly affects BMI, while BMI directly impacts motivation, and motivation affects physical activity. Endurance indirectly influences BMI, BMI on physical activity, and endurance on physical activity.

The chi-square goodness of fit test as the badness of fit test supports correct specification indicating good model fit of the trimmed model to the data, X^2 = 3.897, *df* = 3, *p* = .273. The descriptive index provided by CMIN/DF, which is 1.299, falls between the acceptable ranges from 0 to 2, supporting good fit. Furthermore, the goodness of fit index (GFI), which represents the amount of variance and covariance in the sample covariance matrix as accounted for by the model, generated a value of .993, indicating a good to an exceptionally good fit. The parsimony-adjusted versus of GFI or the adjusted GFI (AGFI), Tucker-Lewis Index (TLI), and the comparative fit index (CFI) yielded values of .975, .986, and .993, respectively, all indicating optimal levels of fit. Another standard is the RMSEA, or the root means a square error of approximation, which has a value of .034, well within the standard of 0 to .05, supporting a close fit to the data PCLOSE > .05. Therefore, there is a reason to believe that the presented framework is sound and acceptable.

3.7. Testing of Hypotheses

Table 8 shows the status of the research hypothesis. Out of the six-research hypotheses, three accepted the alternative hypothesis (H1), while the other three rejected the alternative hypothesis (Ho).

Table 8. Summary and Decision on the Hypothesis Testing Results on the Correlates of Physical Activity on Endurance, BMI and Motivation

	Hypothesis	Standard Estimate	P	Decision
1	Endurance (x1) has a direct positive effect on Physical Activity (y) Ho: βy1 ≤ 0 H1: βy1> 0	-.069	.329	Endurance (x1) has no direct positive effect on Physical Activity (y) Reject H1
2	BMI (x2) has a direct positive effect on Physical Activity (y) Ho: βy2 ≤ 0 H1: βy2> 0	.023	.758	BMI (x1) has no direct positive effect on Physical Activity (y) Reject H1
3	Motivation (x3) has a direct positive effect on Physical Activity (y) Ho: βy3 ≤ 0 H1: βy3> 0	.237	***	Motivation (x3) has a direct positive effect on physical activity (y) Accept H1
4	Endurance (x1) has a direct positive effect on motivation (x3) Ho: β31 ≤ 0 H1: β31> 0	-.116	.087	Endurance (x1) has no direct positive effect on motivation (x3) Reject H1
5	BMI (x2) has a direct positive effect on Motivation (x3) Ho: β32 ≤ 0 H1: β32> 0	-.301	***	The BMI (x2) has a direct positive effect on motivation (x3) Accept H1
6	Endurance (x1) has a direct positive effect on BMI (x2) Ho: β21 ≤ 0 H1: β21> 0	.515	***	Endurance (x1) has a direct positive effect on the BMI (x2) Accept H1

*** P value less than .01

4. Discussion

4.1. Hypothesis 1. Endurance (x1) Has No Direct Positive Effect on Physical Activity (y)

Endurance does not directly affect physical activity. Regardless of one's cardiorespiratory endurance level, there is still a possibility of engaging in physical activity. Interestingly, however, the overweight and obese preadolescents were found to have low endurance levels than their normal counterparts having a low level of physical activity. A low level of cardiorespiratory endurance implies the inefficiency of the cardiorespiratory system in delivering the needed oxygen to the various parts of the body. A higher heart rate also warns that the student respondent is tired and could not go on with the demands of energy in the activity. They tend to perform below the optimum; hence, there is fatigue after the activity. This low cardiorespiratory endurance is the primary reason for low engagement in physical activities among obese children and adolescents [49]. They usually have lower physical abilities and lower cardiorespiratory endurance than normal-weight preadolescents. However, a significantly higher level of cardiorespiratory fitness was found in preadolescents who engaged in regular physical activity than those who engaged only in irregular physical activity. Physically active preadolescents have significantly better cardiorespiratory fitness levels than inactive preadolescents [50].

4.2. Hypothesis 2. BMI (x2) Has No Direct Positive Effect on Physical Activity (y)

The result coincides with an existing study [51], confirming that BMI does not affect physical activity participation. Overweight preadolescents have a high threat of health concerns because of being unhealthy, but it should also be considered that thin or undernourished children can also be unfit due to physical inactivity [52]. These, therefore, suggest that all preadolescents can tend to be physically active or inactive. On the contrary, it has been generally observed that preadolescents with higher BMI do not actively participate in physical activities. It is due to the excess weight carried by the child in the performance of an activity, taking more effort to sustain the work. The table 9 hows the cross-tabulation between physical activity and the BMI of the student respondents.

The results indicated that student respondents from normal classification got higher physical activity scores than overweight and obese students. Those with the most increased physical activity were considered wasted with a 3.156 mean, close to the average mean of 3.022. Being wasted or underweight gives them the advantage of moving quickly with less effort due to less body mass than the overweight and obese. Also, most overweight and obese preadolescents had lower physical activity scores. They found it challenging to participate in physical activities as they got tired quickly, could not cope with the energy demand of the activity, and were less skillful in the different physical activities. They find sedentary activities more fulfilling and satisfying, such as sitting while watching television and playing with their computers. The research found that the prevalence of obesity and overweight can be attributed to a sedentary lifestyle [53]. Preadolescents who are less active and with a sedentary lifestyle have a higher risk of overweight and obesity than those who have a more active lifestyle.

Table 9. Cross Tabulation between the Physical Activity and BMI

Physical Activity	Minimum	Maximum	Mean	Variance
Wasted	1.940	4.550	3.156	0.710
Normal	1.550	4.530	3.022	0.386
Overweight	1.680	4.500	2.844	0.350
Obese	2.120	4.430	2.701	0.262

4.3. Hypothesis 3. Motivation (x3) Has A Direct Positive Effect on Physical Activity (y)

Student respondents were described to have an autonomous form of motivation to engage in physical activities. They do it for enjoyment, fun, and interest in the activity. Some admitted that they were motivated to play sports because of the influence of their family members, mostly their parents. In a short survey (google form survey) conducted to parents, teachers, and coaches, 68.1% of the respondents said that the primary reason for preadolescents to be physically active is to have fun and enjoyment. This data was followed by being fit and healthy (27.7%). The remaining percentage is for social approval and recognition. Other motivations of preadolescents included: easing boredom, gaining new friends, the influence of friends and family members, and gaining confidence. Encouraging preadolescents to participate in varied developmentally appropriate physical activities increases motivation. A good starting point in promoting physical activity participation is identifying the motives or reasons why people engage in sports or exercise [21].

4.4. Hypothesis 4. Endurance (x1) Has No Direct Positive Effect on Motivation (x3)

Student respondents' endurance level does not directly affect their motivation to do physical activity. Regardless of one's endurance level, it was found that it did not increase their motivation for physical activity. At the time of the study, all student respondents had high motivation to perform the activity because of excitement. They all are excited and interested in doing the activity regardless of their fitness level. Doing something new together with the others initially motivated them. The preadolescents did not feel the pressure of finishing the activity because the class started with light moments of exercise to ease the tension of being tested. It proves that all preadolescents can participate in cardiorespiratory activities and other physical activities with appropriate motivation. However, the findings also revealed that those preadolescents with low cardiorespiratory endurance were low motivated to participate. A low endurance level for preadolescents signifies a low motivation to do physical activity. It is common for preadolescents to easily give up when their body does not function properly due to fatigue.

4.5. Hypothesis 5. The BMI (x2) Has A Direct Effect on Motivation (x3)

Results indicated that BMI has a direct negative effect on motivation. It postulates that the lower the BMI level, the higher the motivation to be physically active. Overweight and obese preadolescents have low motivation to get involved for several reasons. If not given proper attention, the BMI would lead to a more severe health problem. In this regard, it is essential for preadolescents, together with the family, school, and community members, to work collaboratively in their intrinsic and identified motivation to be physically active. In the interview, respondents shared that their parents supported them financially and morally in their chosen physical activity. It helps them to continue to be active. Parents also ensured that their children enjoy what they do while building social relations.

4.6. Hypothesis 6. Endurance(x1) Has A Direct Positive Effect on the BMI (x2)

The study found that endurance directly affected BMI. It means that children with high endurance scores (step test) also have a high BMI score. It also implies that higher levels of working heart rate are associated with higher BMI scores. It shows that the respondents who struggled and quickly got tired were overweight and obese. This is because the fatty tissues in the body decrease the endurance level. The body fat cannot contract and does not contribute to the performance of the activity. The fats within the muscle cause inefficiency of the contraction and add weight, increasing resistance against the movement [54]. Obese children tend to avoid weight-bearing activities due to an increased energy cost in performing these activities [55]. As a consequence, they performed more poorly in the physical fitness test.

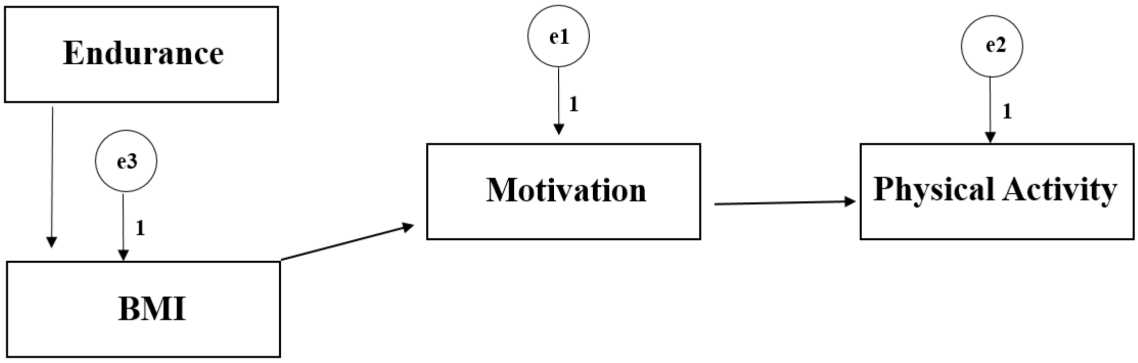

Figure 4. Validated Model

The validated model for this study is presented in Figure 4.

Figure 4 serves as the result of the study, which shows the effect of endurance on BMI, BMI on motivation, and motivation on physical activity. The symbols e1, e2, and e3 suggest that there is another extraneous variable, also considered to capture the dependent variable's variability that is not accounted for by the causal variables. There can be other correlates not covered by the model that might affect the result of the study.

5. Conclusions

The following specific conclusions were derived: First, endurance (x1) had no direct positive effect on physical activity (y). Participation in sustained physical activity requires a high level of cardiorespiratory endurance. The result claims that one does not have a high level of cardiorespiratory endurance to have more participation in physical activities. The cardiorespiratory endurance level was insignificant in becoming physically active. Second, the BMI (x2) had no direct positive effect on physical activity (y). The study concludes that physical activity participation is not based on BMI classification. The study connotes that even the undernourished/wasted, normal, overweight, and obese preadolescents are prone to being physically less active or active. Third, motivation (x3) had a direct positive effect on physical activity (y). The study concludes that motivation influences one's physical activity participation. Intrinsic motivation plays a vital role in more prolonged engagement in physical activities. Next, endurance (x1) had no direct positive effect on motivation (x3). It concludes that endurance does not influence motivation. One's endurance level will not determine motivation to be physically active. Subsequently, the BMI (x2) had a direct negative effect on motivation (x3). The lower BMI scores would mean higher motivation to be physically active. Preadolescents whose BMI is lower have higher motivation to participate in physical activities. The overweight and obese preadolescents had difficulties participating in physical activities due to excess body weight to carry while moving. Therefore, they struggled to move efficiently. These preadolescents also lack motivation because of their self-worth and self-esteem. Finally, endurance (x1) had a direct positive effect on BMI (x2). It means that higher levels of working heart rate are associated with higher BMI scores. A higher endurance level means having a lower BMI rate. Overweight student respondents had a lower endurance level due to excess body weight.

Compliance with Ethical Standards

Conflict of Interest

The author declares no conflict of interest.

Ethical Approval

All procedures performed in this study involving human participants followed the ethical standards of the institutional research committee of Philippine Normal University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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