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Leg Length and Weight: Implication on Exercise Intensity

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ABSTRACT

Practical assessment in Physical Education is one of the most crucial ways of measuring student's physical ability. This study examined the influence of leg length and body weight on exercise intensity during a 3-minute step test, addressing a gap in fitness assessment practices that often overlook individual physical differences. The purpose of this study was to determine the influence of leg length and body weight on exercise intensity to promote safety measures in practical assessment of Physical Education. Employing a descriptive correlational design, the research analyzed data from 167 college students in Gingoog City, Philippines, using descriptive statistics, frequency distribution, and regression analysis. The findings revealed leg length and body weight have significant influence on the outcome variables. The study concludes that both leg length and body weight significantly influenced exercise intensity, necessitating a re-evaluation of fitness testing methods to account for these individual differences. This result suggests that physical educators, sports coaches, and fitness instructors may consider leg length and weight in fitness assessments and training programs, advocating for personalized approaches to ensure equitable and safe physical fitness evaluation practices.

KEYWORDS

leg length; body weight; exercise intensity

INTRODUCTION

Two of the main reasons for fitness testing is to promote healthy lifestyle and physical exercise. Both are usually done in the school setting incorporated in the Physical Education curriculum from Grade school until Higher Education. One of the fitness tests that schools are repeatedly implementing is the 3-minute step test. This test is a popular method for estimating the aerobic capacity (Bates et al., 2015). Instead of adhering to the individual differences, the said test method is still used by teachers to generalize assessments due to the large number of pupils in each classroom, which has resulted in mishaps caused by instructor error, student error, and lastly technical risks (Podstawski et. al., 2015). These mishaps contradict the Principle of Individual Differences, which asserts that every individual's reaction to an exercise regimen is unique (Gill et. al., 2017).

Accordingly, one drawback of a higher step is that persons who are taller will find the step height less difficult because of their longer limbs. This is due to biomechanical differences (Nguyen and Gillum, 2015). While individual difference is a universally established concept, the gap of the study perceived vague equality when fitness tests such as the step test disregard individual differences. Undeterred by this perceived gap, the biomechanical individual differences are used in this study.

Despite the popularity of exercise intensity as an independent variable in weight loss-related studies (Swift et al., 2014;), it is not commonly investigated as dependent variable. This study's gap focuses on the little to no importance given to exercise intensity in planning for practical assessments before implementation. Even in obese individuals, although, regular exercise can improve metabolism disorders but the specific exercise intensity still needs to be discovered (Ruan et al. 2023). In relation, the researcher assumes that fitness assessment disparities will persist due to individual differences in body structure and anthropometry, which are not well understood and considered in exercise physiological responses.

Fitness testing is used as a learning context by physical educators even if there is not enough data to support its value (Alfrey and Gard, 2019). Concomitant to this, the present study aimed to establish empirical evidence demonstrating that leg length and weight can predict step test performance, which may pose practical implications for the fitness assessment practices of PE teachers. An ethical test user's duty in PE is to ensure a favorable testing experience (Baumgartner et al., 2015).

Therefore, this study examined the leg length and body weight influencing exercise intensity in step test performance using a descriptive correlational design. This study intended to find the influence of leg length and weight to exercise intensity to strengthen the idea of safety precautions before conducting a fitness test that requires these variables.

RESEARCH METHODS

Research Design

This study utilized the descriptive correlational design to describe the influence of leg length and weight to the exercise intensity during the 3-minute step test. This design is being applied in this quantitative study so that, the elucidated data, in investigating the relationship between the interplaying variables, will be well defined. In line with this, the results of the study were described using the percentage of Heart Rate Reserve, which entails the zone of exercise intensity based on the anthropometry measurements of leg length and weight. Findings generated from correlational research can be used, for example, to inform decision-making, and to improve or initiate health-related activities or change (Curtis et al., 2016).

Participants and Sampling Procedure

The participants are college students between the ages of 18 and 20 from the schools in Gingoog City, Misamis Oriental. Approximately, there are 185 college students and 75 of these students are female, while 110 are male. The objective was to select a random sample that accurately represents 90 percent of the population. In order to attain the population coverage, the researcher selected a sample size of around 167 pupils (90 percent of 185). Consequently, the sample comprised around 68 female students (90 percent of 75) and 99 male students (90 percent of 110). The figure's ideal proportional representation of both genders was determined by considering their respective populations' sizes.

The study used a random sampling technique which substantially diminished the probability of bias in the research findings. A probability sample using random sampling is one in which each person has an equal and independent chance of being chosen for the sample (Setia, 2016). The application of probability-based sampling methods improves the dependability of the research by facilitating accurate computations of the ideal sample size, sampling error, and result precision. By employing this methodological approach, it becomes possible to get more precise conclusions and judgments on the target population of the study (Bhardwaj, 2019). In using this methodical strategy for participant selection, a more reliable and representative evaluation of the research inquiries is guaranteed.

The researcher, together with the PATH-FIT Instructors, segregated the profiles of the students who have cardiorespiratory medical histories, along with records showing tardiness leading to dropping the course and the differences in subject load for regular students because the data gathering procedures of the study took three to four hours. Then, a random sampling technique was implemented using the random number generator or an analogous instrument in order to guarantee an impartial selection procedure. Furthermore, each participant received a code for the random probability sampling procedure until the desirable sampling procedure was fit for the study. Hence, the researcher generated the data to control bias during sampling.

Moreover, in situations where practical limitations occurred, such as student availability or class schedules, researcher experienced challenges in precisely achieving 90 percent representation, the objective was to approximate this percentage as closely as possible while upholding the random selection procedure. The selection of participants covers the health conditions, voluntary participation, and informed consent. High-risk students, those who declined to participate, and those who did not have parental consent were not included in the study.

Research Instruments

Two anthropometric measures were used, and a reduced-time step test protocol was adapted as instruments. This section expounds on the research instruments used in this study. The following were used to measure the variables:

Measuring Tape. This study is concerned with measuring leg length which is the distance from the anterior superior iliac spine (ASIS) to the medial malleolus using a measuring tape in unit centimeters.

Weighing Scale. The body weight was obtained using a digital weighing scale in unit of kilogram. The weight was taken twice per person to ensure consistency of result given by the weighing scale.

Three-minute step test protocol. The researcher utilized a modified version of the step test protocol in lieu of the existing such as the Harvard Step Test (Vangrunderbeek et al., 2013), Queen's College Step Test (Bennett et al., 2016), and YMCA Three-Minute Step Test (Manadhar et al., 2021). The step test protocol follows the guidelines of YMCA 3-minute step test. A 12-inch step or bench was customized to 10-inch in 1-minute.

Pulse Oximeter. Heart rate was being measured by a pulse oximeter, a non-invasive medical instrument attached to the fingertips of the participant to measure oxygen saturation and pulse rate (Huang et al., 2014; Kong et al., 2014). The participants laid down and rested for fifteen minutes.

At the start signal, the test performer stepped with the right foot onto the bench followed by the left foot. The test performer stepped *up-up-down-down* repeatedly within one minute with a prescribed beat per minute. After the step test performance, the data from the pulse oximeter, called the Exercise Pulse Rate (EPR), were recorded.

Determining the exercise intensity through the heart rate requires calculation involving the Maximum Heart Rate (MHR), HRR, RHR, and EPR. The Fox Equation may be the best choice for the general population since it is less likely to underestimate or overestimate dependent on individual HRmax values (Shookster et al., 2020). The exercise intensity was calculated using the Karvonen method (She et al., 2015).

Validity and Reliability

The validity of YMCA 3-minute step test was analyzed with Pearson test to determine the correlation coefficient between VO_2max and YMCA 3-minute step test. Furthermore, the study indicates that YMCA 3MST equation is a valid sub-maximal test for the prediction of maximum aerobic capacity.

The use of anthropometry measurement is widely used by some researchers and has proved its validity due to a series of examinations for its effectiveness (Dianat et. al., 2018). In this study, the use of tape measurement to measure the leg length from the anterior superior iliac spine (ASIS) to the medial malleolus using a measuring tape in unit centimeters was studied (Neelly etc., 2013). The result shows that the supine TMM (tape measure method) is a valid and reliable clinical measurement according to two physical therapists when measuring leg length compared to CT scan method.

Additionally, the weight was obtained using a digital weighing scale. The study (Kumar et al., 2014) shows DWSs have excellent reliability in static limb loading measurement. Similarly, measurements of digital weighing scale were in good agreement and held valid with measurements of MatScan.

For the pulse oximeter, its validity to get the heart of a person was assessed using a Bland-Altman analysis with bias, precision and limits of agreement (LOA) calculated with 95% confidence intervals (CIs) (Smith, 2019). Accordingly, low-cost, portable fingertip pulse oximeters are widely available to health professionals and the public. The US Food and Drug Administration (FDA) reported that the accuracy of prescribed pulse oximeter is highest at saturations ranging from 90–100%, while intermediate is 80–90% and lowest is below 80% (Brytanova et al., 2022). The data of their study were generated and analyzed using Statistical Package for the Social Sciences Software (IBM SPSS for Windows Inc., v. 26.0, Chicago, IL, USA).

This study utilized the test-retest reliability of the research instruments, which means that the 3-minute YMCA step test was conducted twice with the same participants. According to the study (Noble et al., 2021), test-retest reliability is a measurement theory concept that quantifies the stability of a measure under repeated measurements. Since this study is a descriptive correlation, data were statistically tested using Pearson correlation coefficient. The Pearson correlation coefficient (PCC) is defined (Zhou et al., 2016) as a statistical metric that measures the strength and direction of a linear relationship between two random variables.

Scoring Procedure

The premise for scoring procedure is outlined in this section, especially for the anthropometric measures (leg length and weight) and exercise intensity in HRR. Furthermore, the interpretation was added to lend some substance to the scores acquired throughout the data collection.

In this study, the researcher conducted pilot testing to determine the leg length measures of the participants. In the pilot testing, the researcher noted the longest leg length measure and the shortest possible measure within the circle of participants only. Moreover, to ensure that gender differences are taken into consideration in the conduct of this study, gender-based classification was employed. The result of the pilot testing is as follows:

Table 1. Range of leg length (cm)

Female		Male		Description
80	85.6	71	77.8	Very short
85.7	91.2	77.9	84.6	Short
91.3	96.8	84.7	91.4	Medium length
96.9	102.4	91.5	98.2	Long
102.5	108	98.3	105	Very long

Moreover, Natera and colleagues (1998) documented the weight reference of male (μ=43.1kg; SD=7.6) and female (μ=43.3; SD=6.2) 15–19-year-old Filipinos. These data are helpful to quantify an evaluative norm for Filipino participants:

Table 2. Evaluative Norm

Male	Female	Description	Interpretation
54.0 - 61.1	54.6 - 62.1	Very high	Very heavy weight
46.8 - 53.9	47.1 - 54.5	High	Heavy weight
39.6 - 46.7	39.6 - 47.0	Moderate	Average weight
32.4 - 39.5	32.1 - 39.5	Low	Light weight
25.2 - 32.3	24.6 - 32.0	Very Low	Very light weight

Adding to the evaluative norms is the assessment of the exercise intensity considering the Karvonen method (She et al., 2015):

Table 3. the assessment of the exercise intensity

% Heart Rate Reserve	Exercise Intensity	Description
<20	Very light Intensity	This level refers to steady heart rate and no noticeable change in breathing (Eather et. al. 2020).
20-39	Light Intensity	This level has an increase in respiration or heart rate is minimal or nonexistent. Throughout the activity, a person is able to communicate and sing (Singh et. al. 2019). This level is associated with lower disability and disease activity, as well as risk factors for cardiovascular disease, such as lower BMI and blood pressure (Khoja et. al. 2016).
40-59	Moderate Intensity	This level refers to raising the heart rate, breathing rate, and body temperature which would result to sweat secretion (Kim et. al. 2022).
60-84	Vigorous Intensity	This level is challenging and requires exertion. The intensity was frequently attributed to being so breathless that speaking at the same time is impossible (Hjalmarsson, 2023).
≥85	Maximum Intensity	This level is done "all-out" and maintained by an anaerobic ATP yield that is higher than that of oxidative metabolism (Saghiv et. al. 2020). This level has a lot of energy being released within a small period of time, and the oxygen demand surpasses the oxygen supply (Whitfield et. al 2014).

Data Gathering Procedure and Ethical Consideration

Preparation and planning are vital, including the researcher's ethical obligations. The researcher complied with Lourdes College's Research Ethics Committee (LC-REC) requirements and recommendations and was then given the certificate of approval to conduct the study. This would ensure that ethical considerations from data collection were addressed.

School officials, supervisors, and administrators are highly respected. The researcher asked and requested for their approval before conducting the study through letters. The participants were also given a participation request letter for the prior notice.

Participants were able to complete the limited face-to-face orientation and health preparedness screening for their health clearance. Then, they participated in cross-sectional data gathering through the anthropometric measurement process. The step test protocol was then determined through the exercise intensity. The researcher, together with the assistants, had recorded the scores of the participants.

The research has followed the LC-REC's guidelines. The researcher had gathered the participants' informed assent and parental consent form. Participation is optional. This means that participants were given a chance to ask questions and were told that they might decline or withdraw from the research without worry. Thus, the researcher did not devise a scheme to pressure, convince, or reward the participants. Participation of this study would not affect their grades or their academic standing whatsoever.

The researcher informed the participants of the nature and objectives of the study via letter and informed assent and consent forms. The research assured the participants' safety and welfare by addressing hazards including physical exhaustion from activity. Participants were asked to complete the Physical Activity Readiness Questionnaire (PARQ) to further assess their readiness and to consider medical history. To guarantee everyone's safety, health risks were evaluated. The step test protocol had been demonstrated for the proper and safe performance of the protocol. Qualified assistants, with the collaboration of the school nurse, facilitated the testing process. Warm-ups and PE clothes were recommended, and water was also provided to prevent dehydration. The researcher worked with the school clinic and carried a first aid kit.

On top of that, the student participants are vulnerable age-wise. The LC-REC evaluated the methods to ensure that the strategies outlined are safe for the study's population and not exploitative. Data gathering was conducted in a participant-friendly manner by conducting an orientation first regarding with the intention of the researcher and letting them use their freewill to join or not.

Participants' data and privacy were respected. The Data Privacy Act 2012 protects the identities of schools, teachers, and study participants. Codes were used to conceal names and identify information on record. The researcher ensured that print or electronic data, including numeric, textual, audio, and video, were safely stored. Participants were also encouraged to retain confidentiality and not disclose their classmates' information to others. Policies on video recording and sharing were being set in place.

The researcher provided the study's necessary resources, materials, equipment, and facilities. No participation fees or contributions were requested. The researcher was willing to refund unavoidable participant expenses.

Statistical Treatment

Descriptive statistics for this research comprise the computation of means and standard deviations according to the participants' leg length, weight, and exercise intensity. The frequency distribution method was also utilized to analyze the distribution of variables within the investigated population, enabling visualization of the extent and prevalence of different measurements. Ultimately, the crux of the statistical study resides in the regression analysis, which utilizes the predictive variables—leg length and weight—to determine the cumulative influence of the outcome variable – exercise intensity. The factors representing leg length and weight in this model provide insights into the characteristics and magnitude of their correlation with exercise intensity. The statistical significance of each coefficient was assessed using a t-test to determine if the observed associations are meaningful and not just coincidental.

RESULTS AND DISCUSSION

Problem 1: What are the participants' leg length and weight measures?

In order to present the leg length and weight measures of the participants, this research employed gender-based classification for presentation. Table 4 presents the frequency and mean distribution of leg length measures of female participants.

Table 4. Frequency and Mean Distribution of Leg Length Measures of Female Participants

Range of leg length (cm)	Description	Female Participants	
		F	%
102.5 – 108	Very long	2	2.94
96.9 - 102.4	Long	3	4.41
91.3 - 96.8	Medium length	19	27.94
85.7 - 91.2	Short	36	52.54
80 - 85.6	Very short	8	11.76
	Total	68	100
	Overall Mean	90.28	
	Description	short	
	Standard Deviation	4.90	

Overall, the female leg length was recorded as 90.28 cm interpreted as "*short*" with a standard deviation of 4.90 cm. From the table, it can be gleaned that female participants' leg lengths ranged from an extremely short eighty centimeters (80 cm) to an extremely long hundred and eight centimeters (108 cm). Thus, this result is essential for comprehending their step test performance and level of difficulty.

Table 5. Frequency and Mean Distribution of Leg Length Measures of the Male Participants

Range of leg length (cm)	Description	Male Participants	
		F	%
98.3 - 105	Very long	5	7.35
91.5 - 98.2	Long	29	42.65
84.7 - 91.4	Medium length	35	51.47
77.9 - 84.6	Short	28	41.18
71 - 77.8	Very short	2	2.94
	Total	99	100
	Overall Mean	88.52	
	Description	Medium length	
	Standard Deviation	6.55	

Table 5 shows the frequency and mean distribution of leg length measures of the male participants. The average leg length was documented as 88.52 cm, which corresponds to the category of "medium length." A substantial dispersion in the leg length measurements among the participants was indicated by the 6.55 cm standard deviation for this group. From the table, the leg lengths exhibited a wide spectrum, spanning from an exceptionally short seventy-one centimeters (71 cm) to extremely lengthy hundred and five centimeters (105 cm).

Table 6. Descriptive and Frequency Distribution of Weight Measures of Female Participants

Range of weight (kg)	Description	Female Participants	
		F	%
54.6 - 62.1	Very heavy weight	22	32.35
47.1 - 54.5	Heavy weight	23	33.82
39.6 - 47	Average weight	21	30.88
32.1 - 39.5	Light weight	2	2.94
24.6 - 32	Very light weight	0	0.00
	Total	68	100
	Overall Mean	52.82	
	Description	Heavy weight	
	Standard Deviation	10.53	

Tables 6 illustrates the descriptive and frequency distribution of weight measures of the female participants. As a whole, the mean weight was 52.82 kg, which was classified as "*heavy*". The calculated standard deviation of 10.53 kg suggests that there is a substantial degree of variability in the weight of the female participants which means that the data largely vary from each other; some exceeded too far from the ones from *"light weight"* category. From the table, there were no female participants classified as "*very light weight*". With a total of sixty-eight (68) female participants, the weight distributions are: "*light weight*" (2.94 percent), "*average weight*" (30.88 percent), "*heavy weight"* (33.82 percent), and "*extremely heavy weight*" (32.35 percent). Given that weight represents a gravitational attraction force, the results indicate that the majority of the female participants are heavily weighted, indicating that they have greater gravitational force (Liu & Fang 2016; Sarabando et al., 2016).

Table 7. Descriptive and Frequency Distribution of Weight Measures of the Male Participants

Range of weight (kg)	Description	Male Participants	
		F	%
54 - 61.1	Very heavy weight	27	27.27
46.8 - 53.9	Heavy weight	35	35.35
39.6 - 46.7	Average weight	26	26.26
32.4 - 39.5	Light weight	10	10.10
25.2 - 32.3	Very light weight	1	1.01
	Total	99	100
	Overall Mean	50.28	
	Description	Heavy weight	
	Standard Deviation	8.93	

In contrast, table 7 presents the descriptive and frequency distribution of weight measures of male participants, revealing a broad spectrum of measures ranging from extremely light (25.2 kg) to extremely heavy (61.1 kg). The group had a mean weight of 50.28 kg, which places them in the category of "*heavy weight*." The male participants had a moderate degree of weight variation, as seen by the standard deviation of 8.93 kg. The ninety-nine male participants are having the following weight categories: "*very light weight"* (1.01 percent), "*light weight"* (10.10 percent), "*average weight"* (26.26 percent), "*heavy weight"* (35.35 percent), and "*very heavy weight"* (27.27 percent). These findings imply that one of the things that makes a person to exert more force in the opposite direction to raise their body is their weight (Lee et al., 2013) which means that they have more gravitational force (Liu and Fang 2016) since weight is the gravitational attraction force of the body (Sarabando et al., 2016).

Based on the descriptive data presented, records show notable discrepancies in weight classifications among the participants. Sardinha and team (2014) suggest that schools reinforce more physical activities for the students to improve their cardiorespiratory and weight status. These effects are shaped by a variety of individual, cultural, and societal elements (Azagba et al. 2014).

Problem 2: What is the level of the participants' Exercise Intensity measure after 3 minutes step test performance?

Table 8 reveals the frequency and mean distribution of the female participants' exercise intensity after a 3-Minute Step Test. In general, the group's average exercise intensity was calculated with the mean of 58.45 interpreted as "*moderate*." This was accompanied by a standard deviation of 10.64. From the table, the varying degrees of intensity of female participants is from "*Very Light Intensity*" to "*Maximum Intensity*." Specifically, a total of 1 percent of the participant was labeled as *"Light Intensity"* and *"Maximum Intensity"*. A significant proportion of the participants with 57.35% indicated an intensity level classified as *"Moderate Intensity"* during their activity, whereas 39.71% characterized their workout as *"Vigorous Intensity"*. These results indicate that the participants encountered a moderate degree of variance in their intensity levels as manifested in the increase of their heart rate, breathing rate, and body temperature, which resulted to more sweat secretion .

Table 8. Descriptive and Frequency Distribution Table of the Female Participants' Exercise Intensity after a 3-Minute Step Test

Range of Exercise Intensity	Description	Female Participants	
		F	%
85 - 99	Maximum Intensity	1	1.47
60 - 84	Vigorous Intensity	27	39.71
40 - 59	Moderate Intensity	39	57.35
20 - 39	Light Intensity	1	1.47
0 - 19	Very Light Intensity	0	0.00
	Total	68	100
	Overall Mean	58.45	
	Description	Moderate	
	Standard Deviation	10.64	

In table 8, frequency and mean distribution of the male participants' exercise intensity after a 3-Minute Step Test was presented. On average, the mean intensity of the exercises performed by males was deemed "*Moderate*" at 56.318. The standard deviation of 10.53, which shows a moderate dispersion of the male participants' intensity levels, offers insight into how they performed the Exercise Intensity under their physical capabilities. The level of severity varied between "*Very Light Intensity*" and "*Maximum Intensity*." It is worth noting that a mere 1.47 percent of the male participants exhibited intensity levels classified as both "*Very Light Intensity*" and "*Light Intensity*". The majority, 95.59 percent had an intensity categorized as "*Moderate Intensity*", while 47.06 percent indicated to have a "*Vigorous Intensity*." None of the male participants fell into the "*Maximum Intensity*" category. With such moderate level of exercise intensity, the participants experienced an increase in heart rate, breathing rate, and body temperature, leading to the release of sweat secretion.

Table 9. Descriptive and Frequency Distribution Table of the Male Participants' Exercise Intensity after a 3-Minute Step Test

Range of Exercise Intensity		Description	Male Participants	
			F	%
85	99	Maximum Intensity	0	0.00
60	84	Vigorous Intensity	32	47.06
40	59	Moderate Intensity	65	95.59
20	39	Light Intensity	1	1.47
0	19	Very Light Intensity	1	1.47
		Total	99	100
		Mean	56.32	
		Description	Moderate	
		Standard Deviation	10.53	

The Exercise Intensity statistics presented in both Tables 8 and 9 provide significant insights into the participants' physical activity regimen. Mainly, the moderate to vigorous exercise intensities were more common among them, indicating that individual endurance and strength significantly influence exertion. This means that participants may have experienced a gradual disruption in their homeostasis, affecting their ability to meet the energy demands during their activities. (MacIntosh et al., 2021). This finding is consistent with the perspectives presented by She, J., Nakamura, H., Makino, K. et al. (2015) and Wolpern et al (2015), highlighting the significant variation in the way people physically respond to different levels of physical exercise, particularly when it comes to factors like age and body mass index.

Additionally, the study highlights the significance of tailoring exercise intensity to accommodate a variety of fitness levels and lifestyle constraints. (Hwang et al., 2022; Kawae et al., 2022). The notable proportion of participants who reported moderate intensity suggests a possible emphasis on finding a balance between the effectiveness of exercise and the safety and capabilities of the individuals involved, considering the concerns raised (Myllymäki et al., 2012) regarding the potential hazards associated to high-intensity workouts in particular health conditions.

Problem 3: Do the participant's leg length and weight significantly influence their exercise intensity?

Ho_1: Leg length and weight do not have significant influence on the level of the participants' exercise intensity after 3-minute step test.

Table 10. Regression Analysis of the influence of Leg Length and Weight on Exercise Intensity in Participants Performing the 3-Minute Step Test

Linear Regression				ANOVA		
Model	R	R^2	Adjusted R^2	df	F	p
H_1	0.934	0.872	0.871	166	561.04	<.001

Predicting variables	Standardized	t	p
Leg length (cm)	-0.417	-13.63	< .001
Weight (kg)	1.024	33.497	< .001

The Table10. presents the result of the Regression and Coefficient Analysis of the influence of Leg Length and Weight on Exercise Intensity in Participants Performing the 3-Minute Step Test. The data pointed out that the high correlation coefficient (R) of 0.934 in the linear regression model (H_1) indicates a positive association between leg length and weight and exercise intensity. Evidently, the R^2 value of 0.87 indicates that these two factors collectively account for around 87 percent of the variance in exercise intensity. The remaining 12.8 percent may be attributed to other factors such as the food intake on the day of fitness testing, the weight of the shoes they were using and the missing steps in following the proper rhythm of the metronome.

Additionally, the ANOVA (Analysis of Variance) outcome reinforces that the model is significant (F=561.04, P=.001). This indicates that there is no random variation in the effect of leg length and weight on exercise intensity. Thus, the null hypothesis is rejected. The analysis provides evidence that leg length and weight are substantial predictors of exercise intensity as measured by the 3-minute step test. The table also presents the influence of each predictor variables such as leg length and weight. Leg length has a standardized coefficient of -0.417, a t-value that is deemed highly significant at -13.63, and a p-value that is less than 0.001 which implies a significant inverse correlation between leg length and exercise intensity, suggesting that individuals with longer legs likely experience a decrease in exercise intensity.

In view of the foregoing, the observed inverse correlation between leg length and exercise intensity are corroborated by other scholarly works. For instance, Hazari et al (2021) and Andersen et al (2020) explained the Range of Motion concept, which stated that low-effort, high-accuracy operations require less range of motion. As a result, those with longer legs would typically spend less effort in comparison to those with shorter legs during the same quantity of physical activity, which would create the illusion of a lower intensity of exercise. O'Brien et al. (2018) also discovered that those with longer legs use less steps to attain the same intensity. The findings of Salamuddin et al. (2014) also suggested that leg length has a direct influence on the intensity of exercise.

Lastly, the standardized coefficient for weight is 1.024. This number is further supported by a t-value of 33.497 and a p-value that is <.001. This finding implies a positive influence between body mass on exercise intensity, suggesting that participants who are relatively heavier have corresponding increase in the intensity of their workouts. This result may imply that the study of Meghan (2022) shows the same result which states that longer leg length has been linked with cardiometabolic health outcomes among the adults.

In relation to weight, Cava et al., (2017) found that persons who are overweight exhibit diminished muscle endurance and performance in weight-bearing exercises. Additional evidence to this effect comes from Lopes et al. (2019) and Liu (2011) who averred that those within the normal weight range exhibit superior performance across a range of physical fitness components in comparison to those who are overweight. Ding et al. (2020) discovered a correlation between elevated body mass index (BMI) and diminished cardiorespiratory endurance among males. Research (Raistenskis et al., 2016) has brought attention to the adverse health consequences associated with overweight and obesity in teenagers. The study reinforces the importance of creating personalized physical activities and interventions for overweight or obese individuals to enhance their fitness levels effectively. The study, therefore, confirmed the influence of weight on physical capacity.

CONCLUSION

The results of this investigation with exercise intensity indicated that both male and female individuals engaged in moderate levels of exertion, with a greater incidence of moderate to difficult exercise intensity among the males. The male participants had a "*medium*" leg length, while the female individuals possessed a "*short*" leg length. The average mean of body mass of males and females was "*heavy weight*." There was an influence of leg length and weight on exercise intensity among participants completing the 3-minute step test. The study highlights the potential for longer-legged individuals to engage in equivalent physical activity with reduced effort, potentially enhancing the intensity of the exercise. Exercise intensity tends to diminish as leg length increases and there was a rise in weight corresponds to an increase in exercise intensity.

The results of the study were significantly influenced by theories such as the Range of Motion principle, which states that low-effort actions require a shorter range of motion, and the Ground Reaction Force concept, which establishes a relationship between body mass and the force applied against the ground. These theories provided explanations to confirm the result of the study. For the phenomenon where individuals with longer legs experienced reduced exercise intensity because of biomechanical advantages such as longer stride lengths. Conversely, individuals with higher body weight perceived increased exercise intensity due to the heightened effort needed to maintain their body mass and movement.

This research emphasizes the need for fitness assessment techniques that consider individual differences and needs in leg length and weight, ensuring impartial evaluations for every student. Hence, the study emphasizes the importance of an individualized approach in physical education and fitness evaluations, advocating for methodologies that value diverse physical characteristics, fostering equity, inclusiveness, and fostering a constructive environment for fitness assessment and physical education.

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