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BIOMETRICS EVALUATION AND LUNG FUNCTION ANALYSIS OF MALE LONG-DISTANT RUNNERS AT THE UNIVERSITY OF PORT HARCOURT

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Abstract
This research evaluated the connection between biometrics and lung function analysis in University of Port Harcourt male long-distance runners. Data were collected from participants in 12 days and statistical analysis was done using Pearson's Product-Moment Correlation Coefficient. The significance level was set at $P<0.05$ with a confidence level of 95%. The results revealed a Body Mass Index (BMI) of 21.53 40 male long-distance runners of ages from 18 to 50 years were picked randomly. The findings showed a negative relationship between Body Mass Index and Expiratory Reserve Volume with $p= 0.02$. ERV decreased as BMI increased ($P = 0.063$). The beta correlation coefficient indicated a weak relationship. After regressing BMI and ERV, the hypothesis was rejected. The findings showed a positive relationship between BMI and IRV. $p> 0.05$, the relationship is not statistically significant. A perfect BMI-IRV relationship existed and the hypothesis was accepted. Also showed that IRV is greater, while BMI and IRV are positively correlated. A positive relationship between BMI and Force Vital Capacity is seen with $p> 0.05$. BMI increases FVC, as seen by the beta coefficient's substantial positive association. A weak negative relationship between WC and ERV. Statistically, there was no significant relationship. After the regression analysis of Waist Circumference with ERV to test the hypothesis between WC and ERV was accepted. WC and IRV were positively correlated and showed a modest correlation. The WC had a very modest negative relationship with FVC. The correlations are not statistically significant. The WHR was negatively correlated with ERV and there was a favourable relationship between WHR and IRV, also which demonstrated a negative relationship between WHR and FVC. The results indicated that athletes exhibited significantly higher FVC, ERV, and IRV values.

Keywords: Biometrics Evaluation, Lung Function Analysis, Male Long-Distant Runners, University t

Introduction
Anthropometric measurements can be used as a baseline for physical fitness and to measure the progress of fitness. Biometric measurements are a series of quantitative measurements of the muscles, bones, and adipose tissues used for assessing the composition of the body. The core elements of anthropometry are height, weight, body mass index (BMI), body circumferences (waist, hip, and limbs), and skinfold thickness, age, sex. Long-distance running or endurance running is a form of continuous running over distances of at least 3 km (1.9 ml) (Fatemi et al., 2012). Physiologically, it is largely aerobic in nature stamina as well as mental strength. Endurance running comes with two different types of respiration. The runners experience aerobic respiration more frequently. This occurs when oxygen is present, and the body can utilise it to help generate energy and muscle activity. On the other side, anaerobic respiration occurs when the body is deprived of oxygen, and this is common towards the final stretch of races when there is a drive to speed up to a greater intensity. Overall, both types of respiration are used by endurance runners quite often but are very different from each other. Long-distance running requires strength and endurance. For an effective competition to take place, athletes should be thoroughly prepared. Biometrics and lung function tests are among the physiological components that influence the competitor's performance.

Biometric measures evaluate muscle, bone, and fat tissue to appraise body structure. Level, weight, BMI, body boundaries (midriff, hip, and appendages), skinfold thickness, age, and sex are the groundwork of biometry. Level

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and age are used in formulae to gauge and conjecture Lung test values for various populaces (Stanojevic, 2008). Taller individuals normally have bigger lung limits. Because of greater anthropometric measures, men have bigger lung volumes and abilities. Essential limit ascends with level. Anatometric fluctuations between ethnic groupings likewise make sense of ethnic lung volume/limit inconsistencies. Air contamination and pneumonic infection debilitate lung capability (Lutfi, 2017). As laid out in logical writing, lung capability and biometric boundaries influence competitor performance during competitions. These measurements help competitors work on their state of being by characterizing their state of being and executing individual or specific preparations. Lung capability and anthropometric stations are firmly related because both demonstrate preparation and execution, and great anthropometric estimations are related to better pneumonic capability test boundaries.

Previous research has analyzed estimates of lung capacity during long-distance running and swimming, providing important information for competitors' preparation, organization, and execution throughout preparation and competition. Concentrates on youthful competitors recommend a connection between pneumonic capability boundaries and execution and ability acknowledgement. Competitors generally had more prominent pneumonic capability boundaries than stationary people, along these lines, they performed better in both aspiratory capability and anthropometrics. Anthropometric and pulmonary estimations in duathlon and long-distance marathons are important for some reasons because these attributes influence execution during contests and can give fascinating information to further develop preparation quality. Marathon consolidates swimming, riding, and running over different distances. These conditions generally happened out of Africa, not in Nigeria. Nonetheless, a few spirometric factors have been connected to perseverance execution (Adegoke & Arogundade, 2002; Fatemi et al., 2012; Pringle, 2005). Expanded oxygen admission and lung usage reinforce the lungs, permitting them to extend and inhale. Athletes often have a greater lung limit than non-competitors because they use their lungs more. Practice accomplishes increase more than the limit of the lungs. The present study examined the relationship between biometric and pulmonary function analyses in male long-distance runners from the University of Port Harcourt.

Materials and Methods

The materials used were weighing scale, tape and digital spirometer. This study employed correlational research to collect demographic data including anthropometric and pulmonary parameters following informed consent. The researcher cannot control or change variables in a correlational study design. Correlational studies show the strength and direction of a relationship between variables. Data from natural environments may be collected quickly using correlational study methodology. This lets you legitimately apply your findings to real-world situations. The research was done at the University of Port Harcourt (Uniport), Choba, Rivers State, Nigeria. Latitude 40 53' 14"N to 40 54' 42"N and longitude 60 54' 00"E to 60 55' 50"E. The university has Abuja, Delta, and Choba campuses. Road networks divide the three campuses, however, Abuja and Delta Campuses are closer together in Obio/Akpor and Ikwerre Local Government Areas in Rivers State, Nigeria (Chima & Ofodile., 2015).

Over 80 athletes officially train at the University of Port Harcourt, Nigeria, the African Stadium Sports Institute, and the University of Port Harcourt Abuja Campus. Forty undergraduate male long-distance runners aged 18 to 50 who voluntarily gave their informed consent via a structured questionnaire were used. The research used basic random sampling. According to Evan Morris' formula for tiny (hypergeometric) populations, the research needed 40 athletes who supplied informed permission through a structured questionnaire. The 40 male athletes were University of Port Harcourt Abuja campus sports facility students. Data was collected using a scale/balance. (Seca GMBH & Co., German), tape (5736766), metre ruler, digital spirometer (5Y-10A, Suit, 31 field Medical England), structured questionnaire, recording pen and paper. The appendix contains an organised questionnaire.

Data gathering in this research used standardised instruments. BMI and waist/height circumference tape were shown to be valid. The mean difference (bias) between them determined validity. Weight-to-height ratio body mass index has a validity value of 0.69. At least three appropriate spirograms were acquired to verify spirometric data. Participants breathed for six seconds and stopped when there was no volume change for one second in each test. The test ended when the two biggest FVC and FEV1 readings were within 0.2 L. If both conditions are not satisfied after three manoeuvres, the test is not interpreted. Retests were done until the requirements were fulfilled or eight tests were done

Participants' data was utilised to establish procedures to ensure that pulmonary function measures and findings were trustworthy and valid. Standard deviation was calculated and an acceptable upper limit was used to determine reliability. Spirometry measurements matched pulmonary function. The correlation for all pulmonary function markers was 0.75.

Biometric Evaluation
1. Body mass index. Body weight (kg) divided by height squared (m) yielded BMI.
2. Weight: A standard scale (Seca GMBH & Co., German) was used. The scale was zeroed, and participants stood upright in light clothes and bare feet. The scale read 0.1kg (100g). Morning measurements guaranteed that individuals had their feet together without assistance.
3. Height: Each responder would stand upright, barefoot, and head against the wall to measure their height. Participants' heads were forced down with a metre rule to establish a straight angle with the wall, and the wall was marked where it touched. The distance between the floor and the chalk mark was measured with tape to the closest 0.1cm.
4. Waist Circumference: A Wonmite closet-measuring tape rule (5736766) was used to measure the mid-axillary line midway between the final rib and the superior iliac crest to the closest 0.1cm.
5. Hip circumference: Wunmite closet-measuring tape rule, 5736766) was used to measure horizontally at the point of greatest gluteal protrusion to the closest 0.1 cm. The measuring tape was held softly to avoid compressing the skin.

Lung Function Analysis
After recording their age, weight, and height, digital spirometers (Model: 5Y-10A, Suit, 31field Medical England) performed pulmonary function testing. The device measured ERV, IVR, and FVC. ERV was determined by inhaling normally and exhaling forcefully through the spirometer. Similarities exist for IRV. Instead of taking a regular breaths, participants were instructed to take the most air possible and exhale into the spirometer. The test motivated individuals to perform at their best.

The whole data-collecting procedure took 12 days. Participants provided main data on anthropometric and pulmonary parameters. No prior data was used in this investigation. The mean and standard deviation for each parameter were reported. Pearson's Product-Moment Correlation Coefficient was used to answer research questions. Linear regression was employed to test hypotheses, with a 0.05 p- value and 95% confidence.

Inclusion Rules
1. Male athletes must be undergraduates at the University of Port Harcourt.
2. Healthy undergraduate long-distance runners without deformities or metabolic issues.
3. Training at the University of Port Harcourt Abuja

Excluded Criteria
1. Individuals having medical conditions.
2. without athletic abilities
3. Undergraduate athletes training off-campus at the University of Port Harcourt Abuja.
4. Drug-dependent athletes
5. Female

All athletes who smoked, as defined by the Centres for Disease Control and Prevention (1992), were excluded from the research.

Results

The results for BMI and ERV revealed a significant negative correlation coefficient, BMI and IRV showed a non-significant positive correlation coefficient, BMI and FVC displayed a positive correlation coefficient, WC and ERV revealed a positive correlation coefficient, WC and IRV showed a positive correlation coefficient, WC and FVC displayed a negative correlation coefficient, WHR and ERV demonstrated a negative correlation coefficient, WHR and IRV revealed a positive correlation coefficient, WHR and FVC showed a negative correlation coefficient. See below tables showing the results

Table 1. Relationship between Body Mass Index (B.M.I) and Expiratory Reserve Volume (ERV) of male athletes in the University of Port Harcourt.

Parameter	r	p-value	Remark
BMI ERV	-0.353	0.025	Significant at p<.05

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Table 1 above shows the relationship between BMI and the Expiratory reserved volume of male athlete s(r=-0.353, p=0.025).. The figures above revealed a significant negative correlation coefficient as the p-value is ≤0.05.

Table 2. Relationship between Body Mass Index (B.M.I) and Inspiratory Reserve Volume (IRV) of male athletes in the University of Port Harcourt.

Parameter	r	p-value	Remark
BMI IRV	0.082	0.615	Not significant at p<.05

Table 2 above shows the relationship between BMI and the Inspiratory reserved volume of male athletes (r=0.082, p=0.615). The figures above revealed a non-significant positive correlation coefficient.

Table 3. Relationship between Body Mass Index (B.M.I) and Forced Vital Capacity (FVC) of male athletes at the University of Port Harcourt.

Parameter	r	p-value	Remark
BMI FVC	0.691	0.615	Not significant at p<.05

Table 3 above shows the relationship between BMI and the forced vital capacity of male athletes (r=0.691, p=0.615). The result showed a positive correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Table 4. Relationship between waist circumference and Expiratory Reserve Volume (ERV) of male athletes at the University of Port Harcourt.

Parameter	r	p-value	Remark
WC ERV	0.32	0.843	Not significant at p<.05

Table 4 above shows the relationship between waist circumference and expiratory reserved volume of male athletes (r=0.32, p=0.843). The result showed a positive correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Table 5. Relationship between waist circumference and Inspiratory Reserve Volume (IRV) of male athletes at the University of Port Harcourt.

Parameter	r	p-value	Remark
WC IRV	0.185	0.253	Not significant at p<.05

Table 5 above shows the relationship between waist circumference and Inspiratory reserved volume of male athletes (r=0.185, p=0.253). The result showed a positive correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Table 6. Relationship between waist circumference and Forced Vital Capacity (FVC) of male athletes at the University of Port Harcourt.

Parameter	r	p-value	Remark
WC FVC	-0.198	0.843	Not significant at p<.05

Table 6 above shows the relationship between waist circumference and forced vital capacity of male athletes (r=-0.198, p=0.843). The result showed a negative correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Table 7. Relationship between waist-to-height ratio and Expiratory Reserve Volume (ERV) of male athletes at the University of Port Harcourt.

Parameter	r	p-value	Remark
Wc/Ht FRV	-0.168	0.221	Not significant at p<.05

Table 7 above shows the relationship waist to the height ratio and Expiratory Reserve Volume (ERV) of male athletes. r=-0.168, p=0.221). The result showed a negative correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Table 8. Relationship between waist-to-height ratio and Inspiratory Reserve Volume (IRV) of male athletes at the University of Port Harcourt.

Parameter	r	p-value	Remark
Wc/Ht IRV	0.091	0.576	Not significant at p<.05

Table 8 above shows the relationship between the waist-to-height ratio and Inspiratory Reserve Volume (IRV) of male athletes (r=0.091, p=0.576). The result showed a positive correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Table 9. Relationship between waist-to-height ratio and Forced Vital Capacity of male athletes at the University of Port Harcourt

Parameter	r	p-value	Remark
Wc/Ht FVC	-0.153	0.346	Not significant at p<.05

Table 9 above shows the relationship between the waist-to-height ratio and Forced Vital Capacity of male athletes (r=-0.153, p=0.346). The result showed a negative correlation coefficient, although this result is not statistically significant as the p-value is ≥0.05.

Discussion

The finding showed a negative relationship between Body Mass Index (BMI) and Expiratory Reserve Volume with a p-value of 0.02. ERV decreased as BMI increased (p-value = 0.063). The beta correlation coefficient indicated a weak association. After regressing the BMI and ERV of male long-distance runners at the University of Port Harcourt.

The hypothesis that there is no significant relationship between BMI and ERV was rejected. After a typical resting expiration, the Expiratory Reserve Volume (ERV) may be forcibly expelled, leaving just the RV in the lungs. Forcefully exhaling the ERV requires chest and abdominal expiratory muscular contraction. Higher BMI lowers ERV. Mechanical changes in the chest wall decrease respiratory compliance, and lower lung flow and volume limit ERV as BMI rises. The functional residual capacity (FRC) decreased by 5% each unit of BMI rise and 1% per unit of BMI over 30 kg/m2, (Jones & Nzekwu, 2006). The finding shows a positive association between body mass index (BMI) and Inspiratory Reserve volume (IRV). However, the p-value is above 0.05, therefore this relationship is not statistically significant. The coefficient value demonstrated a perfect BMI-IRV association. After regressing the dependent variable and independent variable, the hypothesis that there is no significant relationship between BMI and IVR of the University of Port Harcourt male long-distance runners was accepted. Rasslan et al. (2004) found that obese people had greater inspiratory capacity (IC) than non-obese people, even with normal spirometric values. These authors stated that this may reflect appropriate lung compliance and the respiratory muscles' capacity to temporarily adjust for extra chest and abdominal weight. Our findings showed that IRV is greater, while BMI and IRV are positively correlated.

The finding also showed a positive association between Body Mass Index (BMI) and Force Vital Capacity, however, p > 0.05. BMI increases FVC, as seen by the beta coefficient's substantial positive association. This supports a recent study in young people that shows how weight fluctuations can affect lung function into late adulthood. Two processes may explain how weight gain accelerates the decline in lung function. First, the mechanical effects of weight gain can impair lung function. By reducing lung expansion during inspiration, the accumulation of abdominal and chest fat can reduce vital capacity and expiratory flow (Young et al., 2007). There is a weak negative relationship between waist circumference and expiratory reserve volume. The connection is not statistically significant. Waist circumference was regressed on ERV to test the hypothesis that there is no significant association between waist circumference and EVR in male distance runners. The hypothesis was accepted. Waist circumference is a fundamental measure of central fat mass and can influence chest wall properties. BMI estimates body mass and volume, while waist circumference reflects body shape (Klein et al., 2007). Obesity is not an appropriate BMI value for body fat distribution (Salome et al., 2010). Abdominal obesity can affect lung mechanics, restrict breathing, and reduce tidal volume such as ERV (Piper & Grunstein, 2010). This mechanical influence is more evident in central obesity than in total or peripheral fat. Fat in the abdominal and chest areas can reduce compliance and resistance of the respiratory system, thereby increasing respiratory energy (Piper & Grunstein, 2010).

The University of Port Harcourt male long-distance runners' waist circumference and inspiratory reserve volume (0.185) were positively correlated. The findings showed a modest correlation. This may reflect appropriate lung compliance and the respiratory muscles' capacity to temporarily adjust for extra chest and abdominal weight. The University of Port Harcourt male long-distance runners' waist circumference had a very modest negative connection with forced vital capacity. The correlations are not statistically significant. A meta-analysis of ten studies found significant inverse associations between Waist Circumference (WC) and lung function, supporting the current study (Wehrmeister et al., 2012; García-Rio et al., 2013). The waist-to-height ratio was negatively correlated with ERV in University of Port Harcourt male athletes. The findings showed little association. No studies have assessed this cut-off point, although research indicates that waist-to-height ratio (WHtR) is linked to pulmonary function impairment and strongly correlates with FEV1 and FCV across populations.

There was a positive significant relationship between waist-to-height ratio and IRR in University of Port Harcourt male long-distance runners. The association between these characteristics was weak. Bariatric surgery patients' lung function improved after a year, and some scientists ascribed this improvement to the W/H ratio lowering. Although the link is weak. However, numerous investigations predicted pulmonary dysfunction with WHR. Athletes utilise their lungs more, hence they usually have a bigger lung capacity. Increased oxygen intake and lung utilisation strengthen the lungs, allowing them to expand and breathe more. Exercise does more than increase lung capacity. Heart blood flow, metabolic breakdown, and muscular endurance improve with activity. These characteristics together with enhanced lung capacity make a healthy body. A non-athlete has weakened muscles, metabolic enzymes, and lungs (UKessays, 2018). Weight changes the respiratory system, causing thoracoabdominal synchronism and diaphragmatic mobility to decrease (Winck et al., 2016). BMI correlated positively with pulmonary function. Physical exercise strengthens lung muscles and increases metabolic activity. Similar to prior research, athletes and singers showed higher vital capacity than the control group (Paralikar et al., 2012). In this research, athletes had considerably larger forced vital capacity, expiratory reserve volume, and inspiratory reserve volume. Adegoke and Arogundade, (2002) agree with these conclusions. Footballers, volleyball, and basketball players had better lung function than non-athletes, according to Adegoke and Arogundade (2002). Strenuous physical training strengthens respiratory muscles, explaining male long-distance runners' higher values. Swimmers and divers have greater lung capacities than non-athletes. Much additional research (Onadeko et al., 1976) found that athletes had a much higher vital capacity than non-athletes. The current research contradicts Hagberg (1988) which found no significant differences between athletes and non-athletes.

Conclusion

It was concluded that this study established that athletes had a significant relationship between anthropometric measures and Pulmonary parameters. Body Mass Index and Expiratory Reserve Volume revealed a significant negative correlation coefficient and a medium/average degree of negative relationship. BMI and Inspiratory Reserve Volume showed a non-significant positive correlation coefficient and a very low degree of positive relationship. Body Mass Index and Force Vital Capacity displayed a positive correlation coefficient, a strong/high degree of positive relationship. Waist Circumference and Expiratory Reserve Volume revealed a positive correlation coefficient and a very low degree of relationship. Waist Circumference and Inspiratory Reserve Volume showed a positive correlation coefficient and a low degree of a positive relationship. Waist Circumference and Force Vital Capacity displayed a negative correlation coefficient, a low degree of negative relationship. Waist to Height Ratio and Expiratory Reserve Volume demonstrated a negative correlation coefficient, a low degree of negative relationship. Waist Height Ratio and Inspiratory Reserve Volume revealed a positive correlation coefficient and a very low degree of positive relationship. Waist to Height Ratio and Force Vital Capacity showed a negative correlation coefficient and a low degree of negative relationship. There is a significantly higher Force Vital Capacity, Expiratory Reserve Volume, and Inspiratory Reserve Volume. These greater values among the athletes could be explained due to better strengthening of respiratory muscles as a result of physical training. These findings are in line with those reported by many researchers.

Recommendations

1. It is recommended that people should be involved in physical activities intermittently because the findings of this study show greater values of pulmonary function parameters among the athletes which could be explained by better strengthening of respiratory muscles as a result of physical training.
2. Athletes should have routine checks of their biometric and lung function parameters to ascertain their status before being involved in any competitions.
3. More studies on biometric and lung functions should be carried out in this part of society to unveil more findings that improve sports performance.

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