Effects of Sprint and Endurance Athletes on some Haematological Characteristics of Female Athletes in the University of Port Harcourt

By

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Abstract

The objective of this study was to compare the haematological characteristics of sprint and endurance female athletes in the University of Port Harcourt. Data were obtained from the athletes (sprints and endurance females athletes), analyzed according to standard principles of haematological practices. The results obtained were statistically tested according to the various research questions and hypotheses raised earlier and in relation to findings of previous researchers. It was discovered that some significant relationships exist between the sprint and endurance male athletes, in Hb, PCV, RBC and WBC. By implications the parallel decreased in PCV and RBC are in response to the increase in training as well as haemostasis mechanism. The reduction in parameters at post test may also be a protective measures against the high rate of dehydration. Physical stress, might have triggered the immune response with attendant increases of white blood cells to fight infections, hence normalizes the hemostasis. The study concluded that sports administrators, couches, and athletes should as a condition verify haematological statuses before embarking on athletic runs.

Introduction

Haematology is the scientific study of blood (Baker & Silverton, 2003). The measurement of different component of blood are referred to as haematological characteristics (Ochei & Kolhutkar, 2003). Among these characteristics are packed cell volume, which is the measure of relative mass erythrocytes present in a sample of whole blood; haemoglobin concentration, which is the measure of oxygen carrying capacity of the blood; red blood cell count and white blood cell is the estimation of the white cells components population. The process by which blood cells are produced is called erythropoiesis and is conducted at a number of different anatomical sites during the process of development from the embryo to adult hood (Baker & Silverton, 2003).

Blood serve three main functions in the body. These include:

1. Transportation (oxygen, vitamins, carbon vi) oxide, urea, uric acid etc).
2. Regulation (buffer pH of blood between 7.35 - 7.45, temperature, osmotic pressure etc.).
3. Protection (hemostasis process by platelets and clotting factors and leukocytes act as immune defence mechanisms, Guyton & Hall, 2000).

Blood functions can be altered by a number of factors and conditions that can affect the production processes. These include disease causing organisms, variations in hormones, haemorrhage, high altitude as well as sporting activity.

Numerous reports has been published on the effects of endurance sports on blood characteristics such as the 5,000m and the 10,000m (Huey-Jane, Kung-Tung & Bing-Wu, 2003). A few investigations have addressed the related haematological and biochemical changes in them (Fallon, Silver & Dare, 1999 & Duca 2006). A regular basis. They believed the mechanisms involves are probable quite different in intravascular harmolysis which is associated with endurance sports and charges in serum erythropoietin

Regular exercise is associated with a reduced incidence of infection compared with completely sedentary state (Ogundeji & Ogundeji, 1999). On the other hand, prolonged strenuous exercise results in a temporary depression in various aspects of immune function that usually last 3-24 hours after exercise, depending on the intensity and duration of the exercise (Bhati & Shach, 2007) and (Gwotmut 2023). They also reported that various immune cell functions are temporarily impaired following acute exercise and that athletes engaged in intensive periods of endurance training appear to be susceptible to minor infections.

Statement of the Problem

Information are scanty on the extent of haematological changes during short distance races (sprint) and long strenuous races (endurance) of sports men within the university. Recent studies have only dealt on endurance sport to the neglect of the effects of sprint on haematological characteristics. Huey-June, et al. (2003), observed in the study that Marathon running is associated with numerous changes in haematological characteristics, many of which are injury related. They went further to state that the charges should not be confused with disease condition, but rather, it is the pressure

on the organs that are responsible for blood production during sporting activity. This study is therefore, interested in comparing bad parameters of sprint and endurance athletes of the University of Port Harcourt. There is also very limited documented information on the topic.

Purpose of the Study

The main purpose of this study was to compare the haematological characteristics of packed cell volume (PCV). Hemoglobin concentration (Hb), Red blood cell count (RBC) and white blood cells count (WBC) between sprint and endurance athletes of the University of Port Harcourt.

Research Questions

The following research questions will be used to guide the study.

1. What will be the relationship between packed cells volume of females sprinters and endurance runners as a measures of haematological characteristics
2. What is the relationship between hemoglobin concentration of females sprint and endurance athletes as a measures of haematological parameters?
3. What is the relationship between red blood cell of female sprinters and endurance athletes as a measures of haematological parameters?
4. What is the relationship between white blood cell count of female sprinters and endurance athletes as a measures of haematological characteristics?

Research Hypotheses

The following null hypotheses have been formulated to guide this study and will be tested at 0.05 level of significance.

1. There is no significant difference in packed cell volume of female sprinters and endurance athletes as a measure of haematological characteristics.
2. There is no significant difference in hemoglobin concentration between female sprinters and endurance athletes as a measure of haematological characteristics.
3. There is no significant difference in red blood cell count between female sprinters and endurance athletes as measures of haematological characteristics

4. There is no significant difference in white blood cell count between female sprinters and endurance athletes as a measure of haematological characteristics.

Significance of the Study

There are no documented data on the effects of female sprint and endurance sports on haematological characteristics in the south geopolitical zone and at the University students of University of Port Harcourt. Most work done are largely on the effects of endurance sports only with little or no information on sprints. This work will go a long way in providing data in this area of study. It will also serve as a reference point to athletes, coaches, human kinetic educators and trainers. It is also hoped that it will improve the existing knowledge on haematological characteristics in sporting.

Delimitation of the Study

The scope of this study is delimited to the following areas:

1. Sprint (100m, 200m & 400m races) and endurance (1,500m & 5,000m), of female athletes of the University of Port Harcourt.
2. It is also delimited to four haematological variables, PCV, Hb, RBC and WBC analysis of subject's blood samples collected before and after sporting activities.
4. It is delimited also to the uses of the following apparatus and methods.
 (i)   Packed cell volume, Standard haematocryal method.
 (ii)   Hemoglobin concentration, colorimetric method,
 (iii)   Red blood cell count, Standard manual method.
 (iv)   White blood cell count, Standard manual method.

Research Design

The design for this study will be the one group pretest-post-test experimental method. This design is considered appropriate as it is going to be purely experimental in nature. This is in line with Nwankwo (2006) and Amadi (2002), who stated that, researches in which the control of many intervening variables and factors which may arise from the subjects, the tools and the experimenter are very paramount. The human element of intervening with the scores as alleged, also by

Nwankwo and Amadi (2002) are not applicable here, since it is blood samples that are collected from the subjects for analysis.

Population of the Study

The population of the study will consist of all males sprint and endurance athletes that are registered at the sport unit of the University of Port Harcourt teams. Some have participated in the Lagos and Port Harcourt cities marathon races respectively. Their number was ten (10).

Sample and Sampling Technique

The sample of the study is a small group and therefore, all the available registered females athletes (sprint and of endurance).

Instrument for Data Collection

The standard apparatus for analysing packed cells volume, hemoglobin concentration, red blood cells count and white blood cell count were used for the study.

Validity of the Instrument

The instruments for the experiments are established apparatus that are used world wide for the analysis of blood samples. Therefore they have international validation and world wide acceptance. Values obtained from, these instruments at pre-test are comparable to standard values.

Reliability of the Instrument

Since these instruments have received international validation, they are therefore reliable (r.8 and .9).

Procedure for Data Collection

The researcher sort and obtained the approval of the Director of Sport of institute at the University of Port Harcourt for the study. The researcher also constructed an informed consent request letter to the participants for the studied. This letter stated clearly the safety guarantee, the procedure, and process to the subjects. This is because blood collection of blood involves pains. The researcher employed the services of two assistants, who were medically qualified for the study.

Data Presentation

The blood parameters of, PCV, Hb, RBC and WBC were studied, and at pre and post analysis of the variables femade.

Research Question 1: Will there be any relationship between packed cells volume of female sprinters and endurance runners as a measures of haematological characteristics?
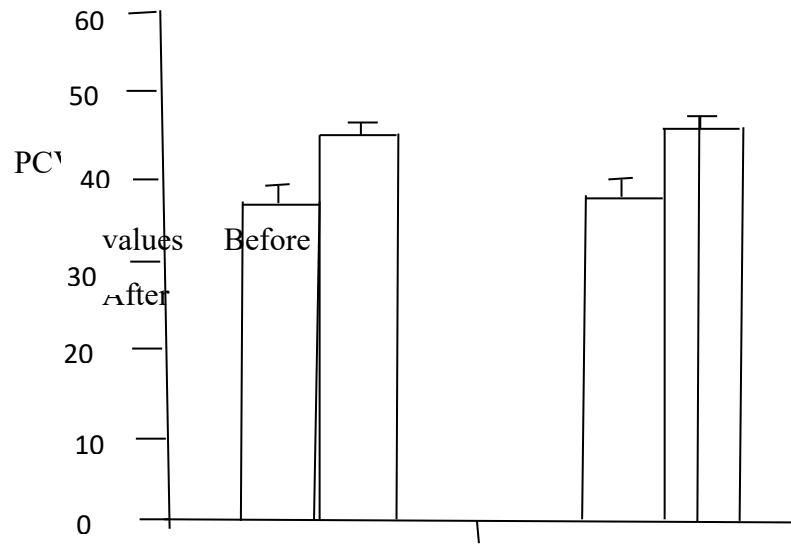
Hypothesis 1: There will be no significant difference in packed cells volume of female sprints and endurance runners as a measure of haematological characteristics.

Table 1: Relationship between PCV of females' spirit and endurance Athletes

S/N	Variable	n	% Mean	SD	t-cal	t-crit	result
1	Spirit and endurance						
	a. Females	10	50.945	9.343	3.502	1.943	Sig
2	a. Sprint pre and post females	5	47.389	6.652	3.309	1.943	Sig
	b. Endurance pre and post females	5	54.500	5.477	8.875	1.860	Sig
	Total	10					

N/B. n. Sig-Not significant   Sig-Significant

Table .1: 1 (a) shows that calculated t-test of female sprint and endurance is 3.502 which is greater that critical (t-crit) of 1.943. The hypothesis is therefore rejected. While, 1: 1 (b) shows that the calculated (t-cal) 3.099 in less than the critical level of 3.743 at 0.05 level. This indicates that the null hypothesis is accepted. It means that the apparent difference in the PCV values is statistically significant. Also 1:2(x) and (b) are the computed t-test as sprint pre and post test males as well as endurance pre and post test males, indicates that, both are significant at 0.05 levels. This result shows that the hypotheses for these variables are rejected. There are therefore significant differences.

Figure 1: Mean values of PCV of female athletes measured before and after exercise

Research question 2: Will there be any relationship between hemoglobin concentration of female sprint and endurance runners as a measures of haematological characteristics

Hypothesis 2: There will be no significant difference in hemoglobin concentration between female sprints and endurance runners as a measure of haematological characteristics. This results signify that the hypotheses are accepted. Meaning no significant differences between the two sets of variables. Furthermore, the table 2 (a) at pre and post test sprints and endurance for females. Showing that there are significant difference at 0.05 level.
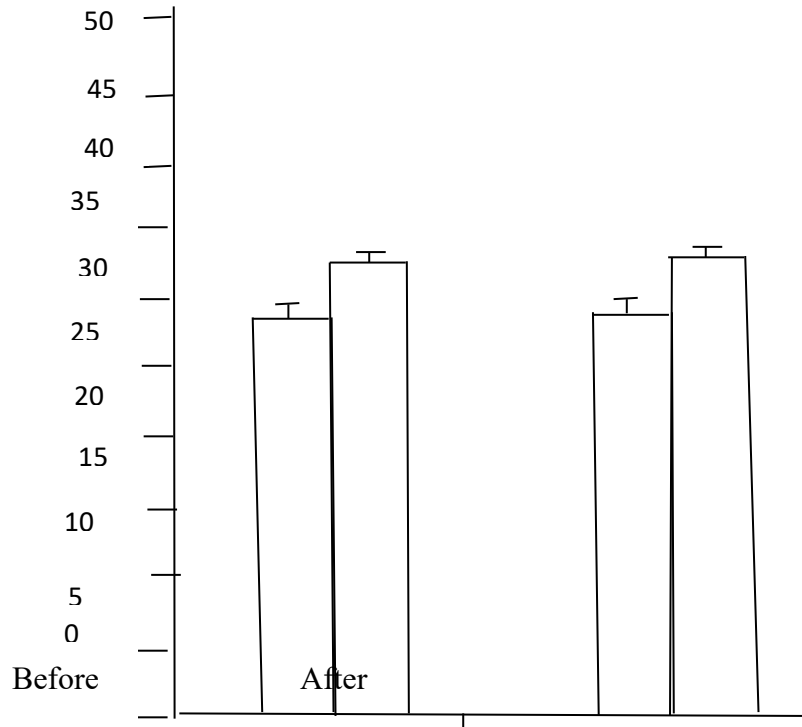
Figure 3: Mean values of Hb of female athletes measured before and after exercise

Table 2: Relationship between hemoglobin concentration of females sprint and endurance Athletes

S/N	Variable	n	% Mean	SD	t-cal	t-crit	result
1	Spirit and endurance						
	a. Females	10	50.945	9.343	3.502	1.943	Sig
2	c. Spirit pre and post males	5	47.389	6.652	3.309	1.943	Sig
	b. Endurance pre and post females	5	54.500	5.477	8.875	1.860	Sig
	Total	10					

N/B n.Sig – Not significant   sig- significant

Table 2: 1 (a) and (b) shows computed hemoglobin concentration of sprint and endurance for females and sprinters and endurance t-cal less than t-

Research Question 3: Will there be any relationship between red blood cells count of females sprinters and endurance runners as measures of haematological characteristics?

Hypothesis 3: There will be no significant difference in red blood cells count between females sprints and endurance runners as a measures of haematological characteristics.

Table 3: Relationship between red blood cells count of females endurance and sprint Athletes

S/N	Variable	n	% Mean	SD	t-cal	t-crit	result
1	Spirit and endurance						
	c. FeMales	5	50.945	9.343	3.502	1.943	Sig
2	d. Spirit pre and post females	5	47.389	6.652	3.309	1.943	Sig
	b. Enduran ce pre and post females	5	54.500	5.477	8.875	1.860	Sig
	Total	10					

Table 3: 1 (a) shows significant results at 0.05 level for females sprint when compared with endurance runners scores. Table 3.2 (a) and (b) are the computed scores of males runners pre and post at 0.05 level for females when sprint is compared with endurance runners scores. Table 3. 2(a) and (b) are the computed scores of females runners pre and post at 0.05 level, both also shows significant relationships.

Research Question 4: Will there be any relationship between white blood cells count of females sprinters and endurance runners as a measures of haematological characteristics?

Hypothesis 4: There will be no significant difference in white blood cell count between females sprint and endurance runners as a measures of haematological characteristics.

Table 4: Relationship between hemoglobin concentration of males sprint and endurance Athletes

S/N	Variable	n	% Mean	SD	t-cal	t-crit	result
1	Spirit and endurance						
	d. FeMales	10	50.945	9.343	3.502	1.943	Sig
2	e. Spirit pre and post females	5	47.389	6.652	3.309	1.943	Sig
	b. Enduran ce pre and post females	5	54.500	5.477	8.875	1.860	Sig
	Total	5					

N/B n.Sig – Not significant   sig- significant

This results shows that there are significant relationships. However in sub table: 2 (a) and (b) which are the scores of pre and post for sprint and endurance females runners. Meaning a significant relationship, but that of the endurance runners is rejected at 0.05 levels.

Discussion of findings

The objective of the study was to compare the haematological characteristics of males sprint and endurance athletes of the University of Port Harcourt. Data were obtained from the males athletes were analysed according to standard principles of haematological practices. The results obtained were statistically tested according to the various research questions and hypotheses raised earlier are discussed in relation to the findings of previous researchers. The mean pretest PCV values for both sprints and endurance were within normal: 53.1%. The findings of this study is that the PCV of all athletes sprints and endurance, females dropped by various percentage as follows:

Sprint females   14.1%

Endurance females   18.5%

These are in relation with the studies of Wu et al (2004): Karakoc et al (2005) and Gwotmut (2023). The study indicated significant relationship between sprint males and endurance females athletes. Significant relationships were observed in pre-test and post-test of females (sprint and endurance athletes). These were also the same with the work of Wu et al (2004) and Karakoc et al (2005). However, the studies of Spencer et al (2005) on ultra-marathon athletes indicated no reduction in

PCV. This study on PCV is in agreement with the school of thought that reduction in PCV might be as a result of shear (angular deformation) rate that occur at the end of the training as well as haemodilution. This is a middle term effects of exercise. Volume depletion of the PCV may be a protective measure to reduce blood viscosity during fluid shift from plasma to the extravascular spaces (Mckenna et al 2000 and Gwotmut, 2023).

The hemoglobin (Hb) values of the athletes, in both sprint and endurance were also within normal before the commencement of the exercise (pre-test).The earlier research question which seeks to evaluate relationship between sprint and endurance athletes as well as the null hypothesis, that there is no significant difference between the sets of variables were statistically tested. It was observed that no statistical significant differences existed between the sprint and endurance athletes males. This is a major finding of this study, because, the work of Hue-June et al (2004) established a non-significant dropped in Hb values.

The third haematological characteristic in this study was the red blood cell count (RBC). The mean scores dropped as follows;

Sprint females - (6.524-6.188 x1012/L);

Endurance females   - (5.861-5.552 x 1012/L).

These dropped in RBC (at post test), were further subjected to statistical test (t-test) at 0.05 level of significant and was observed that significant difference exist between sprint and endurance athletes. These findings are similar to the work of Neumayr et al (2002), Toralov (2000) and Gwotmut et al (2024). The results of the present study also support the conclusions of previous studies that majority of the red blood cells undergoes changes in athletes. Finally, the findings of this study established increases in the white blood cell of the athletes in both sprint and endurance. This sprint and endurance difference increases was also 0.06% lower compared to those of the male sprint endurance of 0.08%. These increases when tested at 0.05 level of significant, were observed to be significant. Fallon et al (1999) and Karakoc et al (2009), established increases in WBC in response to exercises. Their studies attributed the increases to a demargination process caused by exercises. The defensive nature of white blood cells might be responsible for its increases. This is possible because, the white blood cells in response to exercise are mobilized to the peripheral blood used in anticipation of injury and possible inversion of infectious organisms.

Conclusion of Findings

This study looked at documented haematological characteristics of sprint and endurance athletes of the University of Port Harcourt. The following variables were examined, PCV, Hb and RBC indicators of anaemia and polycythaemic were normal in all athletes (pre and post). The study indicated values were observed to have changed and these changes were all statistically significant.

Recommendations

The findings of this study prompt the following recommendations.

1. Athletes need to know their haematological status before embarking on either sprint or endurance sport, so that they are not taken unaware of the attendance consequences of anaemia or infectious diseases.
2. Adequate nutritions is mandatory for all athletes to enhance blood analysis unit within its complex along other basic facilities to improve competition.
3. The sport institute of the University of Port Harcourt should take up adequate pre-test test of athletes blood characteristics of sport men and women prior and after major sporting events like NUGA and National sports festival.

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