Scholars Journal of Applied Medical Sciences (SJAMS) ISSN 2320-6691 (Online)
Sch. J. App. Med. Sci., 2014; 2(1A):96-103 ISSN 2347-954X (Print)

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Research Article

Physiological Profiles of Officers and Men of the Nigerian Armed Forces in Lagos, Nigeria

Benjamin Oluwole ADEDUGBE[1], Monday Omoniyi MOSES[2]*, Ademola Olasupo ABASS[3]
[1]Department of Physical and Health Education, Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria
[2]Department of Sports and Exercise Science, Faculty of Allied Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
[3]Department of Human Kinetics and Health Education, University of Ibadan, Ibadan, Oyo State, Nigeria

***Corresponding author**
MOSES Monday Omoniyi
Email: moniyi152002@yahoo.com

Abstract: The physiological profiles of members of the Nigerian armed forces are of great importance to their mobility and health. Studies have centered on armed forces growth and development for combat readiness but not many of these have critically examined their physiological profiles comparatively. Therefore, this study comparatively analysed the resting heart rate (RHR), systolic blood pressure (SBP), diastolic blood pressure (DBP), flexibility, maximum oxygen consumption ($MaxVO_2$). The *ex-post facto* research design was employed. Purposive sampling technique was adopted to select 186 officers and men (Army, Navy and Air force) as sample for the study. Data were collected using stethoscope, sphygmomanometer, flex-tester-sit-and-reach-flexibility test box and 1.5mile run\walk 400-meter track. Data analysis was done with the use of analysis of variance and Scheffe post-hoc test. Results showed that there were significant differences in SBP ($t=2.791$, $p<0.05$) and $MaxVO_2$ ($t=1.084$, $p<0.05$) between Officers and Men of the armed forces. There were significant difference in SBP ($F_{(2,183)}=4.917$, $p<0.05$), flexibility ($F_{(2,183)}=18.923$, $p<0.05$) and $MaxVO_2$($F_{(2,183)}=9.775$, $p<0.05$) among the three armed forces groups. Scheffe post hoc showed that the significant difference in SBP was between Army and Air Force ($\bar{x}=3.98$), flexibility between [Army and Navy ($\bar{x}=4.22$), Army and Air Force ($\bar{x}=5.52$)], $MaxVO_2$ among [Army and Navy ($\bar{x}=7.67$), Navy and Air Force ($\bar{x}=8.04$)]. There were significant disparities between some physiological profiles level of the different armed forces groups and Officers and Men across the groups. Hence, periodic and consistent physiological profiles appraisal of the armed forces should be prioritised.
Keywords: Physiological profiles, Army, Navy, Air force, Nigeria

INTRODUCTION

The dub for high magnitude of physiological fitness within the security officers in a developing and security challenged nation like Nigeria cannot be over-emphasized. Functional efficiency required by the armed forces to support and defend the constitution of Nigeria against all enemies, foreign and domestic; ensure, by timely and effective military action, the security of the country, its territories, and areas vital to its interest; and uphold and advance the national policies and interests of the country depend on strength possessed [1]. Scholars reiterated that the success and general efficiency of every military establishment, to a large extent, depend upon the physical fitness, endurance and condition of the individual unit or command in which it is composed [2]. The standard physiological functioning of the armed forces as against civilians is a state of being that includes strong, flexible muscles and an efficient system for getting oxygen and nutrients to the body [3].

The activities of the Nigerian security men [4, 5] in the present day require the integrated efforts of the heart, lungs, and circulation to deliver oxygen to the metabolically active muscle mass [6]. Heart rate is the standard guide for determining aerobic exercise intensity [7]. Hence, every military personnel need aerobic exercise intensity to be alert, energetic and possess stamina, in order to effectively carry out their constitutional duties. Being energetic results from acquisition of maximal aerobic power, estimated by determining maximal oxygen consumption ($maxVO_2$), is commonly regarded as the best indicator of endurance sports. As a result, $maxVO_2$ is frequently used to monitor training and periodization [8, 9].

Vigorous involvement of individuals (armed forces) in flexibility activities improves mobility, keep muscles relaxed and joints mobile, helps to live better, longer, comfortable life. These values stem from collective optimal capabilities of oxygen distribution at the cellular level to the working muscles as well as range of motion available at the joints of all armed forces. One

common rationale for increasing range of motion at joints of the military personnel is to prevent injury from overextension of the joint during mission.

Nigerian armed forces is a tri-partied service force that comprises of Nigerian Army, Nigerian Navy and Nigerian Air force, headed by the Chief of Defense Staff followed by Chief of Army Staff, Chief of Naval Staff and Chief of Air Staff in that order (CDS, COAS, CNS and CAS) with different recruitment processes and training routines [10]. Though the intensity and routine of training in the armed forces differ, the customary blood pressure, heart rate, maxVO_2 and flexibility in them should professionally be equivalent given the general demand of defending national security. However, the habitual calling on the Nigerian Army to tackle insecurity in the country will suspiciously question the fitness in the physiological profiles of others. Unedited record obtained from the various clinic and military hospitals in Lagos also shows occurrence of chronic diseases (e.g. coronary heart disease, obesity, hypertension, diabetes, overweight etc) among military personnel across armed forces. This is worrisome because if any section of the group that is expected to protect the nation is getting increasingly unhealthy, the whole citizenry may be in danger.

EXPERIMENTAL SECTION

The research design used in this study was ex-post facto research design. The population for this study comprised of all Officers and men in Armed forces commands Lagos that include Nigerian Army (NA) 81 Division HQ Kofo Abayomi and Bommy Camp Victoria Island Lagos. Nigerian Navy physical training sport and school camp (NNPTSC) NN Quorra/Olokun Apapa Lagos and Nigerian Air force Logistics Headquarter Sam Ethnam Barracks Airforce Base Ikeja Lagos. The purposively convenient sampling technique was adopted to select One hundred and eight six (186) volunteers from Nigerian Army, Navy and Air force, force headquarters Lagos as sample for the study. This comprised of sixty four (64) each from officers and men in the Army, Navy and fifty eight (58) officers and men in the Air force. Moreover the sample comprised of fifteen (15) officers from the rank of captain downward and its equivalent in Army, sixteen (16) form Navy and eighteen (18) from Air force, while the remaining forty nine (49), Forty eight (48) and forty (40) were drawn from the Non commissioned officers (NCOs) or other ranks (ORs), referred to as men, of the three commands respectively. Measurements were conducted at NA 81 Division HQ Bonny camp/Dodan Barracks Obalende Lagos, NNPSTC Quorra Olokun Forkwest, Apapa Lagos and NAF Logistics HQ Sam Ethnam Barracks Base Ikeja Lagos.

Resting Heart Rate

Resting heart rate value was obtained using military 3M Littmann Stethoscope (M3128) produced by 3M Health Care, U.S.A and Sportline 220 model stopwatch produced by Sportcentral, Inc. The stethoscope ear pieces were placed in the ears so that the angle of the ear piece tube pointed forward. The diaphragm of the stethoscope was placed on left side of the participant's chest, over the apex of the heart. The number of beats in fifteen seconds was counted and multiplied by four to get the heart rate (per minute).

Resting Blood Pressure

The stethoscope and the digital mercurial sphygmomanometer with blue nylon cuff and standard latex bulb, model number XR-DXJ-300B of Xuerui brand name made in China were used to measure the blood pressure profiles. The participants sat comfortably on a stool and supported the arm on a table such that laid mid-chest level. The cuff of the sphygmomanometer was wrapped firmly around the arm at 2cm above the cubital fossa. The radial pulse was palpated up to 180mmHg above the arterial pressure at which the radial pulse was expected to disappear. The blood pressure was determined by auscultating the bronchial artery at the lateral cubital aspect of the cubital space with a stethoscope. The cuff pressure was gradually deflated at the rate of 2mm Hg per second. The pressure at which the first "korotkof-sound" was heard was recorded as the systolic blood pressure, while diastolic blood pressure was the pressure where the last sound was heard. The blood pressure was recorded in mmHg (millimeter of mercury) placing systolic over diastolic pressure.

Trunk Flexibility

Flex-Tester-Sit-and-Reach-Flexibility Test box (Flex box) was used for measuring trunk flexibility of participants. Participants assumed a sitting position with the feet put at a shoulder width apart and against the Flex box calibrated in centimeters, the participants then, in that position, leaned the trunk forward with both hands put together, head in between both hands in a way that fingers are placed together properly on the box leading with both middle finger in the leaning and pushing of the measuring gauge on the Flex box as far as possible without jerking. The movement of the gauge would determine the extent to which the hands could reach by the fingers. The marked point reached by the participants was recorded to the nearest centimeters.

Maximum Oxygen Consumption (max$V0_2$)

A 400-meter track was used for the 1.5mile run to obtain maximum oxygen consumption (max $V0_2$). The participants completed the course in the shortest time possible not more than twelve (12) minutes. Although walking was authorized, it was strongly discouraged. If the participants were physically helped in any way (pulled, pushed, picked up, and/or carried) or leaved the designated running course for any reason, he or she was disqualified. The time was recorded when each participants crossed the finishing line on the final lap to the nearest second which was substituted into the regression equation that is max Vo2 (ml /kg/min) =

$108.94 – (8.41 \times T) + (0.34 \times T^2) + 0.21 \times Age \times G) – (0.84 \times BMI)$.Where, T = time in minutes for 1.5miles run-walk test, BMI = Body Mass Index (W/H^2) and G =Gender – coded; female =0; male 1. This equation has multiple correlation of 0.72 [11].

RESULTS AND DISCUSSION

Table 1 present the pooled mean of the variables measured where age was 31.10±6.79 years, height was 1.74±0.09meters, weight (kg) was 69.67±10.62kg, resting heart rate (beat/min) was 68.60±10.11bpm, resting systolic blood pressure (mmHg) was 122.30 ±7.08mmhg, resting diastolic blood pressure was 78.15 ±4.24mmHg, flexibility (cm) was 24.36 ±5.23cm mean and maxVO_2 was 59.43±8.82ml/kg/min.

To test whether there are significant differences, the ANOVA result in table 2 revealed no statistical significant difference in the Heart Rate between the officers and men in the Nigerian armed force [F (1,184) =.021, p > .05 level of significance]. With this value of F, the decision was that officers and men of the armed forces have equivalent heart rate.

The mean scores of respective groups as shown in table 3 were Army= 67.82± 9.04bpm; Navy=67.63±9.82bpm and Air force = 64.92± 22.02bpm with a ground mean score of 68.55bpm.It also revealed that the was no significant difference main interaction effects among Army, Navy and Air force on Heart Rate F[(2,183) = .335, p>.05]. Also, the post hoc result presented in table 4 vividly confirmed the outcome of table 2 and 3 on significant value.

Table 4 showed that the computed scheffe post hoc analysis indicated that there were no significance difference among the three groups in heart rate as p>.05 in the main interaction effects.

The table 5 showed that F (1,184) =7.788, at p < .05 level of significance and that there were significant differences in the systolic blood pressure (mmHg) between the officers and men in the Nigerian armed forces. The implication of the result can be linked to physical training and duration of training.

According to the ANOVA result in table 6, the mean scores of respective groups were Army = 120.55±5.54, Navy= 121.81± 7.18 and Air force = 124.54±8.52 where their average score was 122.23mmHg. The table also revealed that there were significant differences in the main interaction effects among Army, Navy and Air force on systolic blood pressure (SBP) given the position of F [F (2,183) = 4.917, p >.05].

*=The mean difference was significant at the .05 level. The harmonic mean of the group sizes is used. The computed scheffe post hoc analysis in table 7 proved that the difference between Nigerian Army and Air Force among the three groups were significant (p <.05) at the .05 level (*) while there were no significant difference (p >.05) between Army and Navy, Air Force.
In the above table 8, there were no significant differences in the diastolic blood pressure (mmHg) between the officers and men in the Nigerian armed forces given that F (1,184) = .387, at p > .05 level of significance.

Table 9 revealed that there was no significant difference in the main interaction effects among Army, Navy and Air force on diastolic blood pressure (DBP) [F(2,183) = .476, P >.05]. The mean scores of respective groups were shown as Army = 78.44± 3.55, Navy = 77.73± 4.17 and Air force = 78.28± 5.01with average group mean of 78.15mmHg.

Table 10 showed that at 0.05 alpha level, p >.05 and that the mean differences reported were not significant as a backup to ANOVA result.

From the ANOVA result in the table 11, F (1,184) = 1.675, p > .05 level of significance. This connotes that there was no significant differences in the flexibility between the officers and men in the Nigerian armed forces.

Table 12 revealed that Army, Navy and Air Force had mean score of 27.61±5.24, 23.39±4.77and 22.09±5.69 with group mean of 24.44cm respectively in the flexibility performance of the group involved. It also showed that there was significant difference in the main interaction effects among Army, Navy and Air force on Flexibility [F (2,183) =18.923, p <.05].

*=The mean difference is significant at the .05 level. The harmonic mean of the group sizes is used. From the scheffe post hoc analysis table above revealed that there significant difference between Army and Navy, Army and Air Force (p <.05) whereas there was no significant difference between Navy and Air Force (p >.05) in flexibility performance.

Table 14 presented ANOVA result on the significant difference between MaxVO_2 of officers and men of the Nigerian armed forces. It produced an F of 1.726 with table value at $F_{1,\ 184}$ and 0.05 level of significance yielded .191. The table showed that there were no significant differences (p >.05) in the maximum oxygen consumption between the officers and men in the Nigerian armed forces.

The mean scores of respective groups were shown in table 15 above with indication that Army had 63.16±9.98, Navy had 56.30±7.77 and Air force had 58.82±8.70ml/kg/min. The table also revealed that there were significant difference in the main interaction effects among Army, Navy and Air force on MaxVO_2 [F(2,183) =9.775, p <.05. The specific areas of significance were detailed in table16 below.

*=The mean difference was significant at the .05 level. The harmonic mean of the group sizes was used. From the table 16 above, there were significant difference between Nigerian Army and Navy, Army and Air Force (p <.05) while on the order end, there was no significant difference between Navy and Air Force (p >.05).

Table 1: Pooled Descriptive Score of Measured Variables

Variables	Mean	Standard Deviation
Age (years)	31.10	6.79
Height (m)	1.74	0.09
Weight (kg)	69.67	10.62
Resting Heart Rate (beat/min)	68.60	10.11
Resting Systolic Blood Pressure (mmHg)	122.30	7.08
Resting Diastolic Blood Pressure (mmHg)	78.15	4.24
Flexibility (cm)	24.36	5.23
Max VO_2 (ml/kg/min)	59.43	8.82

Table 2: Analysis of Variance on the difference in the Heart Rate between the officers and men in the Nigerian Armed forces

Source of Variation	Rank	Sum of Squares	DF	Mean Square	N	Mean Value
Between Groups	Officers	2.180	1	2.180	49	68.3673
Within Groups	Other ranks	897.884	184	102.706	137	68.6131
Total	Total	900.064	185		186	

F= 0.021, Sig. = .884

Table 3: Analysis of Variance on main interaction effects among Nigerian Army, Navy and Air Force on Heart Rate

Source of Variation	Sum of Squares	DF	Mean Square	Mean Value	F	Sig.
Between Group	224.289	2	112.144	67.82		
Within Group	18675.776	183	102.053	67.63	1.099	.335
Total	18900.065	185		64.92		

Table 4: Scheffe Post hoc interaction effects between Army, Navy and Air force on Heart Rate

Army Forces Type		Mean Diff.	Sig.
Army	Navy	0.25000	.990
	Air force	2.23491	.476
Navy	Army	0.25000	.990
	Air force	2.48491	.400
Air force	Army	2.23491	.476
	Navy	2.48491	.400

Table 5: Analysis of Variance on the difference in the Systolic Blood Pressure between the Officers and Men in the Nigerian Armed Forces

Source of Variation	Rank	Sum of Squares	DF	Mean Square	N	Mean Value
Between Groups	Officers	398.558	1	398.558	49	124.6735
Within Groups	Other ranks	9415.958	184	51.174	137	121.3504
Total	Total	9814.516	185		186	

F= 7.788, Sig. = .006

Table 6: Analysis of Variance on main interaction effects among Army, Navy and Air force on Systolic Blood Pressure

Source of Variation	Sum of Squares	DF	Mean Square	Mean Value	F	Sig.
Between Group	500.476	2	250.238	120.5469		
Within Group	9314.040	183	50.896	121.8125	4.917	.008
Total	9814.516	185		124.5345		

Table 7: Scheffe Post Hoc interaction effects between Army, Navy and Air force on Systolic blood pressure

Army Forces Type		Mean Diff.	Sig.
Army	Navy	1.26563	.605
	Air force	3.98761*	.010
Navy	Army	1.26563	.605
	Air force	2.72198	.112
Air force	Army	3.98761*	.010
	Navy	2.72198	.112

Table 8: ANOVA analysis on difference in the Diastolic Blood Pressure between the Officers and Men in the Nigerian Armed Forces

Source of Variation	Rank	Sum of Squares	DF	Mean Square	N	Mean Value
Between Groups	Officers	6.993	1	6.993	49	78.4694
Within Groups	Other ranks	3328.087	184	18.087	137	78.0292
Total	Total	3335.080	185		186	

F = .387, Sig. = .535

Table 9: Analysis of Variance on main interaction effects among Army, Navy and Air force on Diastolic Blood Pressure

Source of Variation	Sum of Squares	DF	Mean Square	Mean Value	F	Sig.
Between Group	17.260	2	8.630	78.4375		
Within Group	3317.821	183	18.130	77.7344	.476	.662
Total	3335.081	185		78.2759		

Table 10: Scheffe Post Hoc interaction effects among Army, Navy and Air force on Diastolic blood pressure

Army Forces Type		Mean Diff.	Sig.
Army	Navy	.70313	.647
	Air force	.16164	.978
Navy	Army	.70313	.647
	Air force	.54149	.782
Air force	Army	.16164	.978
	Navy	.54149	.782

Table 11: Analysis of Variance on difference in the Flexibility between Officers and Men in the Nigerian Armed Forces

Source of Variation	Rank	Sum of Squares	DF	Mean Square	N	Mean Value
Between Groups	Officers	54.471	1	54.471	49	23.5306
Within Groups	Other ranks	5983.255	184	32.518	137	24.7591
Total	Total	6037.726	185		186	

F= 1.678, Sig. = .197

Table 12: Analysis of Variance on main interaction effects among Army, Navy and Air force on Flexibility

Source of Variation	Sum of Squares	DF	Mean Square	Mean value	F	Sig.
Between Group	1034.688	2	517.344	27.6094		
Within Group	5003.038	183	27.339	23.3906	18.923	.000
Total	6037.726	185		22.0862		

Table 13: Scheffe Post Hoc interaction effects among Army, Navy and Air force on Flexibility

Army Forces Type		Mean Diff.	Sig.
Army	Navy	4.21875*	.000
	Air force	5.52317*	.000
Navy	Army	4.21875*	.000
	Air force	1.30442	.390
Air force	Army	5.53217*	.000
	Navy	1.30442	.390

Table 14: Analysis of Variance on difference in the Maximum Oxygen Consumption between Officers and Men in the Nigerian Armed Forces

Source of Variation	Rank	Sum of Squares	DF	Mean Square	N	Mean Value
Between Groups	Officers	148.003	1	148.003	49	57.9531
Within Groups	Other ranks	15779.776	184	85.760	137	59.9781
Total	Total	15927.779	185		186	

F = 1.726, Sig. 0.191

Table 15: Analysis of Variance on main interaction effects among Army, Navy and Air force on Maximum Oxygen Consumption

Source of Variation	Sum of Squares	DF	Mean Square	Mean Value	F	Sig.
Between Group	1537.395	2	768.698	63.1547		
Within Group	14390.384	183	78.636	56.2969	9.775	.000
Total	15927.780	185		58.8241		

Table 16: Scheffe Post Hoc interaction effects among Army, Navy and Air force on MaxVO_2

Army Forces Type		Mean Diff.	Sig.
Army	Navy	6.85781*	.000
	Air force	4.33055*	.028
Navy	Army	6.85781*	.000
	Air force	2.52726	.293
Air force	Army	4.33055*	.000
	Navy	2.52726	.000

DISCUSSION

The study revealed that Nigerian armed forces (excluding the Police) averaged 29.75±6.33years in age which indicate youthful age that should be capable of facing the rigour of ensuring absolute security of lives and property of the nation. The average of this group is older than that of the Nigerian Police group reported in another study [12]. Although these participants' age falls in the same age range of 18 to 53 years in a study using the Army Physical Fitness Test (APFT) that is a standardized measurement of physical fitness administered to all Army Active Duty, National Guard, and Reserve personnel, but have age that was less than their mean age of 30years [13].

Considering the height obtained in this study, Nigerian armed forces averaged 1.74±0.09m which was less than 1.77±0.06m earlier reported [12]. The implication is that Nigerian Armed forces attached paramount importance to height as requirement for enlistment in the services. The participants in this study had average weight that was more than that of Police trainees (71.64±12.00kg >63.70±5.27kg) also reported [12] that might be the result of drills that accumulated muscle mass over time. The heart rate compared favourably with the study that found no significant difference in the heart rate of men of the Nigerian army after 12 weeks of training [14]. On the other hand, this study showed contrary opinion to the study conducted on the cardiorespiratory endurance indices of new entrants of men of the Police training school [12]. The significant difference in SBP between officers and men support the reports of the study carried out on military personnel which established that different levels of physical fitness between two groups in the various services can be responsible for the differences in their SBP [15]. The officers also engaged in less vigorous physical fitness activity than the men since the latter involve mostly in supervisory responsibilities.

The findings from this study indicate that Nigerian armed forces participate in different regular stretching exercise that present disparity in their flexibility. This agrees with the submission [16] that thirty minutes of static stretching exercises performed twice per week will improve flexibility within five weeks [17].

Preceding a static stretch with an isometric contraction of the muscle group to be stretched is an effective means of improving muscle relaxation and may enhance the development of flexibility [17]. The inequality in oxygen uptake also corroborates training efficiency. A high level of training will lead to improve oxygen consumption. A low level of aerobic fitness can cause coronary heart disease risk even in young and old military personnel. These observations are consistent with cross-sectional findings from other studies in which cardio-respiratory fitness predicted calculated CHD risk [18]. Although the findings from this study did not present unhealthy status of the armed forces, but the variation in their physiological profiles level could mean that some are low while others high. A low level of physical fitness is associated with higher risk for cardiovascular morbidity and mortality, even in younger individuals. Unfit soldiers are at increased risk for cardiovascular- and fitness-related problems that impact wartime operations. Low physical fitness coupled with the protracted stress of combat operations places soldiers at greater cardiovascular risk during deployment and war. This has become increasingly apparent with the shifting of diseases affecting deployed soldiers [13].

CONCLUSION

The Nigerian armed forces personnel do not maintain the physiological fitness status attained at the early stage of their training or at the point of leaving the college. The Nigerian armed forces do not embrace cooper fitness test as this should be a major consideration in building their physiological endurance fitness level. Inability to cohabit the officers and men is a bane of deplorable physiological fitness level amongst the military personnel. Nigerian armed forces do absolutely embrace physiological and physical fitness majorly when they are preparing for peace keeping mission and intra/inter service sport competition. It is advocated that future researchers and research fellows should be encouraged to go into an intervention research programme that cut across the tripartite services as a result of shortfall in the depth of information in this area of knowledge.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the Chief of Defence Staff, Ministry of defense Headquarter, Garki, Abuja; The Service Chief(s) (Army) (Navy) (Airforce), COAS, CONS, COAFS, Ministry of Defence, Abuja; General Officer Commanding (GOC), 81 Division Nigerian Army Lagos, Kofo Abayomi Lagos; Flag Officer Commanding (FOC), Nigerian Naval Command NNS Olokun Apapa Lagos; and The Flag Officer Commanding (FOC) Nigerian Airforce Command, Logistic Headquarter Lagos.

REFERENCES

1. Athekame C; Preparing Nigerian Army for future challenges. NAN, 02 Thursday, August, 2012. Available from http://www.businessdayonline.com/NG/index.php/analysis/features/42157-preparing-nigerian-army-for-future-challenges
2. Settles DM, Brown TP; U.S. Navy Pre-Entry Physical Training Plan OPNAVINST 6110.1G, 10 OCTOBER, 2002. Available from http://www.nrotc.navy.mil/pdfs/pre-conditioning.pdf
3. Dikki CE, Chado MA, Dadi JA; Cardio-respiratory performance and muscular endurance training in female gymnast. In Sohi AS, Igbanugo VC, Agbonjinmi AP editors; Journal of Nigerian Association of Sport Science and Medicine, 1994; 4: 141-146.
4. The Airman, Building A Virile NAF Through Training. Journal of Nigerian Air force, 9 April-June, 2004.
5. Wushishi MI; The Nigerian Army-Growth and Development of Combat Readiness. In Imobighe TA editor; Nigerian Defense and Security, 2008: 23-34.
6. Nam DH; Cardiovascular-respiratory Endurance Test Equation. Journal of the International Council for Health, Physical Education, Recreation, Sport and Dance (ICHPER-SD), 2003; 39(1): 55-59.
7. Prentice WE; Fitness and Wellness for Life. 7th edition, Boston: WCB McGraw Hill. 1999: 45-56.
8. Levine BD; VO2 max: What do we know, and what do we still need to know? Journal of Physiology, 2010; 1(1): 25-34.
9. Midgley AW, McNaughton LM, Wilkinson M; Is there an optimal training intensity for enhancing the maximal oxygen uptake of distance runners? Sports Medicine, 2006; 36(2):117-132.
10. Dule SM, Ajayi DA, Bassey JM, Bomoi Y; History of Nigerian Armed Forces and Commands in Nigerian Army Education Corps and Sew. APRD publishing HQ, 1994: 44-46.
11. Baumgarmer TA, Jackson AS; Measurement for Evaluation in Physical Education and Exercise Science. Boston: WCB McGraw-Hill, 1999: 204.
12. Aniodo DO; Comparative Effects of two Modes of Aerobic Training on the Cardiorespiratory Endurance indices of Police Trainees at Iperu, Ogun State, Nigeria, 2003.
13. Talbot LA, Weinstein AA, Fleg JL; The involvement of the Army National Guard (ARNG) soldiers in Operations Enduring Freedom (OEF) and Iraqi Freedom (OIF). Health News, Military Medicine, September 11, 2001. Available from http://allnurses.com/members/335688/
14. Benoit H, Busso T, Castells J, Geyssant A, Denis C; Decrease in peak heart rate with acute hypoxia in relation to sea level VO2max.

European Journal Applied Physiology; 2003; 90:514-519.
15. American College of sports medicine (ACSM);Guidelines for exercise testing and prescriptions, 2000. Available from www.acsm.org.
16. Powers SK, Howley ET; Exercise Physiology: Theory and Application to Fitness and Performance. 7th edition, The McGraw-Hill Companies, Inc. 2009.
17. Brooks GA, Fahey TD, White TP; Exercise Physiology: Human Bioenergetics and Its Applications. Mayfield Publishing Co., 1996.
18. Talbot LA, Weinstein AA, Fleg JL; Army Physical Fitness Test Scores Predict Coronary Heart Disease Risk in Army National Guard Soldiers. Military Medicine, 2009; 174(3): 245-252.