

## Original Research Article

# Assessment of Cardiopulmonary Profile of Speed-Boat Drivers in Port Harcourt

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**Abstract:** Speedboat drivers are known to operate daily under challenging conditions, including prolonged engine vibration, exposure to fuel fumes, amongst others; thus, making it necessary to assess the likely adjustments in the cardiopulmonary profile possibly exerted by these occupational exposures. This cross-sectional observational study was conducted amongst speed boat drivers operating in Port Harcourt, Rivers State, Nigeria. The study used the purposive/snowball sample size techniques to recruit the participants. Precisely 60 consenting subjects were engaged in the study, making up 30 speedboat drivers and 30 non- speedboat drivers. Quantitative data obtained from the study participants were statistically analysed using version 25.0 of the IBM Statistical Product and Service Solutions (SPSS) software. The study found that, the boat drivers were within their productive age (44.60 years) with healthy mean BMI ( $26.00 \pm 9.28 \text{ Kg.m}^2$ ). On changes in cardiovascular indices, the study found significantly ( $p < 0.05$ ) raised systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure levels in the speed boat drivers with higher risks of hypertension. Considering the outcome on electrocardiographic (ECG) changes in the speedboat drivers, it was found that there was a comparatively lower incidences of sinus rhythm with normal ECG features but raised abnormal ECG features. The speed boat drivers also manifested sinus arrhythmia, septal infarct, sinus bradycardia, and many cases of sinus rhythm with abnormal findings. It is thus suggested that, the subjects should be educated or motivated to have good health-seeking attitude in order to avert possible risks of cardiovascular accidents.

**Keywords:** Occupational Health Risk, Cardiopulmonary Profiles, Speedboat Drivers, Port Harcourt.

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## INTRODUCTION

The cardiopulmonary system plays a crucial part in maintaining life as it majorly ensures sufficient oxygen supply to tissues and the elimination of metabolic waste products (Malone, 2024; Rabadia *et al.*, 2024). Thus, considering individuals working in physically demanding and high-risk jobs, optimal cardiovascular and respiratory function is crucial (Kenny *et al.*, 2024; Parsons *et al.*, 2022). Of course, physically demanding jobs involve intense, repetitive physical labour, heavy lifting, or long hours on one's feet, often in dangerous conditions (Sharkey & Davis, 2008; Roshan *et al.*, 2024; Ullman *et al.*, 2024). Indeed, speedboat driving is a typical example of physically demanding jobs (Myers *et al.*, 2011; Saputri & Febriyanto, 2023; Saputri & Febriyanto, 2023).

Understandably, a major responsibility of a speedboat driver is the safe and effective operation of high-performance watercraft/engine boat utilized for tourism, transit, water sports, or emergency response. Such a job necessitates a combination of technical expertise, keen environmental awareness, and a strong emphasis on passenger safety—often in fast-paced or dynamic environments (Maempel & Maempel, 2019; Roshan *et al.*, 2024). By the nature of speedboat driving, the personnel here, engages in a unique kind of occupational physical strain, exposure to the environment, and psychological stress that may have a major impact on cardiac health.

Considering the unique physiological demands on the body by speedboat driving, assessing the cardiopulmonary profile of such personnel is important

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from occupational, safety, and public health perspectives. Speed-boat operation—especially in riverine and coastal environments such as those common in Port Harcourt.

## MATERIALS AND METHODS

### Study Design

This cross-sectional observational study was conducted amongst speed boat drivers operating in Port Harcourt, Rivers State, Nigeria. The study assessed the cardiopulmonary profile of this set of workers in order to understand the actual impact of the work conditions in order to appreciate the depth of this occupational exposure in this perspective.

### Study Area

The study area was Port Harcourt, which is the capital and largest city in Rivers State, Nigeria. It is noted as the 5th largest sub-population in the country, after Lagos, Kano, Ibadan and Benin. It lies along the Bonny River and is located in the Niger Delta. As of 2016, the Port Harcourt urban area had an estimated population of 1,865,000 inhabitants, up from 1,382,592 as of 2006 (Arizona-Ogwu, 2011; Yoade & Adeyemi, 2020).

### Study Population

The study population included active speed boat drivers aged 18–60 years with a minimum of one year of driving experience. Participants were selected through stratified random sampling to ensure a representative sample of the varying age and experience levels within the population.

### Sample Size of the Study

In view of the nature of the study population and related limitations involved in defining an exact population, the purposive and snowball sample size determination tools were used. Exactly 30 speedboat drivers were recruited across the several water rout terminals located in Port Harcourt into the study with 30 control subjects.

### Eligibility Criteria

The inclusion criteria were apparently healthy speed boat drivers who had been actively working for at

least one year and consented to participate in the study. Meanwhile, the exclusion criteria were speedboat drivers with a known history of chronic pulmonary or cardiovascular diseases, recent respiratory infections, or other conditions that could independently affect cardiopulmonary functions and those apparently health but not willing to participate in the study.

### Methods of Data Collection

The assessment considered cardiopulmonary profile, duration of exposure and other demographic information of the study participants. Trained research assistants were used to administer the questionnaire and obtain measurements and samples from the study participants. Following issuance of consent by the study participants, the respective data as required pf the study.

### Methods of Data Analysis

Quantitative data obtained from the study participants were statistically analysed using version 25.0 of the IBM Statistical Product and Service Solutions (SPSS) software. Statistical significance was done using one-way analysis of variance (ANOVA) and then followed by Post-Hoc LSD multiple comparison test. A P-value less than 0.05 were taken to be statistically significant.

### Ethical Consideration/Informed Consent

The permission for the study was obtained from the Research Ethics Committee of the Department of Human Physiology, Faculty of Basic Medical Sciences, Rivers State University, Nigeria and from other relevant civic agencies. Consent letter was obtained from each participant prior to their inclusion to the study.

## RESULTS

The data on Figure 1 displays age distribution of non-speed boat drivers and speed boat drivers in Port Harcourt.

The mean age of the speed boat drivers was recorded as 44.60 years and those of the non- speed boat drivers as 49.20 years. The age distribution of both sub-groups of the study subjects ranged between mid and late forties.

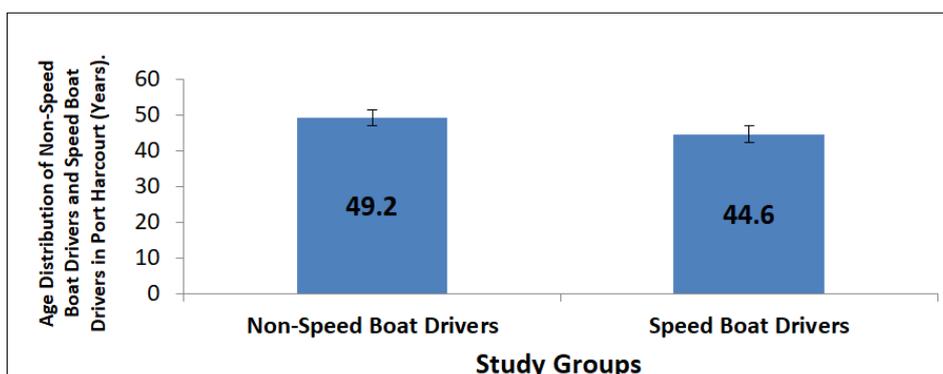
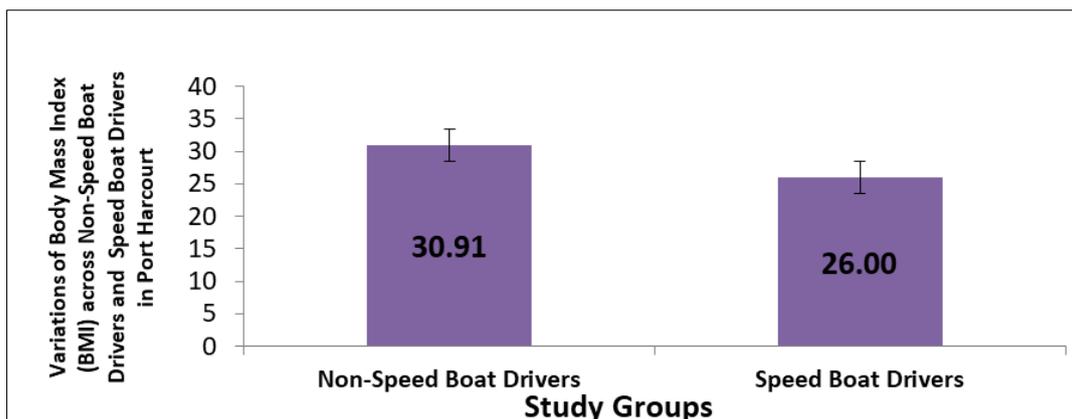


Figure 1: Age Distribution of Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt



**Figure 2: Variations of Body Mass Index (BMI) across Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt**

Values are expressed as Mean ± SD; n=30; \*Significant at P<0.05 when the respective values of the Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt.

Figure 2 shows the outcome on variations of body mass index (BMI) across non-speed boat drivers and speed boat drivers in Port Harcourt.

The speed boat drivers had a mean BMI of 26.00 ± 9.28Kg.m<sup>2</sup> and that of the non- speed boat drivers were recorded as 30.91 ± 8.85 Kg.m<sup>2</sup>. The variation between the values was statistically non-significant (p>0.05).

**Table 1: Comparison of Blood Pressure Parameters of Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt**

S/N	Parameters	Study Groups	
		Non-Speed Boat Drivers	Speed Boat Drivers
1.	SBP (mmHg)	121.97 ± 17.71	139.33 ± 27.16*
2.	DBP (mmHg)	74.00 ± 10.83	93.07 ± 21.58*
3.	MAP (mmHg)	89.99 ± 12.10	108.67 ± 22.90*

Values are expressed as Mean ± SD; n=30; \*Significant at P<0.05 when the respective values of the Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt; systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure.

Table 1 represents the outcome on comparison of cardiovascular/blood pressure parameters of non-speed boat drivers and speed boat drivers in Port Harcourt.

The result revealed significant (P<0.05) increases of systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure in the speed boat drivers when their values was compared to those of the non- speed boat drivers.

**Table 2: Changes in Heart Rhythm of Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt**

S/N	ECG Findings on Heart Rhythm	Study Groups	
		Non-Speed Boat Drivers [Frequency (%)]	Speed Boat Drivers [Frequency (%)]
1.	Sinus rhythm with normal findings	30(100)	6(20.00)
2.	Sinus Arrhythmia	-	6(20.00)
3.	Septal Infarct	-	2(6.67)
4.	Sinus Bradycardia	-	2(6.67)
5.	Sinus rhythm with abnormal findings	-	10(33.33)

(Source: Field Research Data by Researcher).

The data on Table 2 represents the outcome on the changes in heart rhythm of non-speed boat drivers and speed boat drivers in Port Harcourt.

result. In fact, it was only the speed boat drivers that manifested sinus arrhythmia [6(20%)], septal infarct [2(6.60%)], sinus bradycardia [2(6.60%)], and sinus rhythm with abnormal findings [10(33.33%)].

While the non- speed boat drivers all [30(100%)] had sinus rhythm with normal ECG findings, only a few [6(20%)] of the speed boat drivers had same

The sinus rhythm with abnormal finding indicated: poor r wave progression, left ventricular

hypertrophy, poor r wave progression, lateral myocardial ischemia, poor R wave progression inferior, myocardial ischemia left axis deviation, left axis deviation, non-

specific T waves changes, left axis deviation, left ventricular hypertrophy, non-specific T wave changes.

**Table 3: Comparison of some Lung Function Indices between Non-Speed Boat Drivers and Speed Boat Drivers in Port Harcourt**

S/N	Parameters	Study Groups	
		Non-Speed Boat Drivers	Speed Boat Drivers
1	FVC (%)	92.53 ± 4.70	66.63 17.21*
2	FEV1 (%)	88.96 ± 5.89	72.08 13.89*
3	FEV1/FVC	95.60 ± 4.39	111.89 ± 14.16*

Values are expressed as Mean ± SD; n=30; \*Significant at P<0.05 when the respective values of the Abattoir operators are compared to those of Non-Abattoir operators.

**Note:** FVC = forced vital capacity, FEV1 = forced expiratory volume in 1 second, FEV6 = forced expiratory volume in 6 seconds and FEV1/FVC = FEV1/FVC ratio.

On Table 3 is the outcome on comparison of some pulmonary function indices between non-speed boat drivers and speed boat drivers in Port Harcourt.

The result of the variation in forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV1) of the speed boat drivers indicated significantly (p<.0.5) decreased levels when compared to their counterparts who arenon-speed boat driver. On the other hand, the FEV1/FVC ration of the speed boat drivers indicated significantly (p<0.05) higher level when compared to that of the non-speed boat drivers.

## DISCUSSION OF FINDINGS

Boaters have a responsibility to stay safe and ensure their passengers’ safety as well. This is because, they deal with the obvious dangers —shield from cooled environment, navigating crowded waterways, and checking the boxes for the fire extinguisher, life-jackets amongst many others (Graefe, 2001; Jacobs & Hawley, 2007; Patterson Law Group, 2024). On the other hand, many boat drivers are unaware of just how hazardous and toxic boat exhaust fumes can be, not to talk of prevention of themselves and passengers from exposure to such fumes. This unseen boating danger has been recorded to cause many preventable deaths in different locations (Patterson Law Group, 2024). An earlier report suggested that an excess risk for cardiovascular diseases and musculoskeletal disorders in several categories of professional drivers, such as boat drivers, bus drivers, taxi drivers, truck drivers and forklift truck drivers. The researchers noted that, although cardiovascular and musculoskeletal disorders are of multifactorial origin, some characteristics of occupational exposure in transport drivers (stress, workshift, traffic pollutants, awkward postures, exposure to noise and whole-body vibration) may exert at least a concausal role for the onset and the development of these disorders. The predominant role of some confounding factors (Ronchese & Bovenzi, 2012) inappropriate diet, drinking and smoking habits) makes it more difficult to establish causal associations between professional driving and other adverse health effects (respiratory, gastrointestinal, and genito-urinary

disorders, and neoplastic diseases) (Ronchese & Bovenzi, 2012).

Consequently, the present study assessed the cardiopulmonary functions of speed boat drivers in Port Harcourt, Nigeria and made some important findings that are discussed in the following paragraphs.

The present study recorded a mean age of 44.60 years for the speed boat drivers. The speed boat drivers also indicated a mean BMI of 26.00 ± 9.28 Kg.m<sup>2</sup> which did not remarkably vary with that of their counterparts who were non- speed boat drivers (30.91 ± 8.85 Kg.m<sup>2</sup>). Occupations in which there is little or no movement of our bodies are known as “sedentary work” and are characterized by a low energy expenditure, similar to the energy expenditure we have at rest (Toomingas, 2012).

The above result of the present study is unlike that reported for sedentary jobs, where there is increasing risk of obesity (park *et al.*, 2020). By the result it suggests that the boat drivers have comparatively marginally lower BMI for their age. This portends that, the effects of sedentary lifestyle at work may not impact on them. This is could be beneficial of the boat drivers. This notion is valid considering earlier reports that sedentary lifestyle could impair the bodies metabolic balance, generating more insulin resistance (when the body cannot take advantage of glucose in circulation); and decreasing good cholesterol (HDL), elevating our triglycerides and potentially changing blood pressure (Toomingas, 2012).

The finding of the present study on changes in cardiovascular indices by the current study revealed not only significantly raised systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure in the speed boat drivers but values within the established hypertension range (WHO, 2023).

Of course, it is on record that, most people with hypertension do not feel any symptoms (Horne *et al.*, 2023). This is true fo the subjects of this study as most of them profess to feeling apparently healthy even with such deranged cardiovascular indices. Recall that, high

blood pressures can cause headaches, blurred vision, chest pain and other symptoms (Taylor and Ward, 2003). Thus, there would be need for lifestyle changes to help lower high blood pressure and help. In many cases, such changes are expected to be complemented with medications (WHO, 2023). Thus, there is need for motivation of health-seeking attitude amongst the speed boat drivers in order to avert impending danger of these altered cardiovascular indices.

The investigation on electrocardiographic (ECG) changes by the present study revealed that the boat drivers had comparatively lower incidences of sinus rhythm with normal ECG features but raised abnormal features. The speed boat drivers manifested sinus arrhythmia, septal infarct, sinus bradycardia, and many cases of sinus rhythm with abnormal findings.

Report has it that if sinus arrhythmia occurs with sinus bradycardia or tachycardia, the individual might experience some complications from the combination. For slow heartbeats, the subject may experience dizziness, shortness of breath, and fainting (Fu *et al.*, 2015). These are all indications of dysfunctional cardiovascular system.

It is noted that left ventricular hypertrophy (LVH) is a condition where the heart's left ventricle thickens and enlarges; this can happen when the left ventricle has to work too hard, such as when there's high blood pressure or a heart problem (Nwabuo & Vasan, 2020). The ECG changes recorded for the boat drivers corroborates with the earlier finding on cardiovascular indices by the present study on same subjects. More so, the incidence of septal infarct is a possible indication of localized heart tissue damage within the septum of the heart, the heart's dividing muscular wall; it is also said to be due to reduced blood flow following a heart attack (Jones, B. M., Kapadia, S. R., Smedira, N. G., Robich, M., Tuzcu, E. M., Menon, V., & Krishnaswamy, A. (2014). Ventricular septal rupture complicating acute myocardial infarction: a contemporary review. *European heart journal*, 35(31), 2060-2068 *et al.*, 2014). It is therefore, it is suggestive to state that, without necessary checkups and treatments of such deranged ECG features in the boat drivers, they may stand the risk of sudden cardiac complications or even deaths.

## CONCLUSION

The study revealed that, the boat drivers were within their productive age (44.60 years) with healthy mean BMI ( $26.00 \pm 9.28 \text{ Kg.m}^2$ ). The finding of the present study on changes in cardiovascular indices indicated significantly raised systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure levels in the speed boat drivers with higher risks of hypertension. Meanwhile, the outcome on electrocardiographic (ECG) changes in the speedboat drivers showed a comparatively lower incidences of

sinus rhythm with normal ECG features but raised abnormal ECG features. The speed boat drivers also manifested sinus arrhythmia, septal infarct, sinus bradycardia, and many cases of sinus rhythm with abnormal findings. It is thus suggested that, the subjects should be educated or motivated to have good health-seeking attitude in order to avert possible risks of cardiovascular accidents.

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