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Effects of Age, Gender, School Class on Cardiopulmonary Resuscitation Skills of Nigerian Secondary School Students

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ABSTRACT
Background: The need for training of schoolchildren on cardiopulmonary resuscitation (CPR) as potential bystander CPR providers is growing globally but Nigeria is still behind and lacks basic necessary data. **Purpose:** The purpose of this study was to investigate the effects of age, gender and school class on CPR skills of Nigerian secondary school students.**Methods:** Using a pretest-posttest quasi experimental study design, 322 senior secondary school students recruited from four schools in Obio/Akpor Local Government Area of Rivers State, South- South, Nigeria. The cohort was assessed on CPR skills before CPR training, immediately after the training and six weeks later for CPR skills retention. Descriptive, parametric and non-parametric statistics were used to analyze the data with statistical significance set at $P < .05$.**Results:** The three null hypotheses were all accepted as both age, gender and school class were found not to statistically have any influence on the CPR skills of the participants ($P > .05$).**Conclusion/Recommendation:** If our current findings are confirmed after further research work, CPR training in our schools should be encouraged for incorporation into our schools' curricula focusing on the senior secondary school students.
Keywords: Age, Gender, School Class, CPR Skills, Nigerian Schools

INTRODUCTION

The importance of training schoolchildren for possible bystander cardiopulmonary resuscitation (CPR) services in the events of out-of-hospital cardiac arrests (OHCA) cannot be overemphasized. However, according to Sopka et al (2013), well performed external chest compressions (ECC) are of utmost importance for cardiopulmonary resuscitation (CPR) attempts and patient outcome.

Achievement of the recommended chest compression depth was not possible in all the age groups in a study by Jones at al (2007). They then concluded that the children's ability to achieve an adequate depth of chest compression depended on their age and weight (Jones et al.,2007). On gender, Sopka et al (2013) grouped their participants into three (female participants only, male participants only and the standard group having both male and female participants together).They reported that after one week, group with female participants only performed significantly better with respect to the achievement of the correct mean compression depth while the female group and the standard group showed improved performance on the mean compression rate compared to the male group (Sopka et al., 2013).

In the same study by Jones et al (2007) which looked at three school year groups (year 5 of ages 9-10 year-olds; year 7 having ages 11-12-year-olds; and 9 of 13-14 years) reported that no association was found between pupils' age, sex, weight, or height and the average rate of chest compressions over the three minute period of chest compression assessment.

There is a growing world-wide compliance with the need for training of schoolchildren in CPR (Miro et al., 2008; Lafferty et al., 2003; Uray et al., 2003; Naqvi et al., 2011; Connolly et al., 2007; Plant & Taylor, 2013; Bollig et al., 2011; Hoyme & Atkins, 2015; Lotfi et al., 2007; Isbye et al., 2007; Cave et al., 2011; Lorem & Palm, 2008; AHA, 2015). Meanwhile, there are relatively few published works on CPR in Nigerian schools (Onyeaso, 2014; Onyeaso & Achalu, 2014; Onyeaso & Imogie, 2014). Therefore, this study aimed at finding out the possible effect of age, gender and school class on the CPR skills of a selected group of Nigerian secondary school students as a way of providing part of the necessary baseline data on this subject matter in Nigeria, the most populous black nation in the world, with the increasing westernization of the lifestyle of its citizens.

It was hypothesized that: (1) there would be no statistically significant differences in the CPR skills of the participants with respect to age before CPR training, immediately after the training and six months later; (2) there would be no statistically significant differences in the CPR skills of the participants with respect to gender before CPR training, immediately after the training and six weeks later; and (3) there would be no statistically significant differences in the CPR skills of the participants with respect to school class before CPR training, immediately after the training and six weeks later.

MATERIALS AND METHODS

Using a quasi-experimental design, four purposively selected senior secondary schools in Obio/Akpor Local

Government Area of Rivers State, South-South of Nigeria were involved. The data was collected in stages: pre-training, post training (immediately after training) and six weeks later (retention stage).

Sample and Sampling Techniques

The final sample size comprised 322 SS1 and SS2 students of the total SS1 and SS2 students from the public and private schools in Obio/Akpor Local Government Area of Rivers State. Two public and two private schools were purposively selected and one hundred students selected in each school to get the study cohort (fifty from SS1 and fifty from SS2). Due to some copies of the questionnaires that were discarded as a result of mistakes made by some of the students and some incomplete data, the final study sample dropped to the three hundred and twenty two (322) participants.

Data Collection

Stage 1 (Pre-training): The level of pre-training CPR skills of 400 selected senior secondary school students was assessed by asking them to carry out CPR on the manikins provided, if they knew what to do. The CPR skills evaluation guide was used to assess them. The participants were asked to fill in a questionnaire. on CPR knowledge.

Stage 2 (Training and Immediate Post-Training): Teaching was carried out for 135 minutes using power points, modified AHA "Be The Beat" Video clips, and Rap Songs on CPR. . Immediately after training in each school, the participants were put in groups of tens for hands-on sessions while one of the authors (AOO) scored them using the AHA criteria for chest compression depth, compression rate and placement of the hands on the chest. Also, copies of the same questionnaire were administered again to the students and retrieved after they had responded to the questions on their own.

Stage 3 (Six weeks after the Training): At the different schools, the same group of students (participants) were invited and asked to carry out the same CPR skills they performed six weeks earlier. The same assessor scored their performances of the same skills all over again. They were also served the same questionnaire which they filled in again. Using the serial numbers they were given at the onset of the student, it was possible to match their previous scores with their scores six weeks after. The total number of participants that had complete data on both pre-training; immediate post-training and six weeks later were 322, having eliminated the wrongly filled ones and those who were at the post-training but not six weeks after the training. However, this report concentrates only on the CPR skills aspect of the major study.

Therefore, the final sample size was 322 research participants (students). The data generated were coded, tallied, scored and put into frequency distribution table. Descriptive statistics of mean and standard deviation, ANOVA and t-test were used to test the hypotheses at .05 significant levels.

In addition to dichotomizing the participants into male and female, they were grouped into two (12-15-year-olds and 16-19-year-olds) and the senior secondary school 1 (SS1) students and the senior secondary school 2 (SS2) students.

Permission for this study was obtained from the Rivers State Ministry of Education, Port Harcourt. In addition, the authorities of the secondary schools selected for this study were approached and they gave their consents for the study. In addition, each participant was given a consent form to fill and for the parents. Only the students who consented to the study, as well as their parents' were allowed to participate in the study.

RESULTS

The CPR skills mean scores of both SS1 and SS2 was 5.33 and 5.25, respectively. This implies that both classes still retained adequate CPR skills acquired earlier. However, the SS1 mean scores were higher than the SS2 by 0.08 (Table 1).

Table 1: Age, Gender, School Class and the Mean CPR Skills of the Participants

Variables	Groups	N	Mean CPR Skills X	SD	X difference
Age	Group 1	735	5.28	3.26	0.03
	Group 2	231	5.31	3.27	
Gender	Male	465	5.25	3.28	0.07
	Female	501	5.32	3.25	
School Class	SS1	459	5.33	3.30	0.08
	SS2	507	5.25	3.23	

Table 2 shows the ANOVA test Analysis of the CPR skills with respect to age among the selected secondary school students before training, immediately after the training and six weeks after. From the table, the calculated F-value on skills is 2.09 which is less than F-critical of 2.61 at 0.05 significant level. This means that age has no statistically significant influence on CPR skills among the selected secondary school students before, immediately after training and six weeks after. The null hypothesis here is, therefore, accepted.

Table 2: Influence of Age on CPR Skills of the Participants (Pre, Post and Retention)

Items	N	Sources of Variation	Sum of Square	Mean Square	DF	F-Cal	F-crit	P-value	Decision
Skills	966	Between Group	29.445	9.815	3				
		Within Group	10287.697	10.694	962	2.09	2.61	.148	Accepted
		Group Total	10317.143		965				

Significant at $p < 0.05$

Table 3 shows the ANOVA analysis of the CPR skills with respect to gender among the selected secondary school students before training, immediately after the training and six weeks later. From the table, the calculated F-value is 0.288. This is less than the F-critical of 3.85 at 0.05 significant level, which means that gender has no statistically significant influence on CPR skills among the selected secondary school students before, immediately after training and six weeks later. The null hypothesis here is, therefore, accepted.

Table 3: ANOVA Analysis of Influence of Gender on CPR Skills (Pre, Post and Retention)

Items	N	Sources of Variation	Sum of Square	Mean Square	DF	F-Cal	F-crit	p-value	Remark
Skills	966	Between Group	2.360	2.360	1				
		Within Group	10314.783	10.700	964	.288	3.85	.192	Accepted
		Group Total	10317.143		965				

Significant at $p < 0.05$

Table 4 shows the ANOVA test Analysis of the CPR skills with respect to class among the selected secondary school students before training, immediately after the training and six weeks after. From the table, the calculated F-value is 0.294 and 2.69. This is less than the F-critical of 6.67 at 0.05 significant level, which means that class level has no statistically significant influence on CPR skills among the selected secondary school students before, immediately after training and six weeks later. Again, the null hypothesis here is accepted.

Table 4: Influence of School Class on CPR Skills of the Participants (Pre, Post and Retention)

Items	N	Sources of Variation	Sum of Square	Mean Square	DF	F-Cal	F-crit	P-value	Remark
Skills		Between Group	3.952	3.952	1				
	966	Within Group	10313.190	10.698	964	.29	6.67	.188	Accepted
		Group Total	10317.143		965				

Significant at $p < 0.05$

DISCUSSION

Cardiopulmonary resuscitation (CPR) guidelines recommend target values for compressions, ventilations, and CPR-free intervals allowed for rhythm analysis and defibrillation (Wik et al., 2005).

This study has shown that the participants were able to exhibit satisfactory CPR skills which were neither significantly influenced by age, gender, nor by school class. This is comparable to the findings of Jones et al (2007) where no association was found between pupils' age, sex, weight, or height and the average rate of chest compressions over the three minute period. Also, they reported no relation between year group and ability to place the hand in the correct position. Interestingly, the Jones et al (2007) found only the 13-14 year olds performed chest compression as well as adults in terms of depth. The age groups of the present Nigerian study were 12-15 and 16-19 year olds. These two studies seem to agree in their findings.

Kramer et al (2015) noted that male rescuers in a simulated patient needing CPR were more significantly more resistant to remove the clothing in a female patient and as such could not give adequate CPR. Meanwhile, our present Nigerian study did not assess this aspect. Sopka et al (2013) reported that resuscitation training in gender-segregated groups has an effect on individual performance with superior external chest compression (ECC) skills in the female-only learning groups. Furthermore, they reported that male in the standard group (male and female) were less distracted by their peers than the male-only group. The present Nigerian study used the standard grouping with the boys and girls mixed up in the various groups. This could have contributed to the present result of gender not having any significant effect on the CPR skills of the participants.

CPR skills show declining retention after 6-12 months, unless there is refresher training. For best skill retention, there should be refresher training every 6-12 months (ACFASP, 2015; Mahoney et al., 2008). This Nigerian study involved CPR kills retention for ix (6) weeks only. Therefore, it is important to be conscious of this relatively short period of time while interpreting this study. However, this Nigerian study is comparable to that of Handley and Handley (1998) which had acceptable retention after 6 weeks of 4-step CPR training programme compared to a more traditional 8-step approach, although the present Nigerian study used a more modern training approach.

Conclusion

Neither age, gender nor school class had any significant effect on the CPR skills of the Nigerian secondary school students throughout the three stages of the quasi experimental study

Recommendation

It will be helpful to repeat the study in other parts of the country and more importantly include a real female simulator so as to assess the response of the participants to such a scenario instead of only male simulators.

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