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Research Article

# Effects of Gender and Music Genre on Hand-Eye Coordination Task among a Private University Students in Nigeria

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## Abstract

Music has been described as an enhancer of task performance and this varies according to the genre of the music, however, influence of music type on performance, especially in native language has been equivocal. The present study investigated the influence of music genre and gender on eye-hand coordination task performance among private university. Using 144 randomly selected fresh undergraduates who were assigned to a 2x3 design groups, working on O'Connor finger dexterity test, it was observed that performance was generally low. There was marginal better performance of females than males especially while listening to Gospel music, while males did better while listening to local Fuji music. There was no significant main effect of genre and gender on the task performance. It was concluded that performance of females while listening to gospel music may be characteristic of their nature especially when they performance house chores in Nigeria.

## Introduction

A trending fad among the adolescents and youth these days, especially with advancement in ICT and telephony, is going about with phones and i-pad attached with ear piece, either directly or through bluetooth means. According to Balogun, et al. [1], the students, youths and adolescents do these because they believe that listening to music facilitates their ability to concentrate and focus on any given task. The above observation is not limited to students and adolescents alone, but also to some people engaged in some activities. A personal experience with one of the present authors was that while she was in the delivery room and waiting for a surgery, the doctors in charge and the nurses were all listening to music in order to concentrate and relax tension both on them and herself music is integral part of our lives, whether as an integral part of our recreational and entertainment activities, as a component of our religious and spiritual lives, or as a tool to help us relax and remain calm during stressful situations, such as when we are studying for exams or stuck in traffic [2]. In other words, the music was therapeutic for all the stakeholders present during the delivery, and perhaps also as a facilitator, as observed by Balogun et al. [1].

## Music itself

Numerous studies have been conducted to determine if music has a good or detrimental effect on task performance. Despite the lack of clear evidence, the public accepts the notion that music may help individuals perform better at work [3]. While music may be good in itself in the saying that if music be food of love... and music is a universal language, there is equivocality on the relationship between music and task performance. In some instances, music is a facilitator, and in some other instances, it may be inhibitor. This is well documented in the literature. Despite the lack of clear evidence, popular acceptance of assertions supporting music's facilitative role in task performance is widespread [4]. For example, the well-known 1994 research by Rauscher, et al. [5] discovered substantial data "showing" that Mozart music improved spatial reasoning abilities in college students. Music engagement may have a beneficial and long-lasting influence on brain function. Whereas, Odeh (2018) reported that listening to Mozart music did not significantly increase task performance in replication testing. There are theories to explain these observations in music and performance. For example, Filter theories explain that during information processing, certain non-relevant stimuli are not attended to, thereby allowing processing of only relevant ones [6,7]. Other theory, Capacity theory explained the possibility of attending to all incoming information processing without bone disturbing the other [8,9]. Music promotes cognition, enhances memory, increases attention, inspires and motivates, and supports a multisensory learning experience [10]. Music does the following as well in the reported studies below:

**An emotional outlet:** Music has a significant role to play in our lives since it provides an outlet for our emotions. A lengthy trip may be made more bearable with the help of music. The speed of time may be slowed down by listening to music. Music has the power to evoke a sense of movement in the listener [3]. There is a connection between each of these objects and the human senses. Even though no one understands why or how it works, multiple studies have shown that various emotions are linked to certain scales, chords, and harmony. For this reason, we can't imagine our lives without music!

**Improves student self-esteem:** While working together, children like the fact that their "voice" and interests are recognized and understood by others. With the help of their peers, pupils enjoy the fact that their 'voices' are being taken into consideration. Their self-esteem is greatly enhanced by this joint effort since it fosters a feeling of secure acceptance.

**Music helps in relieving stress:** It's a great way for youngsters to unwind, allowing them to immerse themselves in something both rewarding and pleasant. Regardless of how worried I was at school, children would always be happy and comfortable after choir practice [11].

**Music improves language skills:** The ability to learn languages via music is one of the many reasons why music is so vital in our lives. According to recent research, musical training may connect the brain's circuits in ways that enhance the left side of the brain's known to be connected in language processing. By changing the way the brain processes human language, learning a musical instrument may also help pupils learn a second language [2].



**Music helps in developing social skills:** The social skills that may be learned via music are invaluable. Is at the bottom of our list of reasons why music is important in our lives. If you want your kid to meet new people and develop lifetime friendships, music is a great way. People may be brought together by music in tremendous ways. As a result of participating in a musical extracurricular activity, children will have the opportunity to meet other students who share their interests.

**Positive mindset:** Music has the power to alter our moods. It has the potential to have an impact on one's mood and energy levels. In Chris Brewer's book, "Music and Listening," he claims that the music we listen to changes our mood and memory. Music is used in a variety of settings to help individuals relax or get in the right frame of mind. Becoming things done at work, for example, without making any mistakes or getting distracted [4]. School pupils want to retain material so that when they are completing their homework or taking a test, they have a better memory of what they have learned. To develop themselves or their teams, athletes listen to music to get into a competitive mentality and maintain a good attitude. When considering this, instructors might consider playing music in the background during lectures or other class activities. It may aid in the retention of crucial knowledge by kids. In 2011, college students were required to maintain a music journal to see how it impacted their everyday lives. Music and non-musical majors were both included in the research [12]. Students sifted through course material, drove about campus, picked for outfits, and mingled with other students. Those who listened to music in the background reported feeling better.

**Improved memory:** The night before a test, students who are studying run the danger of "cramming" in the material. During the test the next day, they are unable to recall anything. For short-term memory, the "Mozart effect" is beneficial [13]. Studying while listening to classical music improves memory and comprehension. As a result, the brain is activating at a high rate at the same moment. Some parts of the brain are activated when we hear notes, but we don't hear words. In addition, other parts of the brain are actively involved in the process of comprehending new information. As a consequence, a person's brain is working harder and harder at the same time. As a result, the sum of the parts is more than the sum of the parts. The Mozart effect is a term for this phenomenon.

### Type of music (genre as a moderator)

There is a strong association between the style of study and type of music students listen to when studying and their educational level, according to Kang E [14]. Music style (Genre) was the focus of Isabelle P [15], a study that sought to understand how music influences memory. Participants were randomly allocated to four distinct music (Treatment) conditions, namely: Classical music genre, Country and Rhythm, and Blues music genres as well as Reggae music. They were divided into groups of four and then tested on their recall of what they learned by filling out a questionnaire that was derived from the section they had studied. The research was based on three hypotheses. Classical music had a positive impact on memory in an ANOVA test, with  $F(3,60)=7.07$ ,  $P 0.05$  indicating a substantial effect on recall for those randomly allocated to it.  $F(3,57)=0.51$  and  $F(2,61)=1.68$ , respectively, did not show that gender or age were significant determinants in the study. According to the findings, retrieval (recall) may be done the next day and a wider variety of musical styles should be used. Studying the impact of background music on college students' reading comprehension was the focus of Gillis [4]. Seventy-one people were randomly assigned to listen to music with or without lyrics while reading a health-related topic. Participants were asked to fill out a demographic survey after reading the article. There was an extra music questionnaire given to those who were randomized into either of the two groups. Reading comprehension was assessed by having participants respond to five multiple-choice questions and five true/false questions based on the text. Participants in the quiet condition were expected to outperform those in the music condition, it was predicted. There were no statistically significant differences between the groups, according to the findings.

### Type of task involved

There is also a rich body of literature on how music affects individual responses and performance. Konec'ni [16] claimed that listening to music taps cognitive resources and may impair cognitive task performance. However, Cassidy & McDonald [17] argued, based on research in which music was played prior to performing a cognitive

task, that music may actually create a cognitive priming effect. Schellenberg [18], on the other hand, suggested that there must be an obvious link between stimuli in order for priming to occur; so music may not provide a priming effect for all cognitive task performance. Music characteristics, such as genre, familiarity and tempo have been investigated. For example, it has been suggested that low-information music produces optimal arousal for task performance [19]. Other research (e.g. Wolf & Weiner) [20] has found that unfamiliar sounds distract more than familiar sounds and, therefore, hypothesized that the more individuals engage in studying while listening to music, the less likely their performance would be impaired by music [21]. Anderson, et al. [22] also found that background music improved learning conditions. A group of elementary school students exposed to background music in the classroom experienced increased focus and spelling retention, as well as decreased stress levels. The improvements extended beyond the immediate study, as researchers reported the students had higher spelling scores and report card grades post-intervention. Based on the non-linear link between arousal and performance, Linnell [3] evaluated how background music affected the predominance of various attentional states during a performance on a sustained attention test. The psychomotor vigilance task, a time-honored method of assessing sustained attention, was administered to forty students who worked in silence while listening to the music of their choosing. Reaction Time Measurements (RT) and subjective ratings of attentional state (e.g. mind-wandering, task concentration, external distraction) were gathered. A decrease in mind-wandering states was associated with an increase in task attention, however, this effect was not seen when music was played in the background. However, background music did not significantly lower the RT or the variability of RT when compared to silence, even though task-focused states were associated with quicker response times. It is the first time that preferred background music may boost task-focused attentional states on a low-demanding sustained attention test and is congruent with arousal mediating this link between background music and task performance.

Lo-Fi music has been shown to affect cognitive function, according to Daphnie (2021). Research participants were randomly assigned to one of three conditions: classical music ( $n=22$ ), lo-fi music ( $n=32$ ), or no music at all ( $n=32$ ). The study used an experimental design and included 86 people. Participants in the Classical and Lo-Fi music conditions were expected to do better on spatial ability and reading comprehension tasks than those in the no-music condition, because of this, the researchers reasoned. Between the two test types, there were no significant variations in the students' scores on either exam type. Lutz, et al. [2] wanted to find out whether listening to music while studying or engaging in other academic activities may impact the academic performance of undergraduate students. A survey was sent out to students at a South African institution to get a sense of their current music consumption habits, and 197 of those replies were included in the research. This group of students was then asked to engage in a test of working memory span performance under varied auditory settings, after the completion of the survey. It was shown that, even though working memory performance did not change substantially between White Noise and Beethoven sound conditions in a one-way repeated measures ANOVA, student performance dropped considerably when they listened to their playlists of songs they liked. When it came to the equivalent working memory test, it didn't matter whether or not students had studied with music for many years. These results suggest that listening to one's music may overwhelm working memory capacity, affecting the way information is encoded while studying and doing other academic tasks. This might be a problem for students. Two groups of Iranian students at an English language institution in Iran were studied to see whether classical music (Mozart Sonata) influenced their reading comprehension. As a result, over three months, researchers compared two groups of 60 Iranian English language learners: one group received reading comprehension instruction that included music, while the other received no music instruction at all. The study's findings revealed a substantial difference in performance between the music-exposed group and the control group.

### Characteristics of people who listen to music (nature of University)

In a General experimental seminar class where the work of Balogun et al. [1] was being reviewed, two issues came up. One, the question was asked that the Botswana University where the study was carried out, was a public university. Being a public university, it was believed that the rules are more relaxed, and that not every person would be able to afford a phone or any other gadget for that matter. This could be true to an extent especially about relaxation of some rules in a private university. It was argued that because of the semi or whole religious nature of the private universities, especially in Nigeria, the use of mobile phones may be a little bit restricted. Second it



was argued that since type of task could likely affect performance, it is possible that the cognitive task may be an influential determinant of outcome while listening to music. The question was could the outcome of performance be related to the task being performed? Therefore, in the present study the task was replaced with motor task instead of cognitive task with the expectation that previous result would be confirmed even with other task under consideration. Third it was raised that familiarity with music genre could also influence performance especially if it is rendered in mother tongue language as against "foreign language". Though this was manipulated in Balogun et al. [1] study by comparing performance in English, French and Sastwana (native language) languages, it still called for concern were it to be that all the three groups were exposed to native languages. Lastly it was asked why gender was not accounted for as it was assumed that females could be more at home with music than females as a form of therapeutic moderator in a given task more than male. The present study was in response to all the three questions/concern raised at the seminar. The questions being asked in the present study are:

- i. Is Balogun et al. [1] study generalisable across university type?
- ii. Is the work generalisable across genre of music?
- iii. Is the work generalisable across task?

### Methodology

#### Design

Experimental design was adopted in the study. There were two levels of gender (Male and Female), three levels of Music type (Afro, Juju, Gospel). The Dependent variable was performance on an eye-hand coordination task, using O'Connor tweezer Dexterity test. This yielded a 2 x 3 factorial design.

#### Setting

Since the concern in the present study was on a private University for the reasons given earlier, Chrisland University Ajebo Road Abeokuta, Nigeria was purposively chosen, including logistics reason. Chrisland University is a semi-Christian oriented school. It is a private-owned/run university. It is coeducational and currently has students' capacity of about 800. There are 4 existing colleges names CAMASS, CONAS, BMS and COLAW.

#### Materials

The present study adopted a motor skill instrument as the task to perform in the experiment. The O'Connor Tweezer dexterity test was adopted. The instrument is a 4x6 grooved pegboard. It consists of 100 holes in a 10 by 10 arrangement. The holes are to be filled in any order with the provided pins using a tweezer to pick the pin, then insert into the holes. The test was actually designed to measure eye-hand coordination of participants. Good performance is simply assumed to be the number of pins inserted correctly within a given time limit, usually 60 to 90 seconds. In the present study, 90 seconds was adopted as the time limit.

#### Participants and sampling method

There were one hundred and forty-four (144) participants consisting of 78 females and 66 males. They were divided into 6 (six) groups) according to the design of the experiment as follows Male -juju music; male Afro music; male=gospel music; Female-juju music; female-Afro music and female-gospel-music groups. The participants were randomly selected from a pool of 200 level students who are taking a general course that was compulsory for all of them.

#### Procedure

Given the nature and characteristics of the university as a private university, attracting large number of students through advertisement was considered not feasible as many students may not even respond to such an advertisement. We now thought of a large enough class where every student at a particular level of student would be present. It was a glass of GST (General study course, a compulsory course). We approached the

lecturer to spare us the teaching period of two hours on a particular date, to which he agreed. We equally appealed for a 5 points mark to be added to the score of the participants (without their knowledge) in their continuous assessment score. He equally agreed to this request. Next, we went to the ICT centre to get a list of registered students for the course. The list showed their gender in addition to other personal information, such as courses being pursued in the university, matriculation number and so on. We now separated the students into male and female groups, after which we now proceeded to number them, that is, male and female groups separately. Thereafter, we now randomly picked 66 males and 78 females (Please note that in the entire school students' population, there are more females than males, it is therefore sensible to reflect this in our selection for representativeness validity). The sampling method adopted was such that every other number is picked from the lists of participants, e.g 1,3,5,7,9 and so on. When a list of sample was finally drawn, we now decided to randomly assign them to the eight groups such that we have the following: Male-fuji group; Male-afro group; male-gospel group; Female-fuji group; Female-afro group and Female-Gospel group.

Table 1: Distribution of participants to experimental groups.

Genre of Music	Gender	
	Male	Female
Fuji	1	4
Afro	2	5
Gospel	3	6

Thereafter, at the appointed date/day, the participants were gathered together in the general room of the laboratory, from where they are called in one after the other into the experimental room according to the group they belonged to. For easy management of the procedure, the participants were called in one group after the other. Each according to his or her group was called into the laboratory to sit comfortably on a chair and table so provided. They were instructed on what they were expected to do and asked if they were clear. After responding yes, the music was then started and were asked to start the task. They were all given 90 seconds to complete the task. At the end of the 90 seconds allocated, they were asked to stop and both the experimenter and the participants counted how many holes were successfully filled with the pins, and this was recorded against their names. At the end of the experiment, the participants were debriefed where many of them expressed their joy for being considered to participate in the experiment.

### Results

Table 2: Descriptive showing the mean task performance based on levels of music genre and gender.

Dependent Variable: Performance				
Genre of Music	Gender	Mean	SD	N
Afro	Female	5.92	2.45	26
	Male	5.36	2.08	22
	Total	5.67	2.28	48
Fuji	Female	6.54	2.39	26
	Male	5.91	2.72	22
	Total	6.25	2.54	48
Gospel	Female	6.85	2.56	26
	Male	5.59	2.4	22
	Total	6.27	2.54	48
Total	Female	6.44	2.46	78
	Male	5.62	2.39	66
	Total	6.06	2.46	144

**Table 3:** Summary of 3x2 Analysis of variance (ANOVA) showing the effect of music genre and gender on task performance of participants.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	$\eta^2$ Partial
Genre	10.61	2	5.305	0.889	0.414	0.013
Gender	23.728	1	23.728	3.974	0.048	0.028
Genre * Gender	3.499	2	1.749	0.293	0.746	0.004
Error	823.92	138	5.97			
Corrected Total	862.438	143				

Source: R Squared=.045 (Adjusted R Squared=.010).

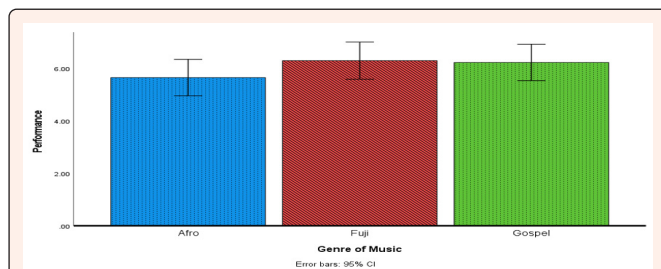
There is no significant main effect of music genre (detect practice repair and Afro music) on the task performance. On the main effect of genre, it is evident as shown in (Tables 1&2) above that the effect of music genre as indicated on the post-test scores of participants was not significant ( $F_{(2,138)}=.889, p>0.05$ , partial  $\eta^2=.013$ ). This shows that there is no significant main effect of music genre on the task performance of participants. In order to determine the magnitude of the mean task performance scores of participants in each of the groups (three music genre), the estimated marginal means is calculated and the result is shown in (Table 3).

**Table 4:** Marginal means of post-test scores by music genre.

Bonferroni Post Hoc Test					
Genre of Music	Marginal M	SEM	1	2	3
Afro	5.643	0.354	-	-0.645	-0.575
Fuji	6.288	0.36		-	0.069
Gospel	6.219	0.354			-
Grand Mean	6.05	0.204			

Source: Based on estimated marginal means adjustment for multiple comparisons: Bonferroni.

The marginal means reveals that the participants in the fuji music genre group recorded the highest marginal means scores ( $M=6.29$ ), followed by those who listened to gospel music genre ( $M=6.23$ ) and those compared to those who listened to Afro music ( $M=5.64$ ). In order to determine if significant difference was recorded in the comparison of the means scores across groups, the Bonferroni post-hoc analysis was done and the result is presented in (Table 4) was not significant. The result is further displayed in the (Figure 1) below.



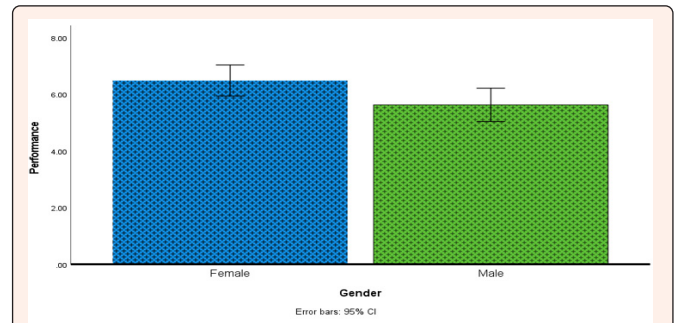
**Figure 1:** Bar chart showing the differences in task performance of participants based on music genre.

There is significant main effect of gender on task performance of participants. The test on the main effect of gender on the task performance of participants ( $F(1,136)=4.35$ ,  $\eta^2$ Partial=.031,  $p<0.05$ ) was not significant as revealed in (Table 3). Further analysis on the mean differences across groups using estimated marginal means and the result is presented in (Table 5).

**Table 5:** Marginal means of gender of the task performance.

Gender	Mean	SE	Mean Difference	S.E	Sig.
Female	6.479	0.278	0.857	0.407	0.04
Male	5.621	0.298			

Source: \*: The mean difference is significant at the .05 level.



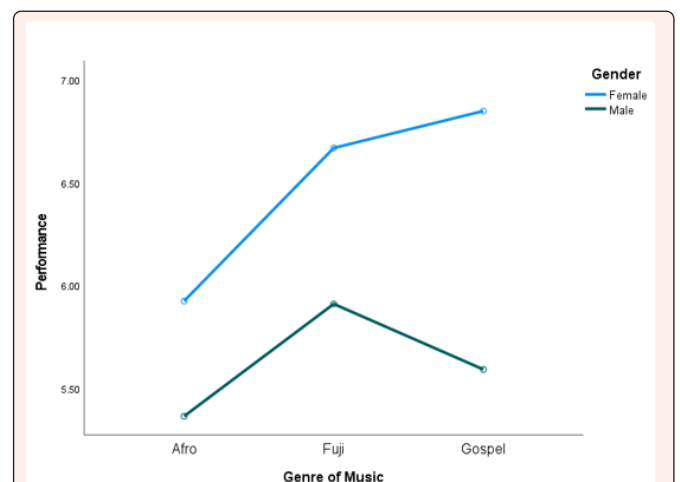
**Figure 2:** Bar chart showing the differences between male and female participants in task performance.

There is significant interaction effect of music genre and gender on task performance of the participants. The result in Table 3 shows that there is significant interaction effect of music genre and gender on the task performance of participants ( $F(2,132).77, p<0.05$ , partial  $\eta^2=.004$ ).

**Table 6:** Marginal Means of task performance based on gender and type of music genre.

Genre of Music	Gender	Mean	SEM	95% Confidence Interval			
				Lower Bound	Upper Bound		
Afro	Female	5.923	0.479	4.976	6.871	0.559	0.708
	Male	5.364	0.521	4.334	6.394		
Fuji	Female	6.538	0.479	5.591	7.486	0.629	0.708
	Male	5.909	0.521	4.879	6.939		
Gospel	Female	6.846	0.479	5.899	7.794	1.255	0.708
	Male	5.591	0.521	4.561	6.621		

Female participants exposed to Afro music (Marginal  $M=5.92$ ), fuji music (Marginal  $M=6.54$ ) and gospel music (Marginal  $M=6.85$ ) significantly recorded higher task performance than male participants exposed to Afro (Marginal  $M=5.36$ ), fuji music (Marginal  $M=5.91$ ) and gospel music (Marginal  $M=5.59$ ). This result however suggests that gender did not moderate the effect of high-volume of music on task performance (Table 6, Figures 2&3).



**Figure 3:** Line graph showing scores on task performance of participants based on the interaction of music genre and gender.

**Discussion**

There was no observed effect of music generally on task performance in the



present study. This is contrary to reported studies in the literature (e.g. Balogun, et al. [1]) where music was documented to facilitate better task performance. The negative result in this study may be due to the type of task performance that was used in the study. While Balogun et al. [1] used cognitive task, the present study used eye-hand dexterity (motor) test. Many studies (e.g Linnell [3]) have reported that type of task at hand may contribute to the success of that task while listening to music, hence the suggested reason as to why the present study differs in the general belief that music most often enhances task performance. Though there was no main effect of music on task performance generally but when the mean task performance score was considered, it was observed that Fuji music minimally positively influenced performance. Fuji music is peculiar to the Nigerian culture (especially among the South West people, where this setting of this study was carried out) cutting across social class and age, but more with the youth at heart, this could account for its slight influence on performance in the task given.

It was expected, given the age brackets of the participants and being university students, that Afro genre of music would enhance their performance in the given task ([1,18,23], since that was believed to be their "turf". Contrary to this, Fuji type of music participants did better than all followed by Gospel while Afro group participants was a far distance to them all Fuji music is indigenous to Nigeria, especially among the Yoruba speaking people of South west Nigeria. It a fusion of many genre of music from "Afro/pop", "apala", "sakara" to "awurebe". More or less a combination of almost all genre of music, and this flows well with indigenous Yoruba people and those from other tribes that have lived long among the Yorubas. This may account for the correlation between that genre of music (fuji), which is often render in native Yoruba language, and the task performance. This observation was equally rendered by Balogun et al. [1] when they manipulated music language and genre in their study. They used English, French and Setswana (Native Botswana language) against Music genre, and found main effect of music language positively correlating with task performance. In the referenced study, Performance was high in English language with Afro/pop than native language of Setswana be it in Afro/pop, or Gospel. Another possibility of Fuji music influence on performance could be familiarity with the music (This was not manipulated in the present study however) which may account for heightened performance under this group [21]. The fuji music may not be perceived as "noise" or interference while performing the task. This just go a long way to confirm the influence of music on task performance rather than being a source of distraction.

Interactive effect of both gender and genre of music influence performance in the task given. Females performed better than males across music genre where they did best when listening to gospel music. One thing common to African women is that they sing while performing chores or a given task, and most times, they sing gospel oriented music along with the performance of the task at hand. What this study did not explore is whether music, especially gospel music is a motivator and an enhancer of task performance, what we did was to establish a correlation between gospel music and better task performance. This may be the implication of the religious disposition of many Nigerians now where everybody claims to be a "born again" Christian and the women folk lead in this direction. This supposition may have gained ground in the fact that Chrisland University is Christian oriented university, attendance at chapel is dominated by more females than males. The Gospel music may be serving as an emotional outlet [3]. Music has a significant role to play in our lives since it provides an outlet for our emotions. For example Stacey AA & Gerald BF [24] confirmed the emotionality influence of music in task performance. Stacey AA & Gerald BF [24] explored the role of music listening and affect in an emotionally-charged online college education environment. Repeated measurements are used in the analysis of data. Daily music listening had a substantial impact on the research participants' happy and negative affect, mental effort, and task performance, but not on their sense of self-efficacy. A lengthy trip may be made more bearable with the help of music. The speed of time may be slowed down by listening to music. Music has the power to evoke a sense of movement in the listener [3]. There is a connection between each of these objects and the human senses. Even though no one understands why or how it works, multiple studies have shown that various emotions are linked to certain scales, chords, and harmony. For this reason, we can't imagine our lives without music!

What this study failed to do was to test for the type of effects genre of music has on the human beings especially when confronted with any type of task. Is the music aggressive, calming and soothing, emotionally captivating or damningly provocative [25]. For example Opera music may be soothing and calming to some people while others see the shrieking part as nauseating or the genre entirely boring to the extent that some would sleep off during performance. According to Sabine JS & Jürgen H [26], she examined the effect of aggressive and soothing music on children's arithmetic and memory test performance. Not only did violent music affect children's memory,

but it also had an influence on their behavior (they exhibited lower levels of pro-social behavior). This observation may need to be further investigated in future study knowing that opera genre of music is "alien" to African culture.

## Conclusion

Did the present study achieved its set goals of whether generalisability of Balogun et al. [1] could be achieved? Yes, it did. The referenced study was replicated and just as performance was generally low, it was also generally low in the present study, even when the task was changed from cognitive task to motor task. A better performance was observed in the present study because all the music was done in native language, whereas, in Balogun et. al. [1] study, performance was low when participants listened to their native language.

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