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Nigerian Genres of Music could be a Therapeutic Stratagem against Alcohol-induced Hippocampal Damage in Experimental Models: Evidences from Neurobehavioural, Oxidative Markers, Histochemical and Pyramidal Cell Evaluations

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Authors' contributions

This work was carried out in collaboration among all authors. Authors GGA and AOA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors OHA and OO managed the analyses of the study. Authors OB and VOA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Memory is a cognitive function essential to everyday life. Alcohol causes damage to the hippocampus. Music (especially Mozart music) has been reported to enhance memory function.
Aim: This study investigated the possible role of different genres of Nigerian music (Afro-Hiphop and Fuji) on alcohol-induced hippocampal toxicity.
Methodology: Thirty-six (36) Adult Wistar rats (105 g-160 g) were randomly distributed into 6 groups. Group A were administered 5 ml/kg b.wt. of distilled water everyday for 28 days. Group B rats were administered 5 ml/kg b.wt. of alcohol (20%) for 2 weeks. However for the first 2 weeks, the rats in Groups C and D were administered 5 ml/kg b.wt. of alcohol (20%) and the rats in

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Groups E and F were exposed to Nigerian Fuji and hip hop music at 75dB-83dB respectively for 4 hours daily. For the last 2 weeks, the rats in C and D were exposed to Nigerian hip hop and fuji music respectively 75dB-83dB, for 4 hours daily and the rats in Group E and F were administered 5 ml/kg b.wt of alcohol.

Results: Higher memory capacity, oxidative status and normal histo-architecture of the hippocampus in group A rats were recorded. However, Group B rats showed a non-significant ($p \geq 0.05$) increase in body weight, higher and lower memory capacity as shown by Morris water maze test and Y-Maze respectively, significant decrease ($p \leq 0.05$) in oxidative stress markers (SOD, CAT, GSH) and a significant ($p \leq 0.05$) increase in MDA and Acetylcholinesterase, structural distortion and neuronal degeneration as evident by a significant ($p \leq 0.05$) decrease in number of pyramidal cells when compared to the rats in groups A, C-F. The rats in group C-F had changes in their memory capacity at the 14th and 28th day.

Conclusion: Music (AfroHip-Hop and Fuji) improved the histo-architecture of alcohol-distorted hippocampus in rats. However they do not have a definite effect on spatial memory.

Keywords: Memory; neurobehaviour; Nigeria; Hiphop; music; Fuji; alcohol; Hippocampus.

1. INTRODUCTION

Memory is a cognitive function essential to everyday life. It is vital to experiences, as it is the retention of information over time for the purpose of influencing future actions [1]. Anatomical structures form the basis on which the processes of memory take place. Various parts or structures of the brain are responsible for the processes that encompass the formation of memory. One of these structures is the Hippocampus, which is of great importance in learning and memory [2]. Any damage that occurs to the hippocampus invariably impairs memory or cognitive function. Alcohol, which is one of the most widely used recreational drugs in the world with about 33% of people being current drinkers [3], has been reported to negatively impact the hippocampus [4].

Music, which is a form of entertainment, helps in relaxation and stress reduction. It has been reported to boost creativity and aid learning and memory [5,6]. Its role in improvement or treatment of memory impairment has been established [2]. Mozart music is the most commonly used genre of music in these studies, and its neuro-therapeutic and enhancing effects have been reported. Mozart music has been linked to high intelligence quotient hence it is described with a term, "The Mozart effect''.

Fuji is a variation of Nigerian Were/Ajisari musical genre comprising of sakara, apala, juju, Aro, afro and gudugudu music characterized by the use of the sakara drum and sometimes harmonica but without the violin-like goje instrument normally played with an accompanying fiddle [7]. African Hiphop (a term coined by African rappers) is mixture of conventional rap with live beat, fuji, pigin English and in some cases native languages. Because alcohol consumption more often than not go "hand in hand" with music, we aimed to investigate the therapeutic effect of Nigeria genre of music- afro hip-hop and fuji on alcohol-induced hippocampal damage.

2. MATERIALS AND METHODS

2.1 Animals

Thirty-six (36) Adult female Wistar rats, weighing between 105 g-160 g were procured from the Animal House of College of Health Sciences of Bowen University, Iwo, Osun State, Nigeria. They were housed in well ventilated cages cushioned with treated saw dusts and were kept at the Animal House of College of Health Sciences of Bowen University, Iwo. The rats were allowed to acclimatize for a period of 10 days before the commencement of the experiment, and they were kept under standard environmental conditions of normal relative humidity, room temperature and 12:12 hours light and dark cycle, and were adequately fed on standard feed and clean water *ad libitium*. The weights of the animals were measured at the commencement of the experiment, on the 14th day and on the last day of the experiment, their individual weights were recorded and they were identified with appropriate tags.

2.2 Preparation of Alcohol

The concentration of the alcohol used for this experiment was 20%, and it was prepared by diluting 200 ml of absolute ethanol (BDH Limited

Poole England), which was obtained from the Department of Biochemistry, Bowen University, with 800 ml of distil water.

2.3 Sound Analysis

The music was analyzed with sound analyzer software (Dominique Rodrigues, version 2.2). The intensity and frequency at which the music was playing was measured and ensured to be within the range of 75dB-83dB [8,9] throughout the experiment. The boom box was placed on top of the cages to ensure that the rats maximally listened to the music. The sound intensity of the music was from 75 dB-83 dB, as measured by a sound analyzer app and the rats were closely observed throughout the period of the administration.

2.4 Experimental Design

The rats were randomly divided into six (6) groups (A, B, C, D, E and F) containing 6 rats each. Group A and B served as the negative and positive control respectively while groups C-F served for the experimental groups.

Group A: They were treated orally with 5 ml/kg b.wt of distilled water for a period of 28 days.
Group B: They were treated orally with 5 ml/kg b.wt. of 20% alcohol only during the last two weeks of the experiment.
Group C: They were treated orally with 5 ml/kg b.wt. of 20% alcohol for the first two weeks and exposed to Afro Hip hop Music at 75 dB- 83 dB for 4 hours (9am-1pm) for the last two weeks of the experiment.
Group D: They were treated orally with 5 ml/kg b.wt. of 20% alcohol for the first two weeks and exposed to Fuji Music at 75dB to 83 dB for 4 hours (9am-1pm) for the last two weeks of the experiment.
Group E: They were exposed with Fuji Music at 75 dB to 83 dB for 4 hours (9am-1pm) for the first two weeks and orally treated with 5ml/kg b.wt of 20% Alcohol for the last two weeks of the experiment.
Group F: They were exposed with Nigerian Hip hop Music at 75 dB to 83 dB for 4 hours (9am-1pm) for the first two weeks and orally treated with 5ml/kg b.wt of 20% alcohol for the last two weeks of the experiment.

2.5 Evaluation of Spatial Memory

Morris Water Maze and Y- Maze were used to access the learning and memory ability of the rats. The memory assessments were carried out at the end of each phase of the experiment.

The Morris water-maze procedure was performed as described by Christopher et al. [10]. The animals were placed in circular basin (124 cm in diameter) containing water. The water was made opaque using thick, non-toxic milk and the water was maintained at room temperature of 27°C throughout the trials The Maze was virtually divided into 4 quadrants: North, South, West and East. The escape platform was 25 cm^2 in diameter and was placed in the center of the North-West quadrant. It was submerged into the water, with the upper surface of the platform, 1 cm above the water. The platform was kept in the same position throughout the period of the trials.

The trial starts when the rats were placed into the water facing the wall of the south-east quadrant and they were allowed to search for the escape platform. The trial ended when the rat climbed on the escape platform or when a maximum of 60 seconds elapsed. Three trials were carried out on the rats per day and there was a break or rest of 30 minutes between each trial. The escape latency and time spent in the target quadrant was recorded during each trial. To access their spatial memory, a probe test was carried out. The probe test was carried on the same day when the second set of trials took place, with an interval of 6 hours. This was done because of the cyclic changes in steroid hormone level in females, which have profound effects on hippocampal-dependent task performance, hippocampal anatomy and hippocampal cell function [11].

The Y- Maze Spontaneous Alternation procedure was performed as described by Miedel et al. [12]. The maze has three, opaque arms at 120° angle from each other. The rats were placed at the center of the maze, with the rats facing one of the arms, and they were allowed to move freely for 5 min. The sequence of the arm entries was manually recorded and the maze was cleaned with absolute ethanol and allowed to dry between the tests. Alternation was defined as an entry into all three arms in consecutive choices. Spontaneous Alternation percentage (SA %) is defined as the ratio of the arm entry choices that differed from the previous two choices to the total choices. The number of maximum spontaneous alteration was then calculated as the total number of arms entered minus 2 and the percentage was calculated as:

$$\frac{\text{Actual Alternations X 100}}{\text{Maximum Alternations}}$$

2.6 Histological Analysis

At the end of the experiment, the rats were sacrificed humanely by cervical dislocation. The brain was perfused with normal saline, and the brain tissue was harvested. The tissues were fixed in 10% formalin, dehydrated through series of graded alcohol, cleared in xylene, embedded with wax, sectioned into 5µm thickness and stained with Haematoxylin and Eosin, and Cresyl fast Violet stains.

2.7 Histo-morphometry

The pyramidal cells of the Hippocampus were counted using Digimizer image analysis software (Version 4.0). The CA3 region was studied at × 100 and × 250 magnifications marker tool was used to click in the image on the cells to mark and count the number of each cell. The total of number of cells were automatically displayed in the statistics window and subjected to statistically analysis.

2.8 Biochemical Analysis

Blood samples were taken from each of the rats and biochemical analysis to investigate the oxidative status of the animals using makers such as Catalase, Superoxide dismutase (SOD), Glutathione (GSH) and Malondialdehyde (MDA) as previously described by Akunna et al. [13]. The concentration of Acetylcholinesterase (ache) and total protein were also evaluated.

2.9 Statistical Analysis

The mean and standard deviations of the data were calculated using descriptive statistic, independent t- student test was used to compare the mean of Negative control group and Positive control group, the difference in mean between the positive control group and the treatment group was test by Analysis of variance (ANOVA-one way) using statistical package of social science (SPSS) (Version 21.0). Results were presented in tables, charts and graphs, $p<0.05$ was taken as statistically while $p> 0.05$ was taken as statistical insignificant.

3. RESULTS

3.1 General Observation

During the first 2 two weeks of administration, rats in Groups A and B were more active than those in Groups C and D, as the latter groups often slept after treatment with alcohol. Group E and F rats were often relaxed when exposed to music. However, Group A rats were more active than the other groups of animal in the last 2 weeks of administration, Group E and F often slept after alcohol treatment; Group C and D were observed to be anxious at the beginning of each day's music administration, but they got relaxed and often fell asleep as the exposure went on.

3.2 Body Weight

There was a non-significant increase ($P>0.05$) in body weight of rats in group A and B at day 14 and 28, and a non-significant decrease at day 1. There was a non-significant difference in body weight of Group B and C rats throughout the experiment. There was a non- significant decrease in body weight of rats Group B and D at Day 14 and a non- significant increase at Day 1 and 28. There was a non-significant decrease ($P>0.05$) in body weight of rats B and E at day 14 and 28, and a non-significant increase at day 1 of the experiment. There was no significant increase ($P>0.05$) between Group B and F at day 1, and a non-significant decrease in body weight of rats at day 14 and 28 (Table 1).

Table 1. The effect of alcohol and different genres of music on body weight index of Sprague Dawley rats

Animal Groups	Day 1 (g)	Day 14 (g)	Wt. Diff for 14 (g)	Day 28 (g)	Wt. Diff for 28 (g)
Group A	132.16 ± 4.15	146.33 ± 4.35	14.1	158.16 ± 5.05	11.84
Group B	125.00 ± 4.24[a]	151.50 ± 1.89[a]	26.5	161.33±4.88[a]	9.83
Group C	118.40 ± 7.16[b]	123.00 ± 5.84[b]	4.60	146.80 ± 4.48[b]	23.8
Group D	136.00 ± 7.59	143.80 ± 7.22	7.80	161.80 ± 7.24	18
Group E	130.00 ± 2.47	138.83 ± 4.32[b]	8.83	147.83 ± 4.62[b]	9
Group F	128.20 ± 6.36	147.60 ± 6.17	19.4	155.00 ± 8.47[b]	7.4

[a,b] represent significant increase or decrease at p≤0.05 when compared to normal control and positive control respectively. Values are means ± SEM. n =6 in each group.

Group A= Negative control; GroupB= Positive Control (Alcohol Only); Group C= Alcohol + Hip Hop Music; Group D= Alcohol + Fuji Music; Group E= Fuji Music+ Alcohol; Group F = Hip Hop Music + Alcohol

3.3 Neuro-behavioural Study

There were no significant difference (P> 0.05) in memory capacity between the Group A and alcohol-alone group (Group B) at MPT day 14 and day 28 and the Y-Maze at day 14, but there was a significant decrease in memory capacity between Group A and B (Y- Maze) at day 28. There was a significant increase (P≤0.05) in memory capacity between Group B and C at day 14 (MPT), a significant decrease (P≤ 0.05) in memory capacity at day 14 (Y- Maze), no significant difference in memory capacity (P> 0.05) at day 28 (MPT) and a significant increase (P≤ 0.05) at day 28 (Y- Maze). There was a significant increase (P≤ 0.05) in memory capacity between Group B and Group D at MPT day 14 and 28, and Y- Maze at day 28; and there was no significant difference in memory capacity (P>0.05) at day 14 (Y- maze). There was no significant difference (P> 0.05) in memory capacity between positive control (Group B) and Group E for the MPT and Y-Maze at day 14 and day 28 respectively. No significant difference in memory capacity between Group B and F for day 14 (MPT) was observed; However, there was a significant decrease and increase in memory capacity at day 14 (Y- maze); and day 28 (MPT and Y-maze (Table 2).

3.4 Biochemical Results

The effect of alcohol and different genre of music were verified on the following biochemical parameters, namely: SOD, MDA, CAT, GSH, Total protein and AChE as shown in Figs. 1-3. The result shows that there was a significant increase (p≤0.05) in MDA and AChE levels between Negative control (Group A) and positive control (Group B) and a significant decrease (P>0.05) in SOD, CAT, GSH and total protein levels. There was a significant increase (P≤ 0.05) in SOD level between positive control (Group B) and Group C; and there was no significant difference (P>0.05) in MDA, CAT, GSH, Total protein and AChE levels.

There was no significant difference (P>0.05) in MDA, GSH, and total protein levels between positive control and Group D in there was a significant decrease (P≤ 0.05) in SOD and AChE levels; and an increase in CAT level. There was a significant increase in SOD level between positive control and Group E; and no significant difference (P>0.05) in MDA, CAT, GSH, Total Protein and AChE levels. There was no significant difference (P>0.05) in the MDA, CAT, GSH, Total protein levels between positive control and Group F; a significant increase (p≤0.05) in SOD level and a decrease in AChE level.

3.5 Histo-morphology

The result shows a well–preserved cyto-architecture of the hippocampus of control group (5 ml/kg body weight of distilled water) of rat with normal cellular composition in the Cornu Ammonis 1, CA2, CA3 and Dentate gyrus (Plates 1 and 2). There were distortion in the curvature of the dendate gyrus and degeneration of pyramidal neurons in the C4 and dendate Gyrus of rats in group B (5 ml/kg body weight of Alcohol) when compared to that of the control (Group A). The hippocampus of the rats in Groups C-F showed few distortion of pyramidal layer, vacuolation and necrotic cells in some areas and some degenerated pyramidal cells. However, there were observable difference between this groups (Plates 5-12).

Table 2. The effect of alcohol and different genre of Nigerian music on memory capacity of the Sprague Dawley rats

Animal Groups	Morris Day 14 Probe Test TQT(s)	Y-maze Day 14 (%S/Alt)	Morris Day 28 Probe Test TQT(s)	Y-maze Day 28 (%S/Alt)
Group A	17.12±4.24	73.86±14.89	13.63±5.45	66.71±17.24
Group B	17.73±3.89[a]	64.29±23.14[a]	14.93±2.07	51.49±17.31[a]
Group C	20.54±12.19[b]	42.29±44.05[b]	15.84±5.76	63.03±37.81
Group D	19.90±7.24	75.56±43.32	18.76±1.61[b]	67.32±24.75[b]
Group E	16.76±04.38	72.32±24.78	14.60±4.59	48.06±41.10[b]
Group F	15.22±2.69	59.51±34.77[b]	16.96±6.14[b]	69.80±24.65[b]

[a,b] represent significant increase or decrease at p≤0.05 when compared to normal control and positive control respectively. Values are means ± SEM. n =6 in each group.

Group A= Negative control; Group B= Positive Control (Alcohol Only); Group C= Alcohol + Hip Hop Music; Group D= Alcohol + Fuji Music; Group E= Fuji Music+ Alcohol; Group F = Hip Hop Music + Alcohol

Group A (X40):

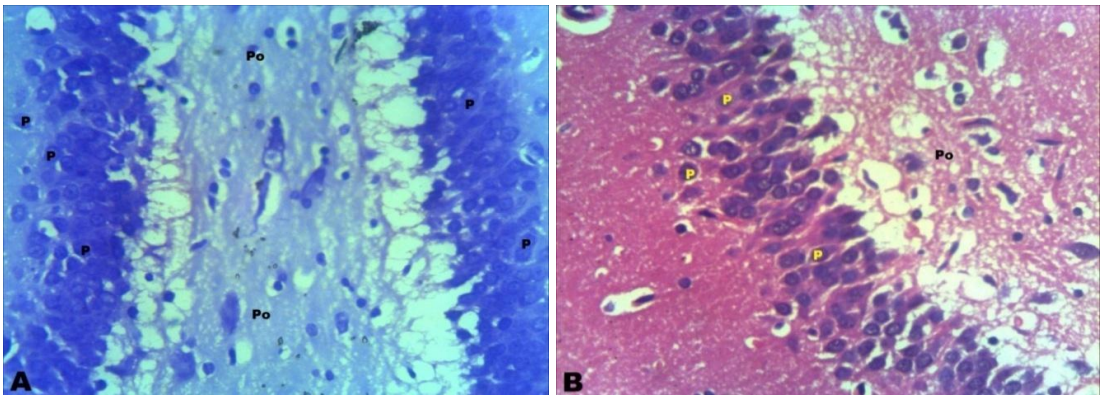

Plate 1. CA1 Area of Hippocampus (X40) of rats in Control group (5ml/kg b.w.t of distil water). Showing normal Pyramidal (P), and Polymorphic (Po) Layers. Glial Cell and Capillaries are scattered inside the Polymorphic Layer (A: Cresyl Violet and B: H&E X40)

Group B(X40):

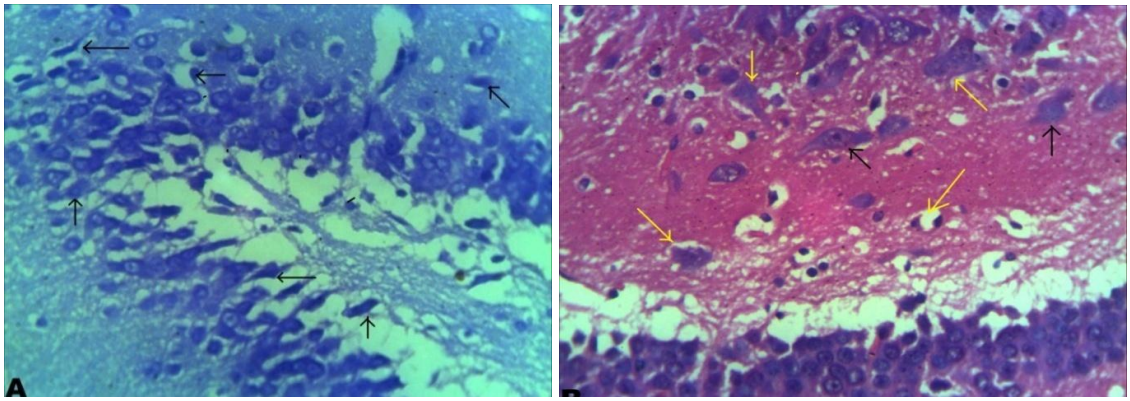

Plate 2. CA4 Area of Hippocampus (X40) of rats in Group B (5ml/kg b.w.t of Alcohol). Showing Disarrangement of Pyramidal cells and vacuolization and loosely packed cells. (Arrows) (A: Cresyl Violet and B: H&E)

Group C(X40):

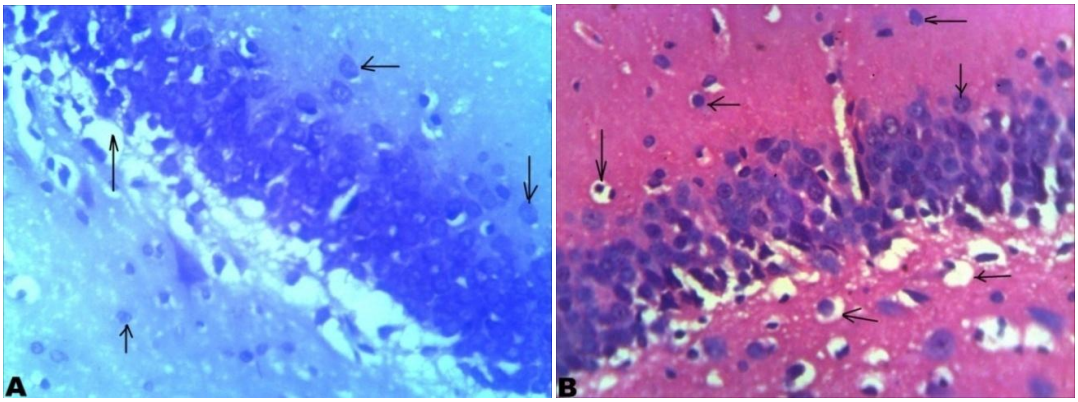

Plate 3. CA4 Area of Hippocampus (X40) of rats in Group C (5ml/kg b.w.t of Alcohol + Hiphop Music). Showing numerous normal pyramidal cells (Arrows)(A: Cresyl Violet and B: H&E)

Group D (X40):

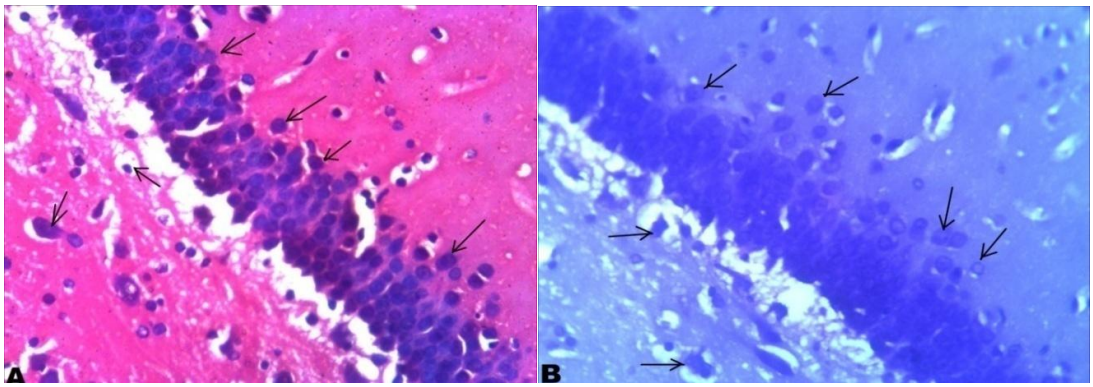

Plate 4. Hippocampus (X40) of rats in Group D (5 ml/kg b.w.t of Alcohol + Fuji Music). Showing numerous pyramidal cells with normal outline at CA2 and CA4 (Arrows)(B: Cresyl Violet and A: H&E)

Group E (X40):

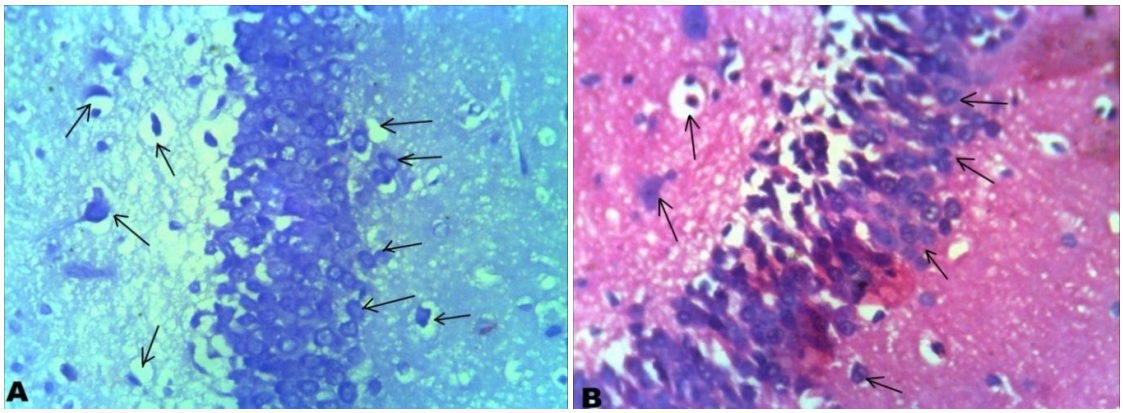

Plate 5. Hippocampus (X40) of rats in Group E (Fuji Music + 5ml/kg b.w.t of Alcohol). The cells appear fainted few vacoulation (Arrows) (A: Cresyl Violet and B: H&E)

Group F(X40):

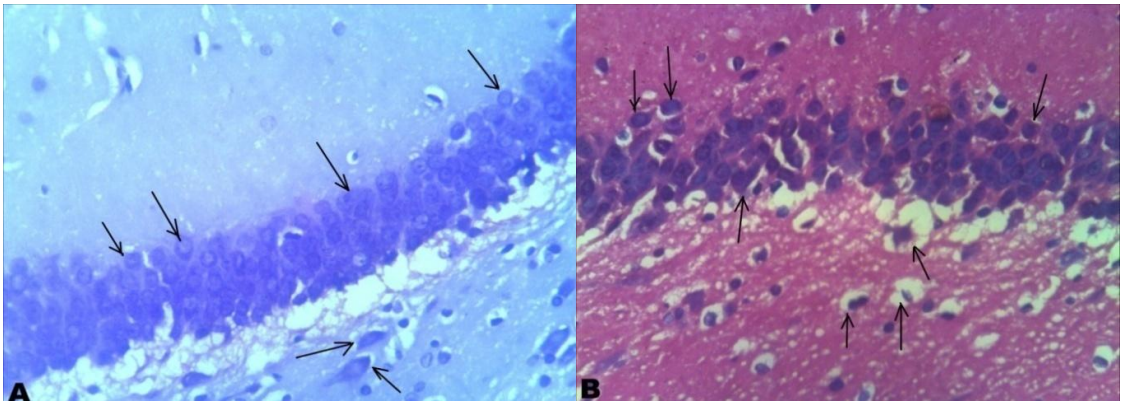

Plate 6. Hippocampus (X40) of rats in Group F (Hip Hop + 5ml/kg b.w.t of Alcohol). The cells appear fainted few vacoulation (Arrows) (A: Cresyl Violet and B: H&E)

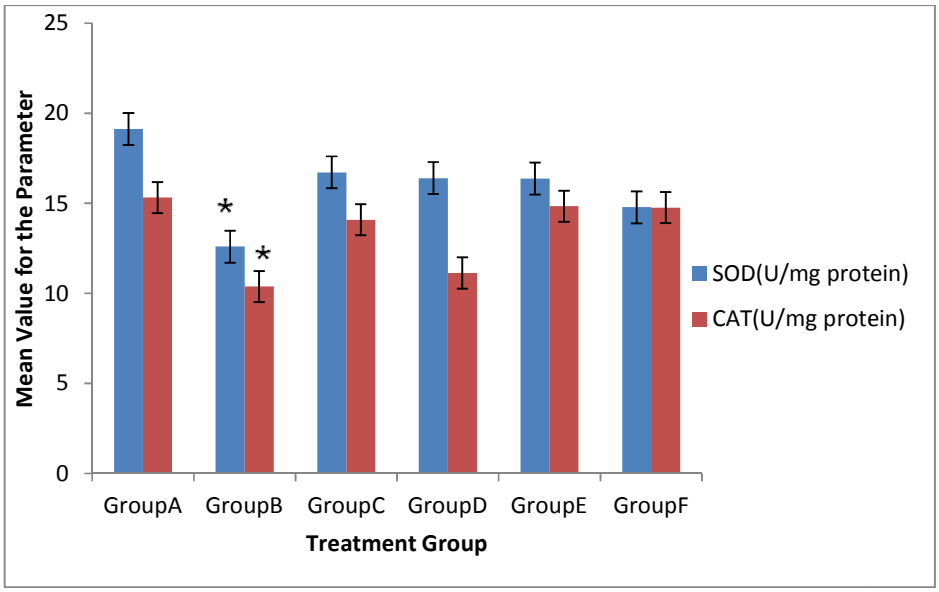

Fig. 1. The effect of alcohol and different genre of music on the level of biochemical parameters- on Superoxide Dismutase (SOD), catalase (CAT)

**p<0.05 when compared to negative control A*

Group A= Negative control; Group B= Positive Control (Alcohol Only); Group C= Alcohol + Hip Hop Music; Group D= Alcohol + Fuji Music; Group E= Fuji Music+ Alcohol; Group F = Hip Hop Music + Alcohol

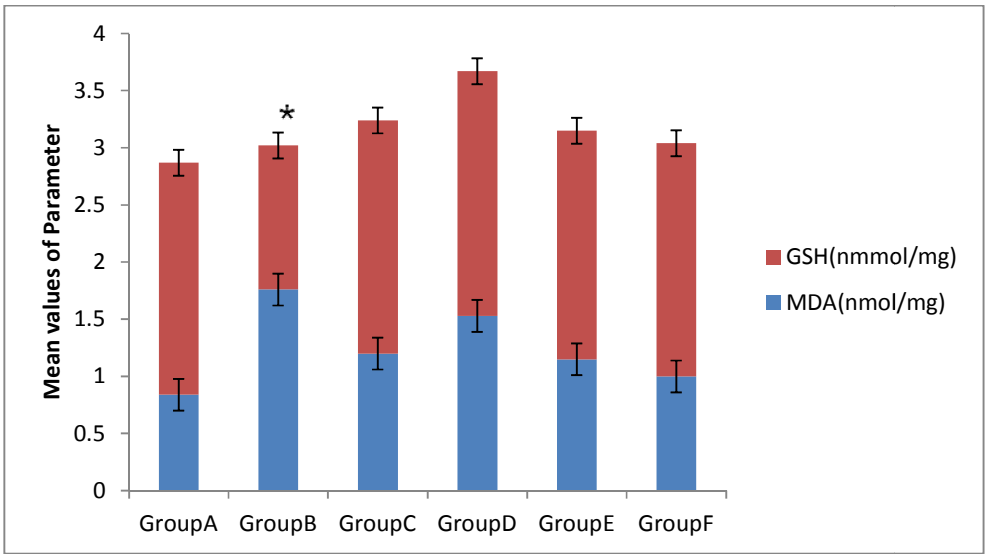

Fig. 2. The effect of alcohol and different genre of music on the level of Malondialdehyde (MDA) and Glutathione (GSH)

**p<0.05 when compared to negative control A*

Group A= Negative control; Group B= Positive Control (Alcohol Only); Group C= Alcohol + Hip Hop Music; Group D= Alcohol + Fuji Music; Group E= Fuji Music+ Alcohol; Group F = Hip Hop Music + Alcohol

3.6 Histo-morphometry of Hippocampus

The results from the study showed a significant decrease (p≤0.05) in Pyramidal cells of the hippocampus among rats in group B when compared to the negative control (group A). There was a significant increase in number of Pyramidal cells in the groups exposed to different

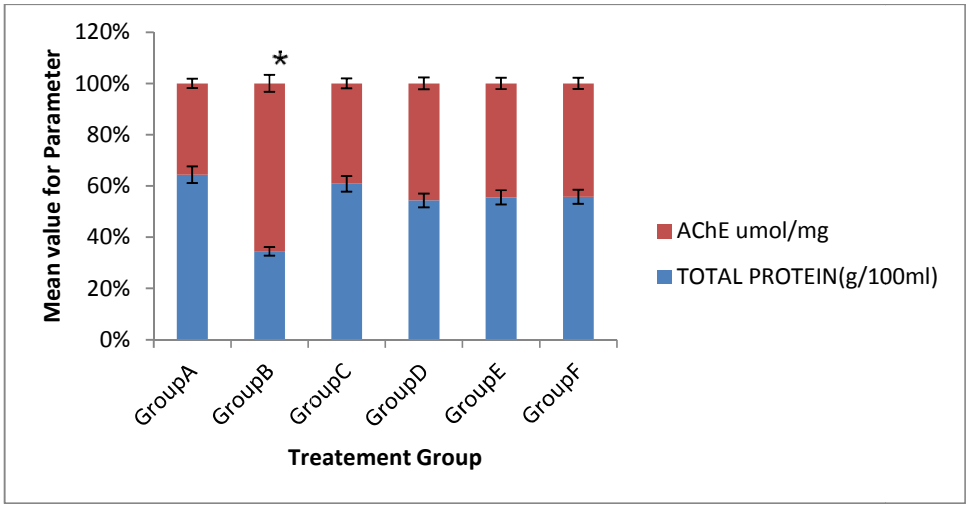

Fig. 3. The effect of alcohol and different genre of music on the level total protein and Acetylcholinesterase (AChE)

**p<0.05 when compared to negative control A*

Group A= Negative control; Group B= Positive Control (Alcohol Only); Group C= Alcohol + Hip Hop Music; Group D= Alcohol + Fuji Music; Group E= Fuji Music+ Alcohol; Group F = Hip Hop Music + Alcohol

Table 3. Effect of alcohol and different genre of Nigerian music on pyramidal cells of the hippocampus

Animal groups	Pyramidal Cells
Group A	47.12±4.24
Group B	17.73±3.89[a]
Group C	24.14±12.19[b]
Group D	31.90±7.24[b]
Group E	28.76±04.38[b]
Group F	35.22±2.69[b]

[a,b]represent significant difference when compared to negative and positive control respectively

P≤0.05 is statistical significant, p>0.05 is not statistical significant.Values are means ± SEM. n =6 in each group. Means between the groups that do not share the same superscripts shows significant difference at p≤0.05 in the LSD Post hoc test.

Group A= Negative control; Group B= Positive Control (Alcohol Only); Group C= Alcohol + Hip Hop Music; Group D= Alcohol + Fuji Music; Group E= Fuji Music+ Alcohol; Group F = Hip Hop Music + Alcohol

genre of music when compared to the positive control (Group B). However, there were significant differences in number of pyramidal cells when the different treatment groups were compared.

4. DISCUSSION

Several studies have reported the role of music in cognitive and physiological functions in human and animal models [6,14,15]. A positive relation was seen between alcohol consumption and weight gain in a study conducted by Wannamethee and Shaper [16], which is not consistent with the weight loss associated with alcohol consumption reported by Olawale et al. [17]. As shown in the result, there was non-significant increase in body weight of rats in treated with alcohol when compared to the rats in negative control group. This is in accordance to the report of Wannamethee and Shaper [16]. Alcohol is a known appetite stimulant through the boosting of the level of the neuropeptide *galanin*, which increases the craving for fatty foods. This could account at least in part for an increase in food consumption hence weight gain. On the other hand, blood alcohol concentration corresponding to heavy intoxication suppresses appetite and the non significant increase in body weight corroborates much with this popular societal experience with drunkards who usually eat very little food.

In this study, there was a significant increase in memory capacity between the Groups B, C and D at the 14th day of the Morris Water test. This is not in line with previous reports linking alcohol to spatial memory impairment in rats [4,18]. However, our study is line with the report by Markwiese [19] that the acquisition and subsequent retention of spatial memory was more potently inhibited by acute exposure to ethanol in adolescent rats, compared to adult rats. There was a non-significant decrease in spatial memory of rats between the positive control and Group E. This is inconsistent to the report of Yao et al. [5] which shows that Mozart Music had a significant effect in increasing memory capacity.

A non-significant increase in the spatial memory capacity between the negative and positive control groups of rats at day 28 of MPT was recorded. This increase in spatial memory capacity of the rats is in accordance to the report by Markwiese [19] and the report of Hashikawa-Hobara [20]. There was an increase (significant and non- significant) in the spatial memory capacity between the rats in the positive control group and the rats in Group C and D. This increase in spatial memory in these rats could have been because of the previous increase in memory capacity, which was correlated with low dose and the age of the rats [19,20] or a suggestion that these genre of music improve the spatial memory capacity of the rats.

Classical music has been shown to reduce anxiety in an elevated plus maze [21], blood pressure [22,23] and improved learning performance of rats in the water maze test [24].

There was a non-significant decrease in spatial memory of the rats in Group E and a significant increase in memory capacity of those in Group F. At Day 28 of Y- Maze, There was a significant increase in memory capacity between the rats in the positive control group and Group C&D indicating the modulating role of music in spatial working memory capacity of the rats. The effect of music on spatial memory is not definite. This could depend on several factors. For instance, while previous reports has linked better memory capacity to classical music [21,24], some linked memory depreciation to rock music [25]. Psyrdellis et al. [6] hypothesis that activating pieces tends to enhance memory while relaxing pieces tends to deteriorate it.

The mechanism of action of music is not clear. Several studies have linked elevated arousal to memory capacity [26] since music tends to affect heart rate and blood pressure [22,23]. Music also acts as a proactive interference [27] which occurs when previously acquired information modifies spatial learning.

The significant alteration in oxidative stress markers implicated ROS as a possible mechanism of action for alcohol. Significant increase in SOD, CAT, Total protein and GSH levels and a reduction in MDA in treatment groups was observed in this study. This is in accordance to the report of Ore & Akinloye [28].

Lipid peroxide- Malondialdehyde (MDA) is an oxidative damage product, which is an important marker for oxidative stress [28] and Acetylcholinesterase (AChE) is the primary enzyme responsible for the hydrolytic metabolism of neurotransmitter- acetylcholine, and it is an important biochemical marker for oxidative stress [28]. The cellular and structural composition of the hippocampal tissues of all experimental groups of rats were compared to that of a normal hippocampal structure, as seen in the negative control group of rats (Group A). The normal histology (as seen in the negative control group of animals) of the hippocampal tissues showed the following areas: The Cornu Ammonis (CA) 1, CA2, CA3, CA4, Dentate gyrus and a Narrow Hippocampus Sulcus. The pyramidal and polymorphic cells can also be observed in the hippocampus of the Negative control group of rats. It can be observed that there was distortion in the curvature of the dendate gyrus, loss of nissl substances, several degeneration of Pyramidal cells, vacuolization and loosely packed cells of the pyramidal neurons in the C4 and dendate Gyrus of these rats when compared to that of the control. These damages or distortions observed in the hippocampus are in accordance to the report of Fakunle et al. [29].

The most probable mechanism for the neurodegenerative effects of alcohol on the hippocampus is by the oxidative action of alcohol on the hippocampal neurons and by the antagonist action of alcohol on NMDA receptor, which is responsible for the acquisition of spatial memory and long Term of memory in the hippocampus [19]. There was an improvement in histo-architecture of the hippocampus of groups exposed to music post alcohol treatment evidenced by a significant increase in pyramidal cells suggesting a possible mitigating role of music in alcohol toxicity.

The results in this study is a universal effect of music and cannot be attributed to any previous experience with the stimulus, which can be a common critic if a human model was used [6].

5. CONCLUSION

Music (HipHop and Fuji) had a mitigating effect on alcohol-oxidative hippocampal damage. The use of this simple and non-invasive technique that modulates memory could become a practical tool in different memories issues, and it is need more basic research to underpin this result.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical clearance was obtained from the Research conducts and ethics committee of Bowen University, Osun State.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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