Background music in the dissection laboratory: impact on stress associated with the dissection experience

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Ananywu GE. Background music in the dissection laboratory: impact on stress associated with the dissection experience. Adv Physiol Educ 39: 96–101, 2015; doi:10.1152/advan.00057.2014.—Notable challenges, such as mental distress, boredom, negative moods, and attitudes, have been associated with learning in the cadaver dissection laboratory (CDL). The ability of background music (BM) to enhance the cognitive abilities of students is well documented. The present study was designed to investigate the impact of BM in the CDL and on stress associated with the dissection experience. After 8 wk of normal dissection without BM, various genres of BM were introduced into the cadaver dissection sessions of 260 medical and dental students for 3 wk. Feedback on the impact of BM on students in the CDL and students’ attitude were accessed using a questionnaire. Psychological stress assessment was done using Psychological Stress Measure 9. Two batches of 30 students each were made to dissect same areas of the body for 2 h, one batch with BM playing and the other batch without. The same examination was given to both groups at the end. Over 90% of the participants expressed a desire to incorporate BM into the CDL; 87% of the sampled population that expressed love for music also reported BM to be a very useful tool that could be used to enhance learning conditions in the CDL. A strong positive relationship was established between love for music and its perception as a tool for learning in the CDL (P < 0.001). Students that studied under the influence of BM had significantly higher scores (P < 0.001) in the overall examination result. BM reduced the level of stress associated with the dissection experience by ~33%.

Stress has been reported to be a product of complex interactions between individuals and their environments (19). This outcome is as a result of perception and appraisal of “events” within such environment either as positive, negative, or neutral stressors. The CDL has been reported by most anatomy teachers and researchers to represent a significant emotional challenge to many medical students (2, 9, 33). The sight, smell, contact, and general appearance of the cadaver have been reported to be among the events in the CDL that are highly stressful for many medical students (1–3, 22). Some of the altered physiological manifestations after exposure to the CDL include faintness, dizziness, palpitations, sweating, sickness, insomnia, recurring images of cadavers, depression, and learning difficulties (8, 22, 26, 47, 52). Finkerstein and Mathers (22) presented dissection as an act that is clearly outside the range of the usual human experience that retains the ability to elicit most of the symptoms of posttraumatic stress disorder. These experiences have influenced student perceptions of the CDL as a very difficult learning environment (2).

The learning environment in the context of this study is an institutionalized body where formal activities of teaching, training, and acquisition of knowledge are carried out. Learning environments have powerful effects on the students’ achievements and motivation for accomplishing tasks (31). These environments are influenced through visual imagery, color, aromatherapy, and sound (31). Influencing the learning environment using sound in the form of music has been the topic of a number of investigations (7, 39, 49). The creation of home-like atmospheres in our classrooms and laboratories has been reported to foster a natural relaxed setting that has a powerful effect in creating supportive learning environments (36). Music has been noted as one of the media that 21st century students have exploited in the creation of a such natural enabling environment (11, 40).

Background music (BM) refers to music not to be actively heard or listened to. Studies correlating BM and students’ academic performance abound (15, 28, 29, 34). Music has been reported to enhance learning by focusing and ordering the mind (10). Many reports have been made on its positive value on intelligence, development, academic performance, and personality (6, 17, 21, 35). Benefits of BM have been enumerated in various fields of life. In health, its role in stress reduction is well documented (46) and has been presented as a therapy to be incorporated into the area of preventive medicine (29, 48, 54). In the area of consumerism, supermarkets, shopping malls, restaurants, and other similar outlets use it to keep consumers in pleasant moods, by enhancing the environment through pleasure and stimulation, causing consumers to stay longer and spend more (30), thereby determining consumer behavior. In corporate workplaces, BM has been reported to enhance employee general feelings of well-being, make staff work quicker, and enhance creativity (38). In education, it has been used to enhance learning of foreign languages (18), improve vocabulary and grammar learning (59), increase mathematical accuracy (57, 25), and enhance learning outcomes in pupils with disabilities (50).

Some earlier reported attempts to improve the learning condition within the CDL include the inclusion of more lights and windows to make the laboratory less cold and eerie,
masking of the cadaver and formalin smell within the laboratory, a description of the general conditions of the laboratory to students before practically exposing them to the CDL, and gradual exposure of the organs to students before the whole body (1, 9, 24, 33). While the objectives of adopting these measures are good, they have yet to make significant differences in improving learning conditions in the CDL. Although BM, as noted above in this report, has been shown to enhance learning outcome in many academic disciplines, its ability to ameliorate the level of stress associated with the dissection experience has yet to be studied. The ability of BM to enhance the cadaver laboratory environment and improve learning outcomes is still a gray area. The present study was designed to study student perceptions of BM as a tool to enhance learning in the CDL and also to determine its ability to reduce stress associated with the dissection experience in the CDL. To enhance these objectives, we considered some of the following research questions:

1. Does second-year medical and dental students’ affinity for music result in a positive perception of BM in cadaver dissection learning?
2. Will the adoption of BM in the CDL improve the state of relaxation and alertness of second-year medical and dental students running dissection sections?
3. Can adoption of BM in the CDL reduce the stress associated with dissection and improve learning conditions in the CDL?

With these research questions, we hypothesized the following:

- \( H_1: \) students will perceive BM as a useful tool that will enhance learning in the CDL or \( H_0: \) students will not perceive BM as a useful tool that will enhance learning in the CDL.
- \( H_2: \) BM will improve learning efficiency in the CDL through improvement of relaxation and alertness or \( H_0: \) BM will not improve learning efficiency in the CDL through improvement of relaxation and alertness.
- \( H_3: \) adoption of BM in the CDL will reduce the stress associated with the dissection experience or \( H_0: \) adoption of BM in the CDL will not reduce the stress associated with the dissection experience.

**METHODS**

A total number of 260 second-year medical and dental students (174 men and 86 women) from the College of Medicine of the University of Nigeria (Enugu Campus) were voluntarily recruited for this study. These students were involved in the dissection program of the Department of Anatomy. Anatomy dissection is a core aspect of the teaching of gross anatomy in our institution. Students actively participate in the dissection of the cadavers. Participation in the dissection is mandatory. Cadaver dissection for the students is separated into 2 sessions/week. These sessions are done in different days of the week with one of the contacts in the morning and the other in the afternoon. Each session lasts for 2 h.

The present study was divided into two phases. Before the beginning of the first phase of the study, students had been exposed to 8 wk of usual dissection without BM (which is usually characterized by chattering background noises of a large number of students in various dissection slabs of the dissection hall). Twenty randomly selected students (both men and women) alongside the researcher and assistants were used to select the various music used as BM in the study. Each song was played for few minutes, and selection was done by a simple majority vote. Calming types of background music of various genres (e.g., classical, R&B, jazz, and country music) were considered and incorporated into the selection. The selected BM was allowed to play in the dissection laboratory for 3 wk in the two sessions of each week. This study was approved by the relevant ethics committee of the College of Medicine of the University of Nigeria (Enugu Campus).

**Tool for psychological stress assessment.** Psychological Stress Measure 9 (PSM-9), a standardized and validated self-reporting test for the measurement of psychological stress (37), was administered to all participants before and after the introduction of BM into the CDL. PSM-9 consists of nine-item self-evaluation questions aimed at measuring perceived stress levels. Participants were required to answer to the various items ranking the intensity of the psychological stress condition (where \( l = \) not at all, \( 2 = \) not really, \( 3 = \) very little, \( 4 = \) a bit, \( 5 = \) somewhat, \( 6 = \) quite a bit, \( 7 = \) very much, and \( 8 = \) extremely). With the PSM-9, assessment of the students’ level of stress was done before and after the introduction of BM in the CDL.

**Development of the participant evaluation material for the laboratory sessions with BM.** At the end of the third week, students were also provided with a questionnaire for feedback on the effects of BM and their opinions about these effects on their work in the laboratory. Some of the areas considered in the questionnaire were the effects of BM on the students, perceived usefulness of BM during the sessions, students’ preferences for various aspects of the music, and time of the day its adoption was perceived most useful.

**Academic assessment of the impact of BM.** The second phase of the study was a crossover study to determine the learning outcome of using BM in the CDL. In this phase of the study, 60 students were randomly selected and also divided into 2 groups of 30 students each. The first group was the BM group, whereas the second group was the non-BM group. Both groups were exposed to 2 h of dissection in the same areas of the body but using their different cadavers. The BM group had BM playing throughout the period of the dissection, whereas the non-BM group had no music playing. The same examination that focused on the areas studied during the dissection was conducted immediately for both groups under the same environment. The examination had three sections; the first section was made up of subjective questions, the second section was of multiple-choice questions, and the third section was of essay questions. During the scoring process, the assessor was blind to the group each of the scripts belonged.

Data were compiled, and descriptive and comparative analyses were carried out using SPSS (version 15.0, SPSS, Chicago, IL). Statistical relationships among groups were accessed using \( \chi^2 \)-tests and Fisher’s exact test.

**RESULTS**

Of the total number of 260 students recruited for this study, only data of 253 students (169 men and 84 women) who completed the study were compiled and used in the analysis. The age of the participants ranged from 18 to 26 yr with a mean of \( 22 \pm 3.6 \) yr. Using the PSM-9 scale, the level of stress was significantly reduced from \( 42.7 \pm 0.9 \) in the pretest to \( 29.4 \pm 0.6 \) in the posttest (\( P < 0.001, Z = 4.46 \)). By this result, the level of stress associated with the dissection experience was reduced by \( \sim 33\% \).

Table 1 shows a summary of the ratings of student’s love for music and perception of the usefulness of BM as a tool for enhancing learning in the CDL. About 87% of male students and 92% of female students expressed a strong love for music; 89% and 87% of the sampled male and female population, respectively, perceived BM as a very useful tool in enhancing learning conditions in the CDL. A Pearson correlation analysis...
showed a strong positive correlation between love for music and perception of music as a useful tool for learning in the CDL \((P < 0.001)\). Table 2 shows the perceptions and attitudes of students to the use of BM. A strong positive association \((P < 0.001)\) was established in the analysis of the students' views to reading with BM, its ability to increase concentration, and adoption in the laboratory. About 90% of the sampled population reported that the adoption of BM in the laboratory should be encouraged. A summary of student perceptions on the impact of BM on various factors affecting learning in the CDL is shown in Table 3. The most important attribute of BM in enhancing learning in the CDL was its ability to refresh energy level and maximize time of dissection (see Table 4).

Results of the academic assessment of the impact of BM on learning outcomes are shown in Table 5. Students that studied under the influence of BM had significantly higher scores in two of three sections of the examination and also in the summary of the whole examination \((P < 0.001)\).

**DISCUSSION**

Interest in the enhancement of academic performance of students using music was overwhelmingly ignited with the release of the theory of Mozart effect by Rauscher et al. \((49)\). In their work on music and spatial task performance, they reported temporary enhancement of spatial temporal reasoning abilities immediately after listening to a piece of music by Mozart. Further studies on this have expanded this theory beyond music by Mozart to other forms of music \((5, 28)\). These studies have explored the physiological, psychological, and cognitive effects of BM on human beings. The present study focused on the impact, attitude, and response of medical and dental students to the introduction of various forms of BM into dissection laboratory sessions.

The result of this study supported the first hypothesis that students will perceive BM as a useful tool that will enhance learning in the CDL. In their work on music and spatial task performance, they

Table 1. **Summary of love for music and perception of the usefulness of BM on a scale of 1–5, where 1 is least and 5 is the peak**

<table>
<thead>
<tr>
<th></th>
<th>Score of 1</th>
<th>Score of 2</th>
<th>Score of 3</th>
<th>Score of 4</th>
<th>Score of 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Love for music</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male students</td>
<td>0</td>
<td>3.6</td>
<td>9.5</td>
<td>30.2</td>
<td>56.7</td>
</tr>
<tr>
<td>Female students</td>
<td>2.4</td>
<td>0</td>
<td>6.0</td>
<td>32.1</td>
<td>59.5</td>
</tr>
<tr>
<td><strong>Usefulness of BM as a tool in enhancing learning in the dissection laboratory</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Male students</td>
<td>5.9</td>
<td>4.7</td>
<td>18.3</td>
<td>30.8</td>
<td>40.3</td>
</tr>
<tr>
<td>Female students</td>
<td>9.5</td>
<td>3.6</td>
<td>25.0</td>
<td>28.6</td>
<td>33.3</td>
</tr>
</tbody>
</table>

\(n = 169\) male students and 84 female students. BM, background music.

Table 2. **Summary of perceptions and attitudes of students on the use of BM**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes, %</th>
<th>No, %</th>
<th>Sometimes, %</th>
<th>Don’t Know, %</th>
<th>Morning, %</th>
<th>Afternoon, %</th>
<th>Not At All, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you usually read on your own with BM playing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male students</td>
<td>43.8</td>
<td>40.2</td>
<td>16.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female students</td>
<td>48.8</td>
<td>34.5</td>
<td>16.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think BM helps to increase concentration during reading?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male students</td>
<td>41.4</td>
<td>37.9</td>
<td>20.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female students</td>
<td>32.1</td>
<td>32.1</td>
<td>35.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think BM should be encouraged in the dissection laboratory?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male students</td>
<td>90.5</td>
<td>9.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female students</td>
<td>89.3</td>
<td>10.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What time of the day during dissection would you prefer BM most?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male students</td>
<td>31.3</td>
<td>62.7</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female students</td>
<td>32.1</td>
<td>64.3</td>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(n = 169\) male students and 84 female students.
the view that the use of BM be encouraged in the CDL and ~80% of this population indicated a strong love for music. The attitude of these medical and dental students toward music is not different from other adolescents in other parts of the world (42, 55, 58). Music has been reported to be the most preferred leisure time activity for many adolescents (23) and also the most favored way of spending time indoors (41). Music is seen to be most meaningful and popular among youths (55). This strong affinity for music can be measured by the amount of time these youths give to it. Some American studies have reported such durations to be between 4 and 6 h/day, or 56.6 h/wk (58); other English studies have estimated ~2.5 h/day (42).

The attachment of youths to music was seen in their positive perceptions to the use of music in both private studies and in the CDL, both views which correlated positively. Worthy of note is the near 100% increase between the number of students that use BM for private studies and the number that recommended for its use in the CDL. This shows that even candidates who do not study with BM in their private hours still prefer its adoption in the laboratory. This action suggests that these students either want to use this BM to suppress a negative factor in the laboratory or that they want to use BM to enhance the learning environment in the laboratory. This is an evidence of student perceptions of the CDL as a difficult learning environment and draws attention to the need to incorporate measures that will enhance learning activities in such an environment.

The hypothesis that BM will improve learning efficiency in the CDL through improvement of relaxation and alertness was also supported by the results of this study. This study noted better noise control, creation of a calm and enabling environment, optimization of time, keeping energy level high, and arousal and sustenance of students’ interest as some of the academic attributes that were tremendously enhanced by the introduction of BM in the dissection laboratory. These enhanced academic attributes most likely resulted in the better academic performance noted in the group of students that studied under the influence of BM. Previous reports on the use of BM have indicated it affects mood state, alters the perception of time and space, moderates physiological changes, reduces stress and anxiety, enhances relaxation, causes arousal, enhances message reception, reduces noise distraction, aids concentration, increases on task performance, and so many others (14, 28, 49).

A typical dissection laboratory scenario is one which students are gathered in small groups around their dissection tables with one person from each of the groups reading from dissection manuals, members of the dissection groups arguing/discussing issues on the structure being dissected, or members of groups or prosectors giving explanations on structures. All of these when coming from the various groups in the laboratory culminate into disturbing background noise. In this report, the most important feature of BM in the control of noise is its ability to drown background noise and make students not experience it. This could have accounted for the 89% of the study population that agreed that BM enabled them to settle faster to work. Also, >95% reported that focus to task was stimulated faster and sustained better using BM. Hall (27), as far back as 1952, noted that BM helped students to settle down more quickly to work, whereas Hallam and Price (28) reported an improvement in mathematical accuracy and work rate by incorporating BM into the classroom environment. A study by Cluph and MacDonald (16) showed the ability of BM to significantly reduce the number of minutes and also number of teacher prompts necessary for third grade students to become engaged in appropriate on-task behavior during morning and afternoon transitional periods.

The afternoon hours were noted to be the most preferred hour of the day for the use of BM in the laboratory. This was not surprising because during this period of the day, students would have had some classes within the earlier hours of the day and, considering the tropical nature of the environment, the weather will usually be very hot and energy levels of the students drained. During these periods, distractions occur very easily and concentration and focus would usually be more difficult. The need to keep energy levels up and sustain focus is usually higher. Considering the reported potentials of BM to refresh energy levels and to sustain focus and interest, incorporating BM during these more difficult learning periods will be a good strategy to enhance and maximize learning effectiveness.

Using PSM-9, the level of stress associated with the dissection experience was reduced by >30% by introducing BM, thereby supporting the third hypothesis. This was also buttressed by the 95.7% of the population that reported being refreshed throughout the sessions with BM. A study by music therapy specialist Lesiuik (38) noted that BM in the workplace reduced anxiety and stress. Most reporters have attributed some of the enhanced performances noted with the use of BM in both classrooms and workplaces to be due to the effects that music has on relaxation and mood (32, 53). Calming BM has been reported to produce a variety of positive physiological effects (32), part of which is to make students to become more relaxed and focused. Other positive results on the use of BM to combat stress in other situations, such as in the workplace and classrooms, have been reported (46).

In conclusion, despite several coping mechanisms and palliative measures introduced in the anatomy dissection laboratory, uncomfortable negative emotions leading to mental distress, negative moods, attitudes, fears, and boredom are still problems for most medical students today. While these other coping and

<table>
<thead>
<tr>
<th>Examination Type</th>
<th>Non-BM Group</th>
<th>BM Group</th>
<th>P Value for t-Test Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective</td>
<td>55 ± 10</td>
<td>51 ± 8</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Multiple choice</td>
<td>57 ± 9</td>
<td>69 ± 10</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Essay</td>
<td>50 ± 7</td>
<td>64 ± 9</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Total</td>
<td>53 ± 8</td>
<td>62 ± 9</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Values for non-BM and BM groups are means ± SD.

Table 5. Summary of the students’ academic performance in BM and non-BM groups

Table 4. Student ratings of the educational attributes of BM on a scale of 1–5, where 1 is least and 5 is the peak

<table>
<thead>
<tr>
<th>Educational Attributes of BM</th>
<th>Scores</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness in control of background noise</td>
<td>3.53</td>
<td>0.5</td>
</tr>
<tr>
<td>Ability to make dissection to be intensive by creating interest</td>
<td>3.61</td>
<td>0.8</td>
</tr>
<tr>
<td>Ability to refresh energy levels and maximize time of dissection</td>
<td>4.01</td>
<td>1.1</td>
</tr>
<tr>
<td>Ability to stimulate and sustain focus on dissection</td>
<td>3.99</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Mean SD.
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palliative measures are encouraged, these students must be given the opportunity to combat these negative feelings and emotions the best and most effective way common to them. Music has been reported as the most popular way youths enhance their moods and combat negative emotional feelings (51). Considering the results of this study, we are of the view that right selection of BM in the dissection laboratory will greatly enhance the quality of academic activity in the laboratory. If music switches on the right mental attitudes and moods that make for effectiveness among the adolescents (51), why do we then switch them off in our classrooms and in our laboratories?

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author(s).

AUTHOR CONTRIBUTIONS

Author contributions: E.G.A. conception and design of research; E.G.A. performed experiments; E.G.A. analyzed data; E.G.A. interpreted results of experiments; E.G.A. prepared figures; E.G.A. drafted manuscript; E.G.A. edited and revised manuscript; E.G.A. approved final version of manuscript.

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