

SYSTEMATIC REVIEW

In What Way Does Music Improve Learning in Medical Education? A Systematic Review

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ABSTRACT

Introduction: Music has been widely used in teaching and learning due to its observed positive effects. This review aimed to identify the beneficial impacts of music utilization in medical education. **Methods:** Using four established databases; Scopus, ScienceDirect, JSTOR and PubMed, exhaustive searched of related articles were performed for articles published between January 2010 and January 2020 using combination of keywords. Screening of titles and abstracts were conducted, with removal of duplicates. **Results:** Five full text articles were finally reviewed, of which one cross-sectional, three intervention and a qualitative studies. Consensus between authors had successfully identified three themes, which were positive effect of music on the well-being and performance of the medical students, as well as improved patient-doctor communication skills. **Conclusion:** The findings of the review confirmed the positive effects of music utilization on the well-being and performance of medical students, as well as on patient-doctor communication skills.

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INTRODUCTION

Globally, there have been increasing demand towards innovative teaching and learning to facilitate learning among students have been observed, including the use of arts such as music. The use of music in teaching and learning has been incorporated in various field of studies including in medicine. It has been proven not only to effectively convey and retain complex medical information to medical students and professionals (1) but also as a humanistic learning tool (2).

Humanism in medicine refers to compassionate and empathetic doctor-patient relationship (2). Empathic communication involves the practice of actively listening and paying full attention to understand another person's feelings and opinion, which is an important component of communication skill better understanding of the problems and assist in better management and solutions for patients (3). Medical students' listening skills can be

enhanced using music, which is an important skill to conceptualize the 'patient-doctor interaction.

Apart from music, participatory entertainment-education has also successfully implemented in the study of medicine (4). Learning strategies such as mnemonics; are commonly used by medical students to retain as much information possible (4). Other than its beneficial role for knowledge acquisition, music also improves learning efficiency through improvement of relaxation and alertness (5). Furthermore, previous related research on the use of background music during teaching and learning in general, have reported the positive effects of music on mood, increase alertness, reduce stress and anxiety as well as enhances relaxation (6,7). In view of the positive impact of music on learning, this review aimed to identify the beneficial impacts of music utilization in medical education.

METHODS

Data source and search strategy

The review is conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (8). We systematically

searched for relevant articles published in four main databases: Scopus, ScienceDirect, JSTOR and PubMed. Combination of keywords were used to allocate relevant articles: music AND medicine or medical AND leaning.

Articles included were observational (cross-sectional studies, cohort studies or case-control), intervention (randomized controlled trials or quasi experimental studies), qualitative and mixed methods study designs, with publication period between January 2010 and January 2020. The main subject discussed in the articles was undergraduate or postgraduate students in the field of medicine, with music utilisation being the intervention. Articles which were excluded were those published in other languages (due to limited resources for translation process), reviews, protocols, commentaries, conference proceedings, editorial letter, thesis and opinion articles.

Study selection

Four authors independently screened the titles and abstracts according to the predetermined eligibility criteria. After removal of duplicates, articles were either included, excluded or categorised as unclear for the review. Full articles were retrieved for those recorded as include, as well as unclear. Discussion between the authors were conducted to resolve any discrepancies in the assessment.

Data extraction and analysis

The extracted data is summarised in Table I. The table included information on study design, objective, location, sample size, participants, intervention (if any) and the study outcome (advantages of music utilization in medical teaching and learning).

Quality assessment

The Crowe Critical Appraisal Tool (CCAT) was used to assess the methodological quality of the included articles, based on eight criteria which included preliminaries, introduction, design, sampling, data collection, ethical matters, result, discussion and conclusion (9). The total score was converted into percentage to allow comparison, with those ≤50% considered of poor quality, 51 to 74% are acceptable quality, and ≥75% are considered high quality.

RESULTS

Search results

The initial search yielded 336 records, identified using four established databases. A total of 114 records remained after duplicates were removed, with further removal of 25 records based on screening of the titles and abstracts. A total of 29 full texts were retrieved and reviewed, leading to the exclusion of 24 full text articles as they did not meet the eligibility criteria for the review which include non-related study population and study field (see Fig. 1).

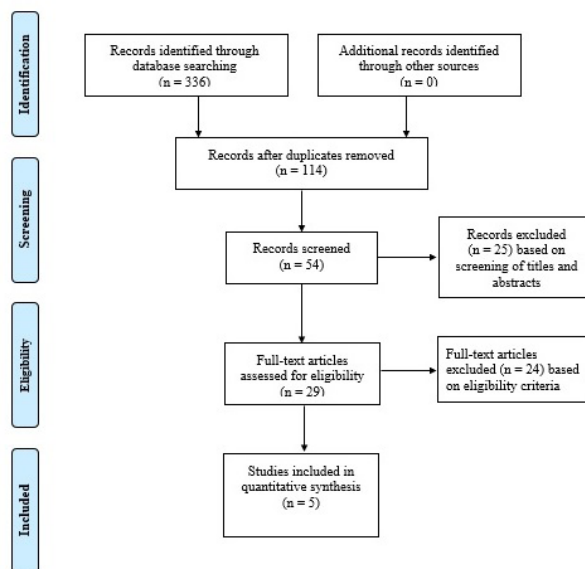


Figure 1:PRISMA flow diagram

Characteristics of the included studies

The included studies were conducted between the year of 2015 and 2020. Table I describes the five studies: one cross-sectional study (3), one qualitative study (10), one quasi experimental study (5) and two randomized controlled trials (11,12). All five studies were conducted among medical students with only one also involved clinical skill teachers (10) and music students (3) as comparative group.

Quality of included articles

According to the Crowe Critical Analysis Tool (CCAT), four studies were rated to be of high quality, with only one study of acceptable quality. Studies were acceptable (Table II).

Main findings

This current review identified three main themes or advantages, based on the findings reported from five included studies which are positive impact of music on the well-being (5,12) and performance (5,10-12) of the medical students, as well as patient-doctor communication skills (3). Two of the studies reviewed documented positive effects of music on the well-being of the medical students, through keeping the energy level up, feeling refreshed (5), reduced anxiety level and increase learning satisfaction (12). Meanwhile, four studies confirmed that utilization of music had positive effects on the performance of medical students. These include music enhanced the learning condition, reduced the length of time to complete the tasks given, makes learning more interesting (5), increased concentration (5,10), increase accuracy (11), and better grades reported (12). Only one article reported the important role of music on the development of higher levels of empathic tendency among medical students which is beneficial for future patient-doctor communication skills (3).

Table 1: Characteristics and summary of the results of the included studies

Citation	Study objective	Study location	Study design	Sample size	Intervention	Study outcomes
Anyanwu (5). Background music in the dissection laboratory: impact on stress associated with the dissection experience	To investigate the impact of background music (BM) in the cadaver dissection laboratory (CDL) and on stress associated with the dissection experience.	Nigeria	Quasi-experimental study	260 2 nd year medical and dental students (174 men and 86 women) from the College of Medicine of the University of Nigeria (Enugu Campus)	Calming types of background music (BM) of various Genres - played in the dissection laboratory for 3 weeks in the two sessions of each week.	<ul style="list-style-type: none"> - 89% (male) and 87% (female) perceived BM as a very useful tool in enhancing learning conditions in the CDL. - 96%: BM calms the environment - 89%: BM reduces the length of time it takes to settle down to the task of dissection. - 93%: BM makes dissection very interesting - 95.7%: BM keeps my energy level up and refreshed - A strong positive relationship was established between love for music and its perception as a tool for learning in the CDL (p<0.001). - A strong positive association on the students' views to reading with BM, its ability to increase concentration, and adoption in the laboratory (P<0.001). - Students that studied under the influence of BM had significantly higher scores (P 0.001) in the overall examination result, with reduction of stress level associated with the dissection experience was reduced by 33% with BM.
Kim et al. (11). Effectiveness of 100 beats per minute music on cardiopulmonary resuscitation compression rate education: A manikin study.	To determine the effectiveness of CPR education using music, to keep accurate chest compression rate, compared to other education method.	Korea	RCT	81 medical students	Control group vs metronome group vs music group	<p>Both education method of using music and metronome are more effective to keep accurate chest compression rate compared to conventional method:</p> <ol style="list-style-type: none"> a. There was a significant difference between the control (mean, 110.4; 95% CI: 104.4, 116.5) and metronome group (mean, 98.5; 95% CI: 91.6, 105.4) after education (p=0.01). b. There was a significant difference between control and music group (mean, 98.2; 95% CI: 94.6, 101.8) after education (p<0.001)
Bellier et al. (12). Impact of background music on medical student anxiety and performance during anatomical dissections: A cluster randomized interventional trial.	to determine if music can have an impact on student anxiety, student satisfaction and student performance in dissection room	Grenoble Medical School (Grenoble Alpes University, France)	A cluster randomized interventional trial	187 second year medical students.	The intervention was standardized background music, selected based on the literature, with a tempo of between 60 and 80 bpm.	<ul style="list-style-type: none"> - Anxiety: A significant (58%) relative decrease in acute anxiety, aOR: 0.423 [95% CI: 0.160- 0.710] was found for the music intervention group. - Performance: Students in the intervention group attaining higher grades than those in the control group (0.42/10 higher, p = 0.0016). - Satisfaction: A non-significant increase in satisfaction with 0.37 extra points (P = 0.137) in the intervention group.
Harris & Flynn (10). Medical education of attention: A qualitative study of learning to listen to sound.	To study how medical students are taught and learn the skills of listening to sound.	Melbourne, Australia	Qualitative study	15 semi-structured in-depth interviews (1 st , 2 nd and final year medical students & clinical skills teachers)	NA	Musical education provides medical students with skills in sensory awareness: Those who had studied music reported finding it easier to be attentive to the frequency and rhythm of body sounds and find ways to describe them, such as listening to lung sounds.
Pirgon (3). The effect of music education on the empathy of medical students	To compare the levels of empathy of music and medical students and then the levels of empathy of the medical students	Turkey	Comparative cross-sectional study	137 students comprising 59 music and 78 medical students.	Music education	<ol style="list-style-type: none"> a. Significant difference (p<0.01) in the Empathic Tendency Scale scores of music students and medical students: Medical students with music education have higher levels of empathic tendency b. Medical students who listen to classical music tend to be more "agreeable" than those who listen to other types of music.

Table II: Quality assessment of studies using Crowe Critical Analysis Tool (CCAT)

Category	Pirgon (3)	Anyanwu (5)	Harris & Flynn (10)	Kim et al. (11)	Bellier et al. (12)
1. Preliminaries (5)	4	4	3	4	4
2. Introduction (5)	4	4	4	4	4
3. Design (5)	4	4	3	5	5
4. Sampling (5)	4	4	3	5	5
5. Data collection (5)	4	4	4	5	4
6. Ethical matters (5)	4	4	4	4	4
7. Results (5)	4	4	3	4	4
8. Discussion (5)	4	4	4	4	4
9. Total score (40)	32	32	28	35	34
10. Percentage (%)	80	80	70	87.5	85

DISCUSSION

Well-being

Music is known to produce psychological reactions (13) that influence individual emotions. According to Welch et al. (14), there is increasing scientific evidence on the positive effect of musical activities on the physical, social, educational, and psychological (cognitive and emotional) of human life.

These benefits are evidenced across the lifespan, from early childhood (15), adolescence (16), and older adulthood (17), with evidence of its contribution to health and well-being (14), physical and psychological impacts (18) were reported. The positive impact on health and well-being were hypothesized to be related to the emotional engagement while performing the musical activities (14).

Music participation has also been linked with good mental health and positive feelings (19). It encourages, motivates, and inspires mood-change, mood-enhancement and can transport and transfer an individual to different psychological states of mind (20). Employing and integrating music in a learning course or curriculum helps motivate students to attend their lectures. Musically integrated courses are described as fun and enjoyable and where students feel engaged with a sense of community in joint musical activities (19) with their course mates, which otherwise sometimes they might feel isolated pursuing each their own tasks. Through participation in the musical activities, some realized their need to socialise, working together as a team and to belong to a group of supportive peers.

Performance

The highly stressful nature of the medical education can negatively affect the cognitive functioning and learning abilities of the medical students. Study method needs

to be modified in order to reduce stress during learning activities. The current review revealed the role of music to enhance performance of medical students. The use of music in teaching and learning is not new but is considerably limited in medical education. Music does not only able to relax our mind effectively on daily basis but also gives such a big impact on academic reputation and achievement. It has been reported to have a strong positive impact on individual performance and an effective tool to relieve stress (21). Music able to calm the mind and increases concentration (22), particularly in learning subjects that need intensive memorizing skills.

Although listening to music while studying has become a common practice among students of various background, its ability to enhance curricular efficiency has been doubtful. According to a local study involving 200 medical undergraduate students, there was no adverse effects on the students' concentration associated with the current trend of listening to music while studying as it may not pose any adverse effects on the concentration of student, evident by the higher incidence (75%) of correct answers while listening to soft music (23). The use of song or musical mnemonic as memory enhancer may seem atypical in some fields such as health sciences and medicine, but at the same time may be the most suitable tool (24).

Communication skills and empathy

The connection between music and communication has always been acknowledged. More recently, modern medicine has embraced the therapeutic role of music and its use as a communicative tool. This is especially apparent in children in the autism spectrum disorder (ASD) who have limitations in verbal communication and in the rehabilitation of stroke patients (25,26).

Medical training often emphasises on having effective verbal communication to deliver accurate of medical information, especially to patients and their family members. However, the art of effective communication also involves being an engaged listener, which is an important aspect during medical consultation. Music encourages the listener to listen for nuances in pitch, rhythm, repetition and even the direction of the music which can be reflected in the voice and patients' affection (27). The interplay of music, both harmonic and discordant encourages the listener to analyse multiple streams of information. For a sharp medical practitioner, a patient's words, behaviour, appearance, medical history, and interactions with family may all present with clues to the patient's eventual medical management (27).

It has been argued that doctors with a background in music tend to be more empathic than their peers (2,3). Despite the very little published works that can connect the two, attempts were made in medical education to

utilize music and song to promote understanding of the disease, empathising with sufferers of disease and also to promote cultural acceptance (2). Music also promotes critical thinking apart from creativity which is essential in the practice of sciences (28). A good example being renowned surgeon, Theodor Billroth best known for creating two gastric reconstruction operations named after himself, but lesser known by history on his skills as a composer. Billroth believed that “science and art spring from the same source”. Thus, the creativity and imagination he utilised in composing music spilled over in his practice of medicine (29). It is generally agreed that humanism training is important in the medical education curricula. Nevertheless, research is still inconclusive on the impact of incorporating music and medical training and whether it will produce better doctors (2,27).

CONCLUSION

Current systematic review identified three themes on the beneficial impacts of music to facilitate learning among medical students through maintaining of good well-being, academic performance, and communication skills of medical students. The positive impact of music on well-being of students through the experience of positive emotions, self-esteem and life satisfaction may mediate the relationship between music and medical students’ academic performance as well as their ability to communicate effectively with patients. However, all included studies indicate the role of music and learning rather than as teaching medium, which may limit the overall interpretation on the beneficial impacts of music utilization in medical education. A combination of medical students’ and lecturers’ perspectives are crucial in order to get a more accurate view and better understanding on the potential pathways between music and medical education.

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