



## Care of Patients Undergoing Diagnostic Procedures

## The effect of music during bronchoscopy: A meta-analysis

Wilson W.S. Tam, PhD<sup>a,\*</sup>, Kenneth K.H. Lo, BSc<sup>b</sup>, David S.C. Hui, MD<sup>c</sup><sup>a</sup> Alice Lee Centre for Nursing Studies, Yong Loo Lin School of Medicine, National University of Singapore, Singapore<sup>b</sup> School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong SAR, People's Republic of China<sup>c</sup> Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Hong Kong SAR, People's Republic of China

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## ABSTRACT

Bronchoscopy is considered a stressful procedure performed on patients. Hence, the use of music to ease the anxiety of patients has been examined in various studies, but the results have been inconclusive. The aim of this review is to synthesize the findings of previous studies on the effects of music therapy on the physiological outcomes of patients undergoing bronchoscopy. An electronic database search was performed to identify the literature. Random-effects model was used to combine the results, and meta-regression was used to explore the heterogeneity. Seven studies with 829 subjects were included. Results showed that the combined mean differences (95% confidence interval) for systolic and diastolic blood pressure were  $-11.99$  ( $-15.82$ ,  $-6.57$ ) and  $-4.84$  ( $-7.78$ ,  $-1.90$ ) mm Hg, respectively, whereas that for heart rate was  $-10.57$  ( $-16.63$ ,  $-4.51$ ) beats per minute. In conclusion, listening to music reduced blood pressure and heart rate among patients undergoing bronchoscopy.

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## Introduction

Bronchoscopy involves the endobronchial visualization of the airways for diagnostic and therapeutic purposes.<sup>1</sup> In this process, a bronchoscope is inserted into the airway through either the nostril or the mouth of a patient so that the bronchoscopist can examine the patient's airway for abnormalities, such as foreign bodies, bleeding, tumors, and inflammation. Specimens may also be taken from inside or outside the major airway.<sup>1</sup>

Bronchoscopy is often stressful for patients because of the fear of pain and breathing difficulties.<sup>2,3</sup> Therefore, sedative drugs are often administered prior to conducting bronchoscopies.<sup>4</sup> However, the use of sedation is risky and costly because of the potential risk of cardiorespiratory complications, such as hypotension, tachycardia, and respiratory depression.<sup>5,6</sup> Among sedated patients, cardiopulmonary problems account for 50% of the complications and 60% of endoscopy-related deaths.<sup>5</sup> Therefore, music therapy has been suggested to alleviate stress, discomfort, and anxiety levels of patients<sup>7,8</sup> as well as decrease stress-related increases in blood pressure and heart rate. Rubin's systematic review revealed

that less sedative ( $p = 0.06$ ) and analgesia ( $p < 0.01$ ) requirements were needed for the patients in the music group.<sup>8</sup>

Meanwhile, music has been used to promote relaxation in many countries, including ancient China<sup>9</sup> and India among others.<sup>10</sup> Scholars have used various experimental designs to evaluate the benefits of music on health.<sup>11</sup> The tempo of the music is the most important component of music therapy.<sup>12</sup> Slow and flowing music with 60–80 beats per minute can distract a patient from pain and anxiety. Listening to music gives patients a sense of autonomy and an ability to cope, thus enabling them to alter their perception of the negative sensation.<sup>7</sup>

From a biological perspective, the sound of music can be transmitted to brain regions involved with emotion so as to initiate psychological response (e.g., anxiety), or influence physiological parameters (e.g., heart rate and blood pressure) by stimulating centers in the central nervous system.<sup>13</sup> The endocrine and autonomic nervous systems are involved in the above responses. Music affects the release of corticotropin-releasing hormones from the hypothalamus. In turn, this alters the release of cortisol, the hormone responsible for stress perception. As for the autonomic nervous system, music may stimulate the release of norepinephrine, which decreases the heart rate and blood pressure.<sup>14</sup>

Recent studies have demonstrated the role of music in reducing anxiety in patients with acute myocardial infarctions<sup>15</sup> and in improving physiological and emotional responses among intensive care patients.<sup>16</sup> The effects of music on endoscopic procedures,

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\* Corresponding author. Alice Lee Centre for Nursing Studies, Level 2, Block MD11, 10 Medical Drive, 117597, Singapore. Tel.: +65 65168684; fax: +65 67767135.

E-mail address: [nurtsw@nus.edu.sg](mailto:nurtsw@nus.edu.sg) (W.W.S. Tam).

including flexible sigmoidoscopy and gastrointestinal endoscopy, have been examined.<sup>17–19</sup> In addition, several systematic reviews and meta-analyses reported beneficial effects, including a shorter procedure time, fewer sedation use, and lower pain levels.<sup>8,20,21</sup> Music has also improved respiratory rate in patients receiving mechanical ventilatory support, although the beneficial effect has not been shown on oxygen saturation.<sup>22</sup> The effects of music used during bronchoscopy have been studied but the sample sizes of the studies have been small,<sup>23</sup> and it is often difficult to make conclusions from individual small studies. Recently, Wang and colleagues conducted a systematic review of studies with the aim of examining the effect of music on endoscopy, in which the patients had significantly improved pain scores, anxiety levels, heart rate, and satisfaction scores. However, they did not focus on bronchoscopy.<sup>21</sup> The aim of the present systematic review and meta-analysis is to integrate evidence from different studies that examined the effectiveness of music in improving physiological outcomes and reducing anxiety among patients undergoing bronchoscopy.

## Methods

### Inclusion criteria

We included only randomized controlled studies, in which at least one of the comparison groups comprised patients listening to music during bronchoscopy as part of the intervention. Moreover, a control group of patients receiving the standard procedure was required for inclusion. Only articles written in English or Chinese were included. No restriction was placed on the demographic, clinical characteristics of the subjects nor the settings for the studies.

### Search strategies

This systematic review identified studies that evaluated the effects of music during bronchoscopy. We followed the strategies suggested in the Cochrane Handbook for Systematic Review to search published articles from the electronic academic database first and then grey literature from thesis/dissertation databases and Internet search engines.<sup>24</sup> First, an electronic search was conducted in four English databases, including the following: Allied and Complementary Medicine (1985–2015), Embase™ (1974–2015), Ovid Medical Literature Analysis and Retrieval System Online (MEDLINE) (1946–2015), and the Ovid Nursing Database (1946–2015). Then, an electronic search was conducted in all evidence-based medicine databases, including the Cochrane Database of Systematic Reviews, the American College of Physicians Journal Club, the Database of Abstracts of Reviews of Effects, the Cochrane Central Register of Clinical Trials, the Cochrane Methodology Register, the Health Technology Assessment, and the National Health Service Economic Evaluation Database (1991–2015).

The keywords “bronchoscopy” and “bronchoscope,” subject headings in Ovid MEDLINE, were used to search for bronchoscopy-related articles. Meanwhile, “music” and “music therapy,” subject headings in Ovid MEDLINE, were used to search for music-related articles. This set of keywords was also used for other databases within the Ovid platform. The searches were then combined and all duplicate records were removed.

Second, an electronic search was performed in two Chinese databases [(the China Academic Journals Full-Text Database and the WangFang Data), with the keywords “支气管” (bronchus) and “音乐” (music).] Here, “支气管” was used as the keyword instead of “支气管镜” (bronchoscopy) because the former should include all the studies related to the latter. Similarly, “音乐” (music) was used because it included articles about music therapy.

Third, an attempt to identify theses and dissertations through the ProQuest Dissertations and Theses Database and the Chinese Dissertation Database was performed. Finally, an Internet search was carried out using the Internet search engine Yahoo! with “bronchoscopy” and “music” as keywords. The inclusion criteria used were the same as those in previously mentioned databases. The search results were sorted by relevance so only the first 10 pages of the search results were examined. In addition, reference lists of the collected papers were scrutinized for potential eligible articles.

### Data extraction

Authors, year of publication, and demographic data (e.g., age distribution, gender proportion, intervention, outcome measures, and results) were extracted for each eligible study. The data extraction form was modified from the data extraction form of van Tulder and colleagues.<sup>25</sup> The investigators independently extracted the data and one investigator summarized the data. Agreements were reached on the choice of the articles before proceeding to data analysis. When data or information were missing or unclear, the corresponding author of a study was contacted through e-mail in order to obtain clarification.

### Risk of bias

Two reviewers independently scored the risk of bias with Cochrane risk of bias assessment.<sup>26</sup> This tool has six domains (sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting, and other sources of bias).<sup>26</sup> Blinding generally refers to the blinding or masking of participants, personnel and outcome assessors; however, because the blinding of participants is difficult in behavioral interventions,<sup>27</sup> only the blinding of personnel and outcome assessors was evaluated in this review. Discrepancies in data extraction and risk of bias assessment results were resolved by group consensus.

### Statistical analysis

The means and standard deviations of the outcomes, such as blood pressure and heart rate measurements, were extracted from each study. Next, the mean difference and standard error between the music group and control group for each outcome were computed. Blood pressure readings reported in kilopascals (kPa) were converted to mm Hg before computing the mean difference. Random effects models were used to combine the effects from individual studies.<sup>28</sup> Heterogeneity was examined using Cochran's Q test and  $I^2$ . All analyses were conducted using the Review Manager software (RevMan, version 5.3). Meta-regression<sup>28</sup> was used to examine the source of heterogeneity when necessary using the R-function metafor with the male proportion, mean age, and the outcome measured at baseline as the explanatory variables. Personal data in systematic reviews were not identified and the study was exempted for ethical approval.

## Results

### Literature search

The final electronic search was conducted in March 2015. A total of 13 articles were found from five English databases, and nine articles were excluded after screening their titles and abstracts. The four remaining full text articles were obtained for further examination.<sup>23,29–31</sup> One paper was further excluded because it was not a randomized controlled trial.<sup>30</sup>

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