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Review

Effect of music in reducing patient anxiety during colposcopy: A systematic review and meta-analysis of randomized controlled trials

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ABSTRACT

Background: Music therapy has been used greatly in various medical procedures to reduce associated anxiety and pain.
Objective: to evaluate the evidence from published randomized clinical trials (RCTs) about the effect of music intervention in reducing patient's anxiety during the colposcopy.
Search strategy: Electronic databases included PubMed, Cochrane Library, Scopus and Web of Science were searched using the relevant MeSH terms.
Selection criteria: All RCTs assessing the effect of music therapy versus no music in reducing anxiety during colposcopy were considered. Eighty-five studies were identified of which five studies deemed eligible for this review.
Data extraction: The extracted outcomes were; anxiety, pain during and after the procedure, and satisfaction levels. They were pooled as mean difference in a fixed-effects model, using Review Manager 5.3 software for windows.
Main results: We found no effect of music therapy in reducing the anxiety levels when compared with the control group (SMD= -0.11, 95% CI [-0.36, 0.14], p = 0.4). No difference between music and control groups regarding pain during and after the procedure respectively (SMD= -0.20, 95% CI [-0.58, -0.18], p = 0.31) and (SMD=-0.10, 95% CI [-0.30, -0.10], p = 0.33).
Conclusions: Music therapy had no positive effect in reducing anxiety, pain and satisfaction levels during colposcopy.

Contents

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Introduction

Cervical cancer is one of the most common cancers affecting the female genital tract worldwide [1]; however there is a dramatic decrease in its incidence as a result of adherence to efficient screening programs [2]. Cervical cancer screening is crucial for different women in this world [3].

Colposcopy is a procedure used to detect and treat any cervical cancer precursors [4]. Many women reported that colposcopy is stressful procedure because of the associated anxiety, unprotected placing, pain during taking the biopsy and burning effect of the acetic acid preparation [5]. Associated Anxiety and pain may be very challenging as experienced by some patients leading to loss of their follow up in the future [6]. Any intervention that can reduce the stress before and during colposcopy is of great interest for different physicians treating women with cervical dysplasia. One of these interventions is video colposcopy in which Walsh et al. found a significant diminution in anxiety was realized in all visits in patients with video colposcopy more than the control groups [7].

Furthermore, the importance of music as an intervention to decrease anxiety and fear before and during colposcopy has been discussed controversially with no firm conclusive evidence about this problem. Because of the low-cost effectiveness nature of the music therapy, it has been widely used in various medical practices to decrease anxiety, distress, and pain including cancer treatment, delivery, pre-surgical preparation, and postsurgical recovery [8–10].

Different Music types for pain alleviation were observed in a previous review which included a considerable number of studies. Their results showed a great variability in the included studies. Pooling of the studies resulted in a minimal significant reduction which makes it of suspicious meaning [11]. A meta-analysis done by Mak et al. indicated an optimistic music influence in improving discomfort, anxiety, and pleasure for patients who had performed endoscopic surgery, however, they did not include the patients who had done a colposcopy [12].

Additionally, a Cochrane systematic review included only one trial about music in colposcopy suggested that music during colposcopy significantly caused an improvement in both anxiety levels and pain experienced by the patients during the procedure in comparison with the control group [13]. In addition, no value of music in increasing patients' satisfaction during colposcopy as reported by Danhauer et al. in contrary to the fact that music can increase the patient's satisfaction level [14].

As a result of this controversy, we conducted this systematic review and meta-analysis to establish evidence from published studies about the effect of music during the colposcopy procedure regarding anxiety, pain and satisfaction experienced by various patients.

Materials and methods

We did this systematic review and meta-analysis in accordance with the guidelines reported in the Cochrane Handbook for Systematic Reviews of Interventions [15]. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines were followed during the preparation of this review and meta-analysis [16]. Because the study was a systematic review, it was exempt from ethics approval.

Search strategy

We performed a comprehensive literature search using four electronic databases (PubMed, Cochrane library, Scopus and ISI Web of science) using the following search terms: (Music OR Symphony OR Rhythm OR Orchestra OR Song) AND (Colposcopy OR cervicoscope OR colposcope). We also searched the references of relevant articles retrieved.

Eligibility criteria

We included randomized clinical trials (RCTs) according to following criteria: (I) population: women who were examined by colposcopy (II) intervention: Music intervention; (III) comparator: control (No music intervention); (IV) outcome parameters: Anxiety, pain and satisfaction; and (V) study design: RCTs. We excluded from our study all non-English studies, non-randomized clinical trials, editorials and letters.

Study selection

We performed screening of potentially eligible studies in a two step-wise manner (title/abstract screening followed by full-text screening). Each stage was conducted by two authors (AA, AS) and in case of controversies, a consensus was obtained upon discussion between the authors. We excluded any paper not reporting enough data to report our included outcomes. All identified articles were evaluated according to a standardized format including study design, methods, participant characteristics, intervention, and results.

Data extraction and analysis

Two authors (AA, AS) extracted the data independently using Microsoft excel sheet. We collected the following data: baseline characteristics of enrolled patients, and outcomes if reported as follows: Anxiety change, pain during and after the procedure, satisfaction level.

Continuous outcomes were pooled as weighted mean difference (WMD) and standardized mean difference (SMD) using the Mantel-Hansel method with 95% confidence intervals (CI). All statistical analyses in this study were completed by the RevMan software package (ver. 5.2; Cochrane Collaboration, Oxford, UK). Chi-square test was used to investigate the presence of heterogeneity while Higgins I^2-statistic was utilized to quantify the variability in effect estimates that is caused by heterogeneity if found. If there was any heterogeneity between studies, we used random-effects model; otherwise, the fixed-effects model was utilized. We did the sensitivity analysis to consider the contribution of each included study to the pooled estimation of the reported heterogeneity by removing one trial at a time and reanalyzing the pooled mean difference estimation for the remaining studies.

Quality of included studies and risk of bias assessment

The quality of the included RCTs were evaluated according to the Cochrane risk of bias assessment tool, obviously judged in (chapter 8.5) of Cochrane Handbook for Systematic Reviews of Interventions 5.1.0 [17]. This tool contains the following domains: selection bias (sequence generation), performance bias (blinding of participant and personnel), blinding of outcome assessment (detection bias), attrition bias (incomplete outcome data), reporting bias (selective outcome reporting) and other potential sources of bias. The authors' decisions are regarded as "Low risk," "High risk," "Unclear risk" of bias.

According to Egger and colleagues, the estimation of publication bias utilizing funnel plot and Egger's test is unpredictable for less than ten pooled studies. Therefore, in the current study, we could not assess for publication bias by Egger's test due to the limited number of the studies which met our inclusion criteria [18,19].

Dealing with missing data

We used Hozo et al. method to obtain mean and standard deviation (SD) from median and range to avoid excluding those papers [20]. Moreover, we used Luo et al. to obtain the mean and SD from median and interquartile range to include those papers [21].

Results

Search results and characteristics of included studies

We retrieved 85 studies from the electronic databases. After title and abstract screening, nine articles were eligible for full-text screening. We excluded four of them after reading the full-text which did not fit our eligibility criteria. Therefore, we included five studies with a total number of 836 patients in our final analysis (Fig. 1). We searched the references of the included RCTs manually, but we did not find any more relevant records. The characteristics of the included studies [12,14,22–24] were summarized in Table 1.

Risk of bias assessment

The quality of the included RCTs was of moderate quality as stated by the Cochrane risk of bias assessment tool. The Quality assessment summary is shown in Fig. 2.

Outcomes

Anxiety change

Anxiety change was reported in five studies with 384 patients in music group and 379 patients in the control group. The pooled SMD showed no difference between the both groups (SMD= -0.11, 95% CI [-0.36, 0.14], p = 0.4). The pooled studies were heterogeneous (p = 0.02, I^2 = 66%) as shown in Fig. 3A.

This high heterogeneity disappeared after doing sensitivity analysis by removal of Chan et al. study (p = 0.59, I^2 =0%) and it shows no difference between the music and control groups in reducing anxiety during the colposcopy (SMD= -0.01, 95% CI [-0.18, 0.16], p = 0.93) as shown in Fig. 3B.

Pain during colposcopy

Pain levels during the procedure were reported in four studies with 328 patients in the music group and 321 patients in the control group. The pooled SMD showed no difference between both groups (SMD= -0.20, 95% CI [-0.58, -0.18], p = 0.31). The pooled studies were heterogeneous (p = 0.0008, I^2 = 82%) as shown in Fig. 4A.

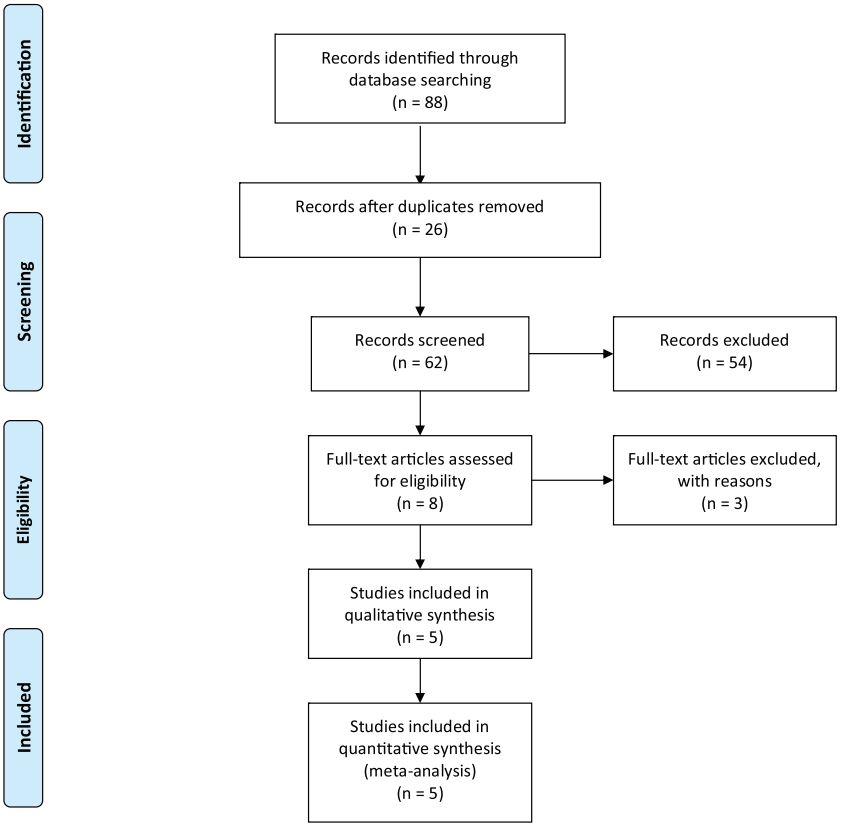


Fig. 1. PRISMA Flow Chart of the study selection process.

Table 1
summary-of-included-studies.

Study ID	Study design	Groups of interventions	Sample size	Age Mean (SD)	BMI Mean (SD)	Parity Mean (SD)	Marital status in mean (SD)	Colposcopic findings	Conclusion
Hilal 2018	Randomized controlled trial	Music intervention	103	35.1 (12.2)	24.1(3.8)	0.7(1.5)	Married or in a relationship 45 (43.7) Single 40 (38.8) Divorced, widowed, or separated 18 (17.5)	Normal 6 (5.8) Minor changes 51 (49.5) Major changes 42 (41.7) Suspicious for invasion 1 (1.0) Nonspecific 2 (1.9) Miscellaneous findings 0(0)	Mozart's Symphony No. 40 does not reduce anxiety in women undergoing colposcopy
		No music intervention	102	34.2 (9.2)	23.3(3.2)	0.7(0.9)	Married or in a relationship 50 (49.0) Single 35 (34.3) Divorced, widowed, or separated 17 (16.7)	Normal 1 (1.0) Minor changes 45 (43.7) Major changes 55 (53.4) Suspicious for invasion 0(0) Nonspecific 1 (1.0) Miscellaneous findings 0(0)	
Chantawong 2017	Randomized controlled trial	Music intervention	74	48.6(37)	NA	2.9(5.3)	NA	≥ LSIL 27 (36.5) ≥HSIL 46 (62.2)	The effects of music listening on reducing pain and anxiety during LEEP could not be demonstrated in this study.
		No music intervention	76	44(28.7)	NA	1.4(2.3)	NA	≥ LSIL 28 (36.8) ≥HSIL 42(55.3)	
Danhauer 2007	Randomized controlled trial	Music intervention	56	27.3 (9.1)	NA	159.9 (5.3)	Never married: 29(51.8) Divorced or separated 7(12.5) Married/ Partnered 20(35.7)	NA	Mind-body interventions had no statistically significant impact on reported anxiety, perceived pain, or satisfaction with care
		No music intervention	58	28.9 (9.5)	NA	157.4 (5.7)	Never married 23(39.7) Divorced or separated 16(27.6) Married/ Partnered 19(32.7)	NA	
Mak 2017	Randomized controlled trial	Music intervention	39	38.8(8.3)	24(4.1)	156.9 (3.9)	N/A	Normal 2(6) Low grade 18(47) High grade 17(44) Carcinoma 1(3)	No positive effect of music on patients' level of pain, anxiety or satisfaction of patient or doctor for office hysteroscopy and colposcopy.
		No music intervention	35	38.9(10.7)	24.1(6.1)	156.9 (5.8)	N/A	Normal 2(7) Low grade 22(64) High grade 10 (29) Carcinoma 0(0)	
Chan 2003	Randomized controlled trial	Music intervention	112	40(6.8)	NA	NA	Single: 11 (9.8) Divorced 11 (9.8) Widow 0(0) Married 84 (75.0) Cohabitated 6 (5.4)	Normal 12 (10.7) LSIL 85 (75.9) HSIL 15 (13.4)	Music is a simple, inexpensive, and easily used strategy to minimize anxiety and pain during colposcopy examination.
		No music intervention	108	38.5(7.7)	NA	NA	Single: 20 (18.5) Divorced 4 (3.7) Widow 1 (0.9) Married 79 (73.1) Cohabitated 4 (3.7)	Normal 18 (16.7) LSIL 72 (66.7) HSIL 18 (16.7)	

SD = Standard Deviation,N/A = Not Available.
LSIL = Low grade squamous intra-epithelial lesions.
HSIL= High grade squamous intra-epithelial lesions.

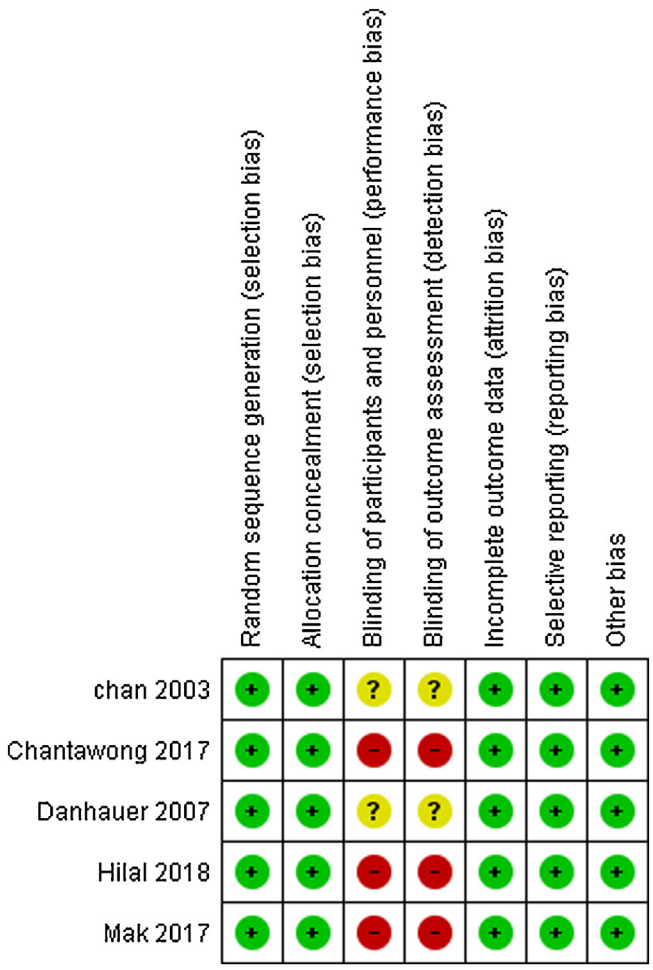


Fig. 2. Risk of bias summary graph.

This high heterogeneity disappeared after doing sensitivity analysis by removal of (Chan et al. study) (p = 0.49, I^2 =0%) and it showed that there is no difference between the music and control groups in reducing pain during the colposcopy (SMD= -0.02, 95% CI [- 0.21, 0.17], p = 0.87) as shown in Fig. 4B.

Pain after colposcopy

Pain levels after colposcopy were reported in three studies with 198 patients in the music group and 195 patients in the control group. The pooled SMD showed no dissimilarity between both groups (SMD=-0.10, 95% CI [-0.30, -0.10], p = 0.33). The pooled studies were homogenous (p = 0.92, I^2 = 0%) as shown in Fig. 5.

Satisfaction levels

Satisfaction levels after the procedure was reported in three studies with 233 patients in the music group and 236 patients in the control group. The pooled SMD showed a similarity between the music group in comparison with no music intervention group (SMD = 0.16, 95% CI [-0.02, 0.34], p = 0.08). The pooled studies were homogenous (p = 0.30, I^2 = 17%) as shown in Fig. 6.

Discussion

Up to our knowledge, this is the first systematic review and meta-analysis to investigate the efficacy of musicintervention in reducing anxiety and pain during colposcopy.In this meta-analysis, we did not find any statistically significant difference regarding the change in the anxiety scores between music and no music intervention groups. Moreover, there is no significant difference between both groups regarding pain during and after the procedure and the satisfaction level after the procedure.

First of all, the high heterogeneity that was found in the anxiety change levels and pain during the procedure was resolved and entirely disappeared by the removal of Chan et al. study [22]. This may be due to the associated limitations in this study in which

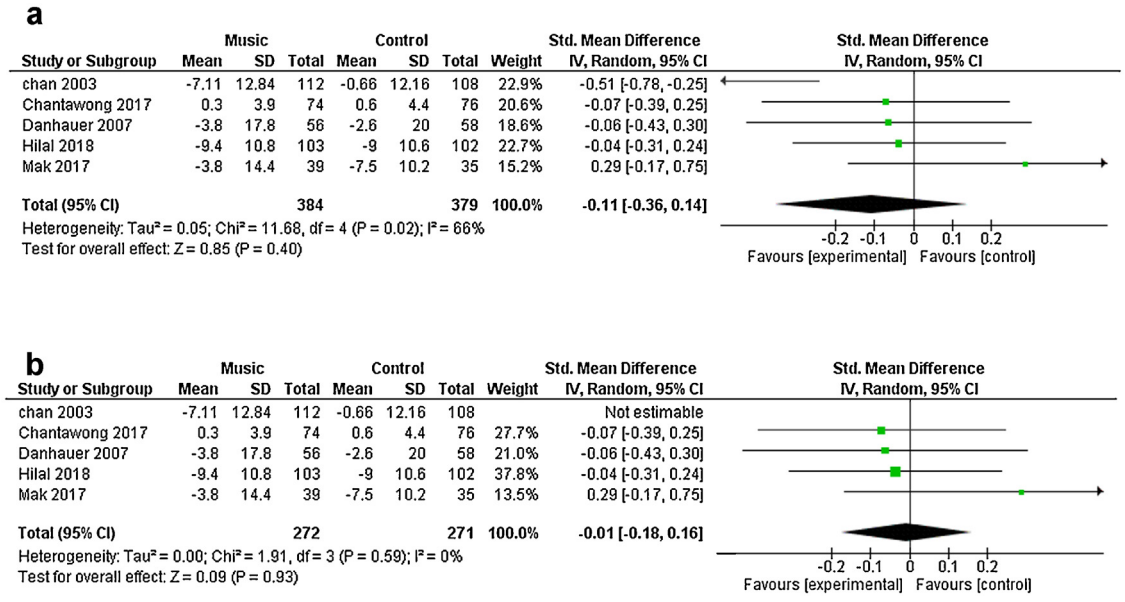
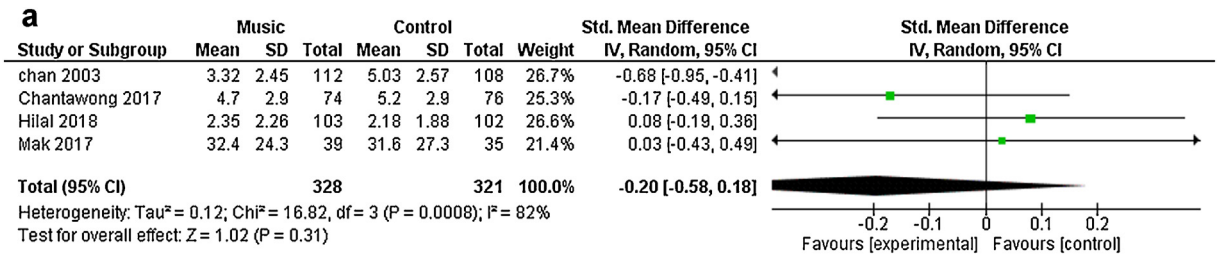


Fig. 3. (A) Forest plot for anxiety change with colposcopy. (B) Forest plot for anxiety change with colposcopy after removal of Chan et al study.



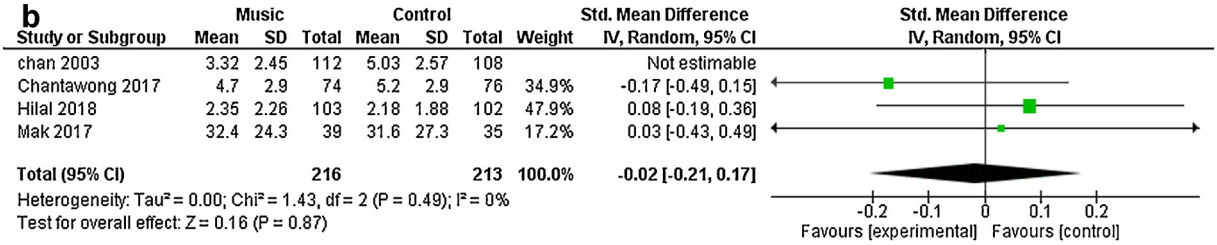


Fig. 4. (A) Forest plot for pain scores during colposcopy. (B) Forest plot for pain scores during colposcopyafter removal of Chan et al study.

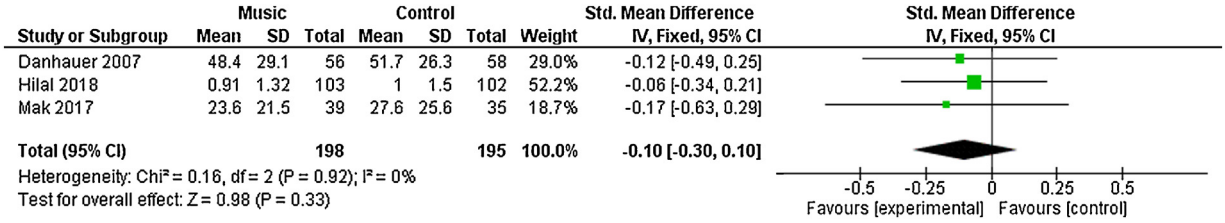


Fig. 5. Forest plot for pain scores after colposcopy.

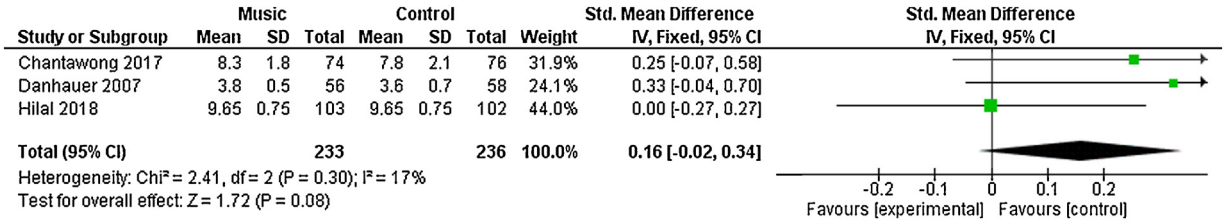


Fig. 6. Forest plot for satisfaction levels after colposcopy.

many clinicians were put in the colposcopy clinics to imitate actual medical examination. This may produce a bias due to variability in the results provided by different doctors. Furthermore, most of the participants in Chan et al. study were Chinese, and the music style might not be accepted by different cultural individuals [22].

Regarding the anxiety levels, our results are in accordance with the study done by Hilal et al. which demonstrated that music therapy during colposcopy didn't reduce the anxiety levels greatly as thought [23]. Moreover, Chantawong et al. indicated that there was no difference between music therapy and control groups in reducing anxiety and this came in agreement with our results [24]. However, Chan et al. concluded that music therapy is effective in reducing the degree of anxiety in patients undergoing colposcopy procedure [22]. Additionally, our results about pain perceived either during or after the procedureis reinforced by Danhauer et al. that found a similarity between music and control groups in reduction of pain procedure by the procedure [14]. However, this is contradicted by the study of Chan et al. which concluded that music therapy greatly reduces pain perceived by the patients during colposcopy compared to the control group [22].

In addition, this is argued by some studies in which they concluded that music could lead different women to forget severe painful sensations experienced during the procedure and thereby decreasing their anxiety reactions. Moreover, they found that music therapy implementation during different procedures may have a role in the cognitive level in which women forgot their worries and anxiety, and instead, they concentrate on enjoyable music thereby decreasing their tension, their distress and their perceived pain [25,26].

Furthermore, post procedure satisfaction levels were the same in both music and control groups. This is supported by the study of Danhauer et al. which indicated that there was no encouraging effect of music therapy regarding the satisfaction levels [14]. This is also in accordance with Hilal et al. that supported our results and showed no increase in the satisfaction levels caused by Mozart's Symphony No. 40 [23]. However, this is argued by Evans' study.in which they found that the music therapy can be used to increase the satisfaction levels

in addition to termination of different side effects of the care and treatment in patients in different hospitals [27].

The main strength of our systematic review was including very good-quality studies, which allowed us to solve the question and generate recommendations and accomplishing a complete methodology; however, we acknowledge the presence of some limitations.

The limitations of our study are the limited number of the included studies; the relatively small sample size of the involved studies participants and our ruling out of non-English studies. However recent evidence realized that exclusion of non-English studies does not cause any bias to the meta-analysis results [28]. Moreover, the choice of the anxiety measurement tool during the colposcopy procedure which is Spielberger State-Trait Anxiety Inventory (STAI) used in the most of our included studies may not be the gold standard for measurement. Although it was validated and established, some questions were vague and insufficiently framed especially if the concerns were about the procedure and other related influences. Most of our included studies are not blinded which is a considerable limitation. Each study from our included studies used different types of music which may be confusing for different patients and may cause high heterogeneity in some outcomes. Duration of the procedure and waiting time were not handled in most of the included studies. Waiting for a long time can greatly modify the anxiety and pain in different patients, and longer procedure time can decrease the satisfaction level in both the patients and the doctors.

However, in randomized trials of non-pharmacological treatments, it may be difficult to blind the relevant parties and to exclude the influence of the provider's expertise [29]. Although the nature of music interventions makes it hard to perform double-blinded studies, suitable randomization, and reporting following the CONSORT checklist for non-pharmacological trials could help minimize the risk of bias in future trials [30].

Our recommendations are to increase the number of blinded randomized clinical trials related to this topic to reach a better conclusion. Moreover, we recommend reducing the number of physicians to better determine the pain, anxiety and satisfaction levels without bias. More experienced physicians should be chosen to do the colposcopy. Pain scores can drop more than expected when more experienced physicians are used to perform any gynecological procedures. The future studies related to this topic should focus on the doctors' satisfaction levels as this outcome is poorly discussed in the studies.

Conclusion

This systematic review suggests that music therapy has no great positive effect in reducing anxiety and pain levels and no effect in increasing satisfaction levels when compared with control groups during the colposcopy procedure.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

Acknowledgements

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