REVIEW ARTICLE

Effect of music therapy on blood pressure and quality of life among individuals with essential hypertension: A systematic review and meta-analysis

Zewen Li[1,*], Yi Zhang[2]

[1]Department of Medical and Health Care, Linyi Vocational College, Linyi 276017, Shandong Province, China
[2]Faculty of Health and Wellness, City University of Macau, Macau 999078, China

ABSTRACT

Essential hypertension requires lifelong treatment, which is ineffective and has many side effects with medications alone, thus, a non-invasive, low-cost non-pharmacological therapy to improve treatment rates and compliance is needed. To investigate the effects of music therapy on blood pressure levels, negative emotions, and quality of life in patients with essential hypertension, a systematic review and meta-analysis based on Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were performed in the present study. Randomized controlled trials about the effect of music therapy on essential hypertension were retrieved by a systematic search of PubMed, Embase, Scopus, Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), WanFang, VIP, and China Biology Medicine (CBM) databases from inception to February 2025. Two reviewers independently screened the literature, extracted data, and assessed the risk of bias for inclusion in the study. Statistical analyses were performed using Cochrane software Revman 5.3 software and ADDIS 1.16.5 software. A total of 14 studies involving 1472 patients were included. Meta-analysis showed that music therapy reduced systolic blood pressure (mean difference [MD] = -11.18, 95% confidence interval [CI]: -13.17 to -9.20, $P < 0.05$) and diastolic blood pressure (MD = -7.06, 95% CI: -9.14 to-4.97, $P < 0.05$), and alleviated anxiety (MD = 2.15, 95% CI: -2.74 to-1.57, $P < 0.05$) and depression (MD = -3.66, 95% CI: -5.88 to -1.45, $P < 0.05$) in patients with essential hypertension. Network meta-analysis indicated that Chinese traditional medicine five-element music (59%) was more effective than other types of music (41%) in lowering systolic blood pressure, but less effective than other music (73%) in lowering diastolic blood pressure. No serious adverse events were reported in any trial. In conclusion, music therapy effectively lowered blood pressure levels, improved the quality of life in patients with hypertension, and had positive efficacy in relieving anxiety and depression.

Key words: music therapy, hypertension, Chinese traditional medicine five-element music, anxiety, depression

INTRODUCTION

Hypertension is a common chronic cardiovascular disease characterized by increased blood pressure in the systemic circulation. Essential hypertension accounts for 95% of human hypertension (Daghbouche-Rubio *et al.*, 2022). Its underlying pathogenesis may involve multiple factors such as genetics, environment and lifestyle, presenting as a disease in which the nervous system and immune response are jointly involved (Daghbouche-Rubio *et al.*, 2022). Epidemiological studies report that approximately 1.4 billion adults worldwide

***Corresponding Author:**
Zewen Li, Department of Medical and Health Care, Linyi Vocational College, Hudong Road, Luozhuang District, Linyi 276017, Shandong Province, China. Email: lzlzw8@163.com; https://orcid.org/0009-0005-9190-3348
Received: 1 September 2025; Revised: 1 October 2025; Accepted: 15 October 2025
https://doi.org/10.54844/wsr.2025.1061

suffer from hypertension (Egan *et al.*, 2019). It is predicted that by 2025, the number of people with hypertension will increase by 60% globally, with a prevalence rate of approximately 29%, or 1.56 billion people at risk of developing hypertension (Kearney *et al.*, 2005). In addition, the prevalence of hypertension is higher in low- and middle-income countries than in high-income countries, while the awareness, control and treatment rates are lower than in high-income countries (Mills *et al.*, 2020). Since there are no specific symptoms of elevated blood pressure, only 46.5% of hypertensive patients can be diagnosed (Chow *et al.*, 2013). If blood pressure is not effectively controlled, it can consistently elevate and lead to damage to multiple organs, such as the heart, brain, and kidneys, which will later develop into irreversible complications such as stroke, coronary heart disease, metabolic syndrome, and kidney disease (Chow *et al.*, 2013; Oparil *et al.*, 2018).

Based on the existing findings, chronic sympathetic nervous system activation is an important causal mechanism of essential hypertension (Fujita & Fujita, 2016; Johnson & Xue, 2018). Sympathetic nervous system (SNS) overactivity may increase resting heart rate, cardiac blood output, and myocardial contractility and may also cause peripheral artery constriction, leading to increased perivascular resistance, with significant effects on blood pressure homeostasis (Ma & Chen, 2022). However, mental stress and negative emotions lead to sympathetic overactivation and dysfunction of the hypothalamic-pituitary-adrenal axis, which increases vascular tone and blood pressure (Carnovale *et al.*, 2023). The relationship between negative emotions and hypertension appears to be bidirectional, as hypertensive patients are susceptible to anxiety and depression symptoms due to psychological stress or financial burden, and negative emotions such as anxiety and depression also increase the risk of developing hypertension and reduce the quality of life (Liu *et al.*, 2017).

In Chinese medicine, essential hypertension is classified as "dizziness" and "headache", and the core pathogenesis of essential hypertension is the dereliction of the function of the "heart mastering blood and vessels" (Jiang *et al.*, 2022). Essential hypertension has a long-lasting course, with an imbalance of Yin and Yang. Yin deficiency leads to insufficient Yang, so the "heart" loses its duty to manage blood and vessels, and "Qi" movement is dysregulated. Thus, the heart beats slowly or weakly, and blood circulation and pulse beats are also weak (Wang *et al.*, 2018). It is manifested as a weakening of cardiac and vascular systolic and diastolic functions, an increase in peripheral resistance, and a significant increase in blood pressure.

Global clinical practice guidelines for hypertension emphasize the need for lifelong treatment of essential hypertension with the help of pharmacological and non-pharmacological therapies (Carey *et al.*, 2018; Unger *et al.*, 2020). However, less than 13.8% of adults can control their blood pressure with antihypertensive drugs (Mills *et al.*, 2016). Long-term use of antihypertensive drugs is prone to adverse side effects such as dizziness, edema, bradycardia, and renal dysfunction (Loganathan *et al.*, 2020). Particularly, it is common for patients with hypertension to be reluctant to take medication, not take medication without symptoms, and not take medication as prescribed (Lee *et al.*, 2022). This phenomenon leads to the ineffectiveness of relying on medication alone and therefore requires the combination of non-pharmacological therapies to control blood pressure. Non-pharmacological therapies include low sodium and low-fat diet, regular exercise, weight loss, smoking cessation, alcohol restriction, and psychological interventions (Mahmood *et al.*, 2019). Chinese guidelines for the prevention and treatment of hypertension (2009 primary edition; Liu *et al.*, 2010) proposed music therapy (MT) to control hypertension by reducing mental stress. Compared with drug therapy, MT has the advantages of being relatively safe, easy, economical, *etc.*, and it can improve patient compliance with traditional blood pressure management models through personalized design.

Music is an art form composed of melody, rhythm, and harmony. Listening to or playing music can achieve a state of inner "spiritual" harmony, thus re-establishing balance in the body (Li *et al.*, 2022c). However, there are various forms and types of MT. Rock, Western classical music, and traditional Chinese medicine five-element music therapy (TCM-FEMT) have been widely used in clinical treatment (Malakoutikhah *et al.*, 2020; Monteiro *et al.*, 2022). TCM-FEMT integrates the theories of "correspondence between man and universe" and "Five phase theory". People can choose the tunes of the five-element music according to the circadian rhythms, physical constitution, and TCM syndromes. The five-element music is based on the theory of visceral manifestations, and the five modalities move the five Zang-organs and six Fu-organs and harmonize the Yin and Yang, thus achieving the therapeutic effect of treating the body and mind together (Li *et al.*, 2022a).

Previous studies have shown that Western classical music is effective in lowering blood pressure in a small number of Western populations, but this finding may not be universally applicable due to differences in ethnicity, music preference, and cultural background (Liao *et al.*, 2023). Therefore, it is not clear whether MT can exert definite efficacy on groups with different cultural backgrounds. The present study fills a research gap regarding the potential cross-cultural effects of the five-element music, which originated in China and has limited dissemination in Western countries. In addition, there is a lack of studies validating the correlation between negative emotions, such as stress and

depression, and hypertension, and it is easy to overlook the impact of MT on the quality of life and prognosis of hypertensive patients.

Therefore, this study aims to systematically evaluate the effects of MT on essential hypertension, including blood pressure levels, mood, and quality of life, by comparing the effects of different music types and duration on the efficacy and to explore whether TCM-FEMT has advantages over other music types.

METHODS

This systematic review protocol was registered on PROSPERO (No. CRD 42022373266). Our study followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA; Moher *et al.*, 2009). The EQUATOR guideline used for reporting this study was PRISMA 2020 checklist (Tong *et al.*, 2012; See Table 1)

Search strategy

Two researchers independently searched The China National Knowledge Infrastructure (CNKI), Wanfang database, China Science and Technology Journal Database, China Biology Medicine database (CBM), PubMed, Embase, Scopus, Cochrane Library, and Web of Science databases.

Studies evaluating the effect of MT on essential hypertension that were published between the date of inception of the utilized databases and February 2025 were identified. Taking the Embase database as an example, the specific retrieval strategy is as follows: ('music therapy' OR 'music therapy' OR 'music therapy' OR 'music') AND ('essential hypertension' OR 'essential hypertension' OR 'hypertension' OR 'primary hypertension' OR 'arterial hypertension' OR 'high blood pressure').

Inclusion criteria

The study was selected if it met the following participant, intervention, comparison, outcome, and study design (PICOS) criteria. (1) Participant: Patients with a confirmed diagnosis of essential hypertension, with diagnostic criteria referenced to the International Society of Hypertension Global Hypertension Practice Guidelines 2020 or other criteria-consistent hypertension guidelines (Verdecchia *et al.*, 2020). Patients were not limited to gender, age, race, duration of hypertension, hypertension classification, or case origin. (2) Intervention: MT; if any conventional treatment intervention was required, the same conventional treatment measures were used the MT group as in the control group (CG). (3) Comparison: CGs not received MT (*e.g.*, placebo, conventional treatment, or no treatment). (4) Outcome: The primary outcomes were systolic blood pressure (SBP) and diastolic blood pressure (DBP). Secondary outcomes were the self-rating anxiety scale (SAS), the self-rating depression scale (SDS) and the 36-item short-form (SF-36). (5) Study design: Randomised controlled trials (RCTs) investigating MT for essential hypertension were included.

Exclusion criteria

Non-RCTs or semi-RCTs; non-Chinese and English literature; baseline not comparable or no baseline information reported; unknown diagnostic criteria for hypertension, with no indication of inclusion and exclusion criteria; inclusion of cases with gravida, white-coat hypertension, secondary hypertension, deafness or blindness; inclusion of cases with other risk factors such as severe cardiovascular disease and respiratory disease; unknown outcome indicators; incomplete or unusable data, original research data not available after contacting the original author; abstracts, conference reports, animal experiments, reviews, *etc.*

Study selection

Two independent researchers strictly followed this systematic review's inclusion and exclusion criteria for stratum-by-stratum screening and used the double-blind principle for data extraction. After eliminating duplicates using EndNote X9 software, researchers read and analyzed the titles, abstracts, and full text of the literature, then downloaded articles that might meet the inclusion criteria and finally cross-reviewed them. Extracts included the first author, country, publication year, sample size, baseline information, intervention protocol (measure, duration), and outcome indicators. Any disagreement in the above process should be referred to a third researcher for arbitration.

Assessment of risk of bias and study quality

Quality assessment of the literature was cross-reviewed by two researchers after independent evaluation; in case of disagreement, we would negotiate or seek third-party opinions until a consensus is reached. Evaluation of the quality of RCTs using the Physiotherapy Evidence Database (PEDro) scale (Albanese *et al.*, 2020). The PEDro scale has eleven entries, each accounting for 1 of the total score out of 10, except for the first one. Higher scores indicate better methodological quality (9-10 as excellent, 6-8 as good, 4-5 as fair, and < 4 as poor).

Researchers used the Cochrane risk of bias tool to evaluate the quality of the selected literature (Cumpston *et al.*, 2019), including random sequence generation, allocation concealment, blinding, outcome data integrity, selective outcome reporting, and other sources of bias; each project is divided into "low risk", "high risk" and "unclear".

Data extraction and meta-analysis

Meta-analysis was conducted using the RevMan 5.3. All included outcome indicators were continuous variables. Mean difference (MD) and 95% confidence interval (CI) were used to represent the effect sizes with a test level α of 0.05. Judging the magnitude of heterogeneity according to the I^2 statistic. If $P \geqslant 0.1$ and $I^2 \leqslant 50\%$, indicating no significant heterogeneity among studies, the fixed-effects model was selected; if $P < 0.1$ and $I^2 > 50\%$, indicating significant heterogeneity among studies, the random-effects model was selected. When heterogeneity was very high, subgroup and sensitivity analyses were performed to assess the stability and reliability of the results.

A network meta-analysis of the included RCTs was performed by ADDIS 1.16.5, comparing the efficacy differences between TCM-FEMT and other music genres for the treatment of hypertension. There was no closed loop between the music type in this study, so there was no need for a consistency test. The network graph and optimal probability ranking were drawn based on the Markov Chain Monte Carlo fitting consistency model, with the initial model value of 2.5, iteration step size of 10, and \0 simulated iterations. The potential scale reduction parameter (PSRF) reflects convergence, and a PSRF close to 1 indicates good convergence and high confidence in the consistency model conclusions.

RESULTS

Search results

A total of 3538 studies were obtained from the initial screening based on the pre-defined search strategy, and 1535 were obtained after eliminating duplicates. After the researcher read the title, abstract and full text of the literature, 14 studies were finally included (Bekiroğlu *et al*., 2013; Chen *et al*., 2022; Im-Oun *et al*., 2018; Ji *et al*., 2018; Lei *et al*., 2013; Lorber & Divjak, 2022; Song & Li, 2015; Su, 2007; Su, 2016; Teng *et al*., 2007; Zanini *et al*., 2009; Zhang & Luan, 2018; Zhang & Shi, 2021; Zheng *et al*., 2017; Figure 1).

Study characteristics

All 14 RCTs included were double-arm RCTs with a total of 1472 patients, including 737 in the MT group and 735 in the CG. The most prolonged duration of treatment in all included literature was three months, and the shortest was eight days (Table 1).

Study quality

The median PEDro scale score was 6, and 14 studies had a good level of quality (Table 2). Baseline information for the trial and CGs was comparable for all studies, and all described inclusion and exclusion criteria. Data from all studies were complete and free of other biases. Six studies did not mention a specific random sequence generation method; two studies elaborated on the allocation concealment method, while other studies did not describe it; no studies described blinding of study personnel and subjects, and seven studies used blinded methods for outcome raters; only one study had a shedding rate greater than 15% (Figure 2).

Meta-analysis

SBP

Fourteen RCTs reported changes in SBP (Bekiroğlu *et al*., 2013; Chen *et al*., 2022; Im-Oun *et al*., 2018; Ji *et al*., 2018; Lei *et al*., 2013; Lorber & Divjak, 2022; Song & Li, 2015; Su, 2007; Su, 2016; Teng *et al*., 2007; Zanini *et al*., 2009; Zhang & Luan, 2018; Zhang & Shi, 2021; Zheng *et al*., 2017). The music genres involved TCM-FEMT, Turkish folk music, and other types of music, *etc*. There were 737 cases in the MT group and 735 cases in the CG. The results showed significant heterogeneity between studies ($P < 0.1$, $I^2 = 97\%$), so a random effects model was used for the analysis. In addition, it was necessary to search for sources of heterogeneity by sensitivity analysis, which decreased after excluding two papers (Ji *et al*., 2018; Zheng *et al*., 2017; $P > 0.1$, $I^2 = 60\%$). Meta-analysis showed that the MT group was superior to the CG in reducing SBP (MD = -11.18, 95% CI: -13.71 to -9.20, $P < 0.05$).

Subgroup analysis showed that both TCM-FEMT and other types of music were superior to the CG in lowering SBP (MD = -12.18, 95% CI: -12.74 to -11.61, $P < 0.05$) and (MD = -11.10, 95% CI: -14.21 to -7.98, $P < 0.05$). In addition, five papers with an intervention period of less than or equal to one month, involving 259 cases in the MT group and 261 cases in the CG, showed significantly better SBP reduction in the MT group than in the CG after treatment (MD = -12.15, 95% CI: -17.08 to -7.22, $P < 0.05$); seven papers with an intervention period greater than one month, involving 419 cases in the MT group and 418 cases in the CG, showed better SBP levels in the MT group than in the CG (MD = -12.11, 95% CI: -12.66 to -11.55, $P < 0.05$; Figure 3, 4)

DBP

Thirteen RCTs reported changes in DBP (Chen *et al*., 2022; Im-Oun *et al*., 2018; Ji *et al*., 2018; Lei *et al*., 2013; Lorber & Divjak, 2022; Song & Li, 2015; Su, 2007; Su, 2016; Teng *et al*., 2007; Zanini *et al*., 2009; Zhang & Luan, 2018; Zhang & Shi, 2021; Zheng *et al*., 2017). The music genres involved TCM-FEMT, Turkish folk music, other types of music, *etc*. There were 707 cases in the MT group and 705 cases in the CG. There was significant heterogeneity between studies ($P < 0.1$, $I^2 = 96\%$), so a random effects model was used for analysis. In addition, it was necessary to look for sources of heterogeneity through sensitivity analysis, and after excluding

Table 1: Characteristics of included individual studies

Study	Country	Sample (*n*)	Age (year)	Gender (M/F)	SBP (mmHg) baseline	DBP (mmHg) baseline	Intervention	Duration	Outcomes
Bekiroğlu *et al.* (2013)	Turkey	EG: 30 CG: 30	60.0-89.0	EG: 17/13 CG: 17/13	EG: 128.2 ± 6.7 CG: 121.2 ± 5.9	EG: 77.5 CG: 80.0	Resting, 25 min; music exposure, 25 min	4 weeks	SBP, DBP
Chen *et al.* (2022)	China	EG: 30 CG: 30	EG: 67.2 ± 5.7 CG: 65.9 ± 5.1	EG: 18/12 CG: 20/10	EG: 146.2 ± 11.3 CG: 145.8 ± 10.7	EG: 97.6 ± 11.8 CG: 98.8 ± 12.5	Conventional treatment; CT + Wuxing music intervention, 30 min	2 times/d, 8 weeks	SBP, DBP, SAS, SDS
Im-oun *et al.* (2018)	Thailand	EG: 57 CG: 57	EG: 51.5 ± 8.5 CG: 51.8 ± 9.1	EG: 24/33 CG: 20/37	EG: 137.3 ± 9.0 CG: 129.8 ± 10.7	EG: 84.6 ± 8.1 CG: 76.1 ± 9.0	Conventional treatment; CT + Thai instrumental folk music listening intervention, 32 min	1 times/d, 30 days	SBP, DBP
Ji *et al.* (2018)	China	EG: 30 CG: 30	29.0-69.0	22/38	EG: 169.0 ± 0.5 CG: 168.0 ± 0.7	EG: 97.0 ± 0.1 CG: 96.0 ± 0.4	Conventional treatment; CT + Wuxing shangdiao music intervention, 30~60 min	2 times/d, 8 weeks	SBP, DBP
Lei *et al.* (2013)	China	EG: 36 CG: 36	EG: 63.8 ± 9.7	EG: 22/14 CG: 17/19	EG: 148.9 ± 7.2 CG: 146.3 ± 6.4	EG: 89.6 ± 8.7 CG: 86.2 ± 10.8	Drug; drug + music, 60 min	12 weeks	SBP, DBP, SF-36
Lorber *et al.* (2022)	Slovenia	EG: 30 CG: 30	⩾ 65.0	EG: 12/18 CG: 15/15	EG: 132.5 ± 23.3 CG: 130.6 ± 22.0	EG: 77.1 ± 12.7 CG: 76.4 ± 11.2	Conventional treatment; CT + MT, at least 30 min	10 weeks	SBP, DBP
Song *et al.* (2015)	China	EG: 60 CG: 60	EG: 72.5 ± 5.9 CG: 72.4 ± 6.2	EG: 23/37 CG: 26/34	EG: 180.2 ± 14.2 CG: 176.5 ± 16.1	EG: 110.3 ± 11.1 CG: 108.1 ± 16.2	Drug; drug + music intervention, 30 min	8 days	SBP, DBP, SAS, SDS
Su *et al.* (2016)	China	EG: 40 CG: 40	EG: 65.9 ± 0.4 CG: 66.3 ± 0.6	EG: 28/12 CG: 25/15	EG: 162.0 ± 18.0 CG: 161.0 ± 15.0	EG: 124.0 ± 11.0 CG: 125.0 ± 12.0	Drug; drug + music, 30 min	2 times /d, 3 months	SBP, DBP
Su *et al.* (2007)	China	EG: 20 CG: 20	EG: 68.0 CG: 67.0	EG: 12/8 CG: 12/8	EG: 207.0 ± 8.3 CG: 206.3 ± 9.0	EG: 109.5 ± 4.2 CG: 108.8 ± 5.3	Conventional treatment; CT + MT, 25 min	2 months	SBP, DBP
Teng *et al.* (2007)	China	EG: 15 CG: 15	EG: 83.7 ± 8.3 CG: 82.5 ± 8.1	EG: 4/11 CG: 4/11	EG: 138.9 ± 16.5 CG: 134.0 ± 20.3	EG: 60.9 ± 13.5 CG: 58.7 ± 7.5	Seated for 25 min; MT, 25 min	every day for 4 weeks	SBP, DBP
Zanini *et al.* (2008)	Brasil	EG: 23 CG: 22	EG: 66.5 ± 9.1 CG: 67.2 ± 9.6	EG: 7/16 CG: 12/10	EG: 149.7 ± 6.4 CG: 145.4 ± 5.6	EG: 89.1 ± 9.1 CG: 86.9 ± 11.3	Conventional treatment; CT+ MT, 60 min	12 weeks	SBP, DBP, SF-36
Zhang *et al.* (2018)	China	EG: 100 CG: 100	54.4 ± 10.3/ 55.3 ± 10.6	EG: 56/44 CG: 59/41	EG: 172.6 ± 15.6 CG: 170.0 ± 14.4	EG: 112.2 ± 10.6 CG: 110.4 ± 15.6	Drug; Drug + Wuxing music, 30 min	2 times /d, 30 days	SBP, DBP, SAS, SDS
Zhang *et al.* (2021)	China	EG: 240 CG: 240	EG: 58.3 ± 4.9 CG: 58.3 ± 5.2	EG: 140/100 CG: 130/110	EG: 148.2 ± 2.9 CG: 148.6 ±2.9	EG: 94.5 ±2.2 CG: 93.9 ± 2.5	Conventional treatment; CT + Wuxing music intervention, 30~45 min	3 times/w, 8 weeks	SBP, DBP, SAS, SDS
Zheng *et al.* (2017)	China	EG: 29 CG: 26	EG: 65.2 ± 9.6 CG: 66.1 ± 7.9	EG: 14/15 CG: 10/16	EG: 146.1 ± 4.3 CG: 144.5 ± 3.8	EG: 92.6 ± 3.0 CG: 91.3 ± 2.6	Conventional treatment; CT + Wuxing jiaodiao music intervention, 30 min	12 weeks	SBP, DBP

CI, confidence interval; CT, conventional treatment; DBP, diastolic blood pressure; M, male; F, female; MD, mean difference; MT, music therapy; TCM-FEMT, traditional Chinese medicine five-element music therapy; SBP, systolic blood pressure; SAS, self-rating anxiety scale; SDS, self-rating depression scale; SF-36 ,36-item short-form; EG, experimental group; CG, control group.

Table 2: Methodological quality evaluation of the PEDro scale

Study	Inclusion criteria	Random assignment	Assign hidden	Comparability of baselines	Blinding of subjects	Blinding of therapists	Blinding of assessors	Shedding rate <15%	Intentionality analysis	Intergroup statistics	Point measurements and variance values	Score
Bekiroğlu	●	●	○	●	○	○	○	●	●	●	●	6
Chen	●	●	○	●	○	○	○	●	●	●	●	6
Im-oun	●	●	○	●	○	○	○	●	●	●	●	6
Ji	●	●	○	●	○	○	○	●	●	●	●	6
Lei	●	●	○	●	○	○	○	●	●	●	●	6
Lorber	●	●	●	●	○	○	○	●	●	●	●	7
Song	●	●	○	●	○	○	○	●	●	●	●	6
Su	●	●	○	●	○	○	○	●	●	●	●	6
Su	●	●	○	●	○	○	●	●	●	●	●	7
Teng	●	●	○	●	○	○	●	○	●	●	●	6
Zanini	●	●	○	●	○	○	○	●	●	●	●	6
Zhang	●	●	○	●	○	○	○	●	●	●	●	6
Zhang	●	●	○	●	○	○	●	●	●	●	●	7
Zheng	●	●	○	●	○	○	○	●	●	●	●	6

● indicates that the item is scored 1 point; ○ indicates that the item is not scored. The item "inclusion criteria" is not included in the total score. PEDro, physiotherapy evidence database.

one paper (Zhang & Shi, 2021), there was no significant heterogeneity between studies ($P > 0.1$, $I^2 = 25\%$). Meta-analysis showed that the MT group was superior to the CG in reducing DBP (MD = -5.78, 95% CI: -6.74 to -4.81, $P < 0.05$).

Subgroup analysis showed that both TCM-FEMT and other types of music were superior to the CG in reducing DBP (MD = -5.89, 95% CI: -6.23 to -5.73, $P < 0.05$) and (MD = -6.37, 95% CI: -8.36 to -4.38, $P < 0.05$). In addition, four papers with an intervention period of less than or equal to one month, involving 229 cases in the MT group and 231 cases in the CG, showed significantly better DBP reduction in the MT group than in the CG after treatment (MD = -6.12, 95% CI: -7.71 to -4.53, $P < 0.05$); eight papers with an intervention period greater than one month, involving 238 cases in the MT group and 234 cases in the CG, showed better DBP levels in the MT group than in the CG (MD = -5.60, 95% CI:-7.06 to -4.13, $P < 0.05$; Figure 5, 6).

SAS

Four RCTs reported SAS scores (Chen *et al.*, 2022; Song & Li, 2015; Zhang & Luan, 2018; Zhang & Shi, 2021), $P < 0.1$, $I^2 = 13\%$, and there was no significant heterogeneity between studies, so a fixed-effects model was used for the analysis. The MT group was superior to the CG in relieving anxiety (MD = -2.15, 95% CI: -2.74 to -1.57, $P < 0.05$; Figure 7)

SDS

Four RCTs reported SDS scores (Chen *et al.*, 2022; Song & Li, 2015; Zhang & Luan, 2018; Zhang & Shi, 2021), $P < 0.1$, $I^2 = 75\%$, and there was significant heterogeneity between studies, so a random-effects model was used for the analysis. The MT group was superior to the CG in relieving depression (MD = -3.66, 95% CI: -5.88 to -1.45, $P < 0.05$; Figure 8).

SF-36

Two papers reported SF-36 scores (Lei *et al.*, 2013; Zanini *et al.*, 2009), with a smaller volume of literature. Both literatures showed better efficacy of the modules in the test group (Figure 9).

Network meta-analysis

Evidence network

Taking SBP as an example, a total of 12 RCTs (Bekiroğlu *et al.*, 2013; Chen *et al.*, 2022; Im-Oun *et al.*, 2018; Lei *et al.*, 2013; Lorber & Divjak, 2022; Song & Li, 2015; Su, 2007; Su, 2016; Teng *et al.*, 2007; Zanini *et al.*, 2009; Zhang & Luan, 2018; Zhang & Shi, 2021) were included for combined statistics. Three studies chose TCM-FEMT and nine studies used other music genres. There was no statistically significant difference in the SBP levels of the patients before treatment ($P > 0.05$) by statistical comparison. "A" represents the CG, "B" represents TCM-FEMT, and "C" represents other music types. The gray line between each oval represents the RCT, and the two interventions are directly compared. The width of the gray line represents the number of

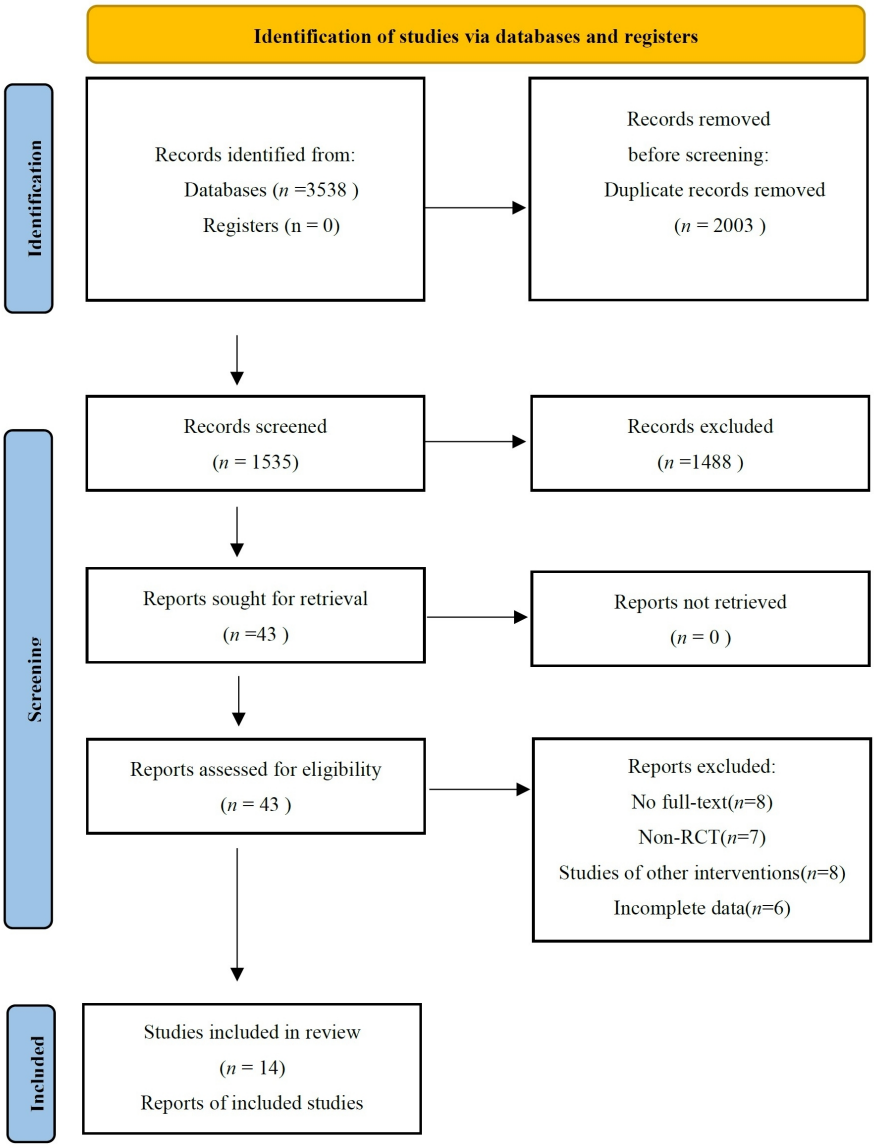

Figure 1. Flow chart of number of studies identified and included in the review. RCT, randomized controlled trial.

RCTs (Figure 10).

Network meta-analysis showed that the MT group was superior to the CG in improving SBP in all cases (Table 3).

Convergence diagnosis

Convergence diagnosis was conducted for the included studies. The PSRF value was close to 1, indicating good convergence.

Probability ranking

Network meta-analysis showed that the best probability ranking for the effect of two different music genres on SBP level was Chinese traditional music (P = 0.59) > other music (P = 0.41), and the best probability ranking for DBP level was other music (P = 0.73) > Chinese traditional music (P = 0.27; Figure 11, 12).

Publication bias

Funnel plot analysis of the included literature was performed using SBP as an indicator, and there was no significant asymmetry in the funnel plot (Figure 13), indicating that the results were reliable.

DISCUSSION

In recent years, MT has gradually evolved from a purely medical medium to a non-pharmacological therapy, and previous studies have demonstrated that MT is a less side-effective, easy-to-use, and low-cost option with clinical applications in cancer and cardiovascular diseases (Kulinski *et al.*, 2022; Rennie *et al.*, 2022). In this study, we evaluated the efficacy of MT on essential hypertension from an evidence-based medical perspective by

Table 3: Network meta-analysis of SBP levels

MD (95%CI)	MD (95%CI)	MD (95%CI)
A		
11.58 (6.24, 16.50)	B	
10.98 (7.69, 14.47)	-0.58 (-6.36, 5.89)	C

A represents the CG; B represents the EG, namely TCM-FEMT; C represents other music genres. SBP, systolic blood pressure; MD, mean difference; CI, confidence interval; CG, control group; EG, experimental group; TCM-FEMT, traditional Chinese medicine five-element music therapy.

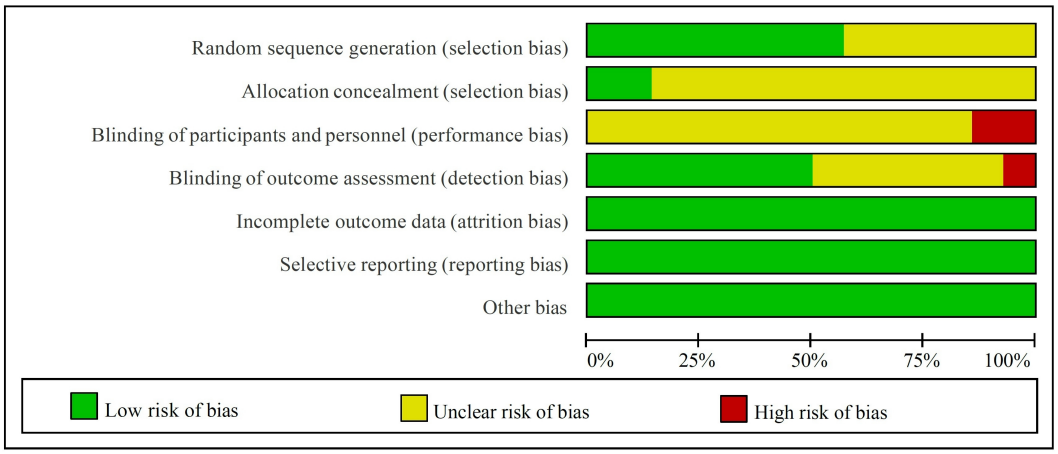

Figure 2. Risk of bias assessment for inclusion in the study.

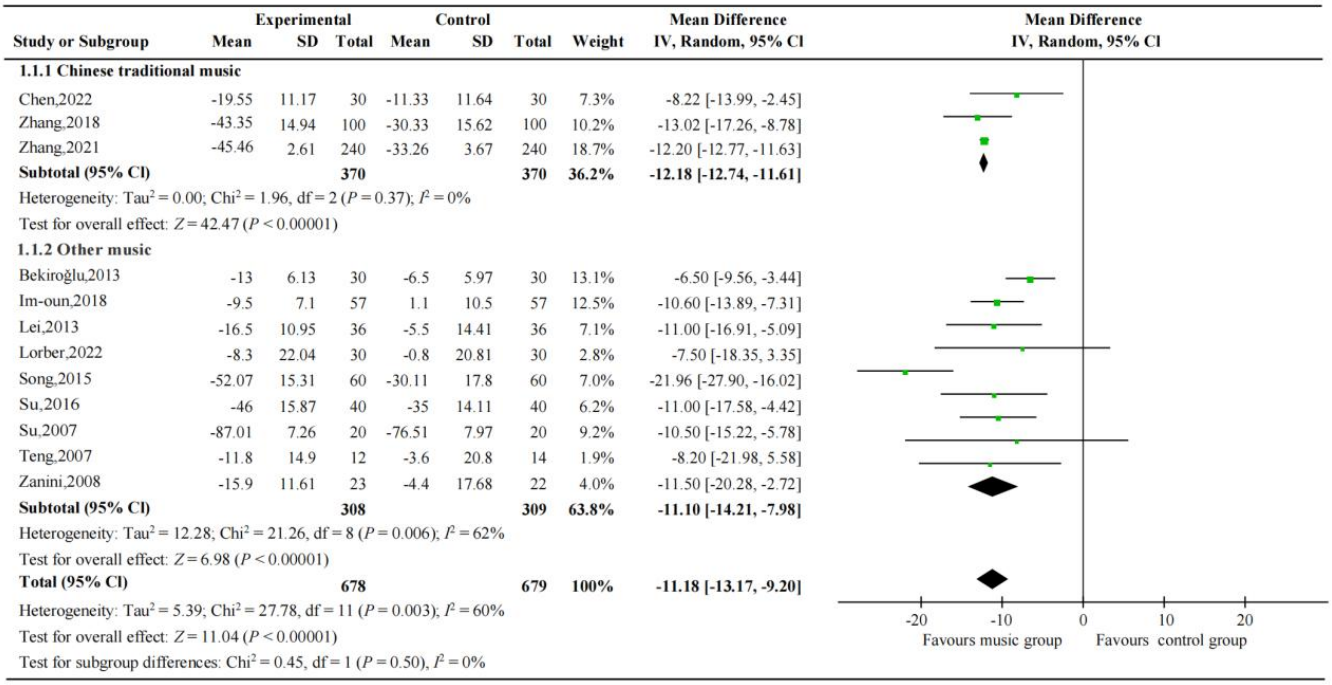

Figure 3. Effect of different music types on SBP levels in patients with essential hypertension. SBP, systolic blood pressure; CI, confidence interval; SD, standard deviation.

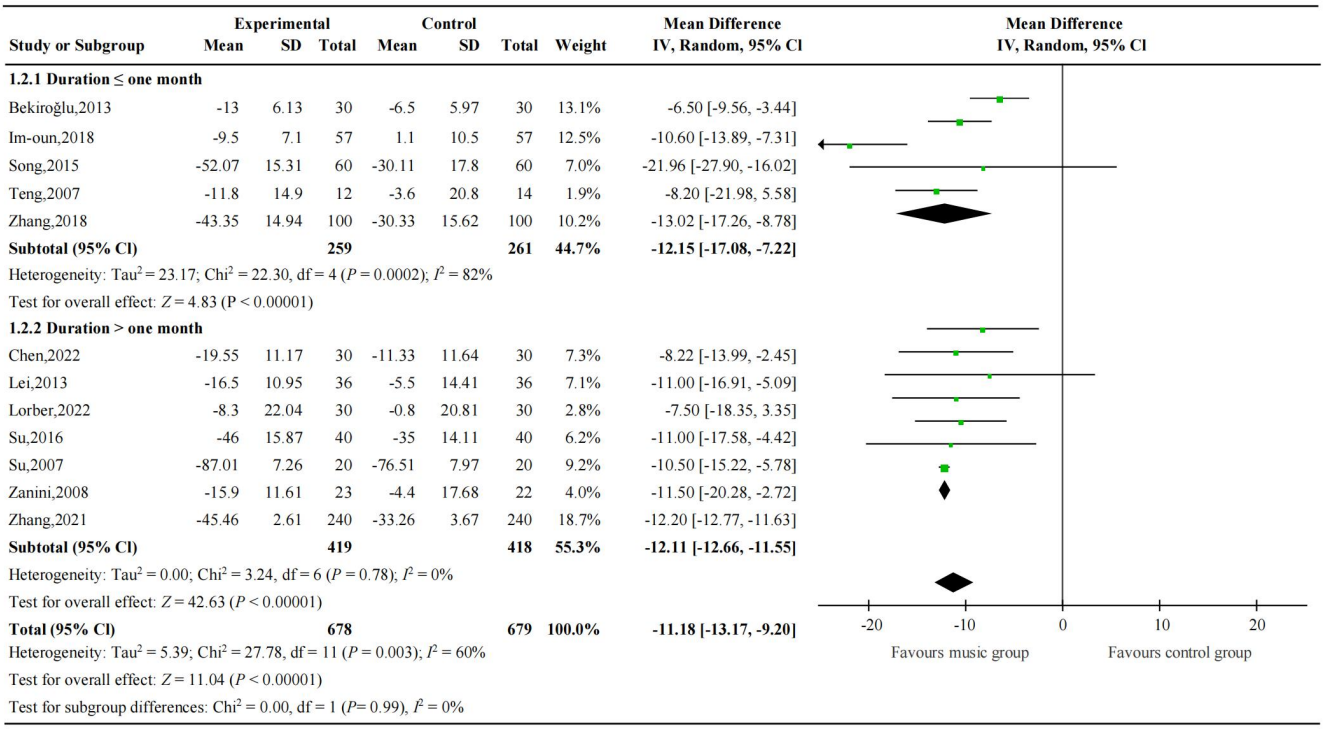

Figure 4. Effect of different duration on SBP levels in patients with essential hypertension. SBP, systolic blood pressure; CI, confidence interval; SD, standard deviation.

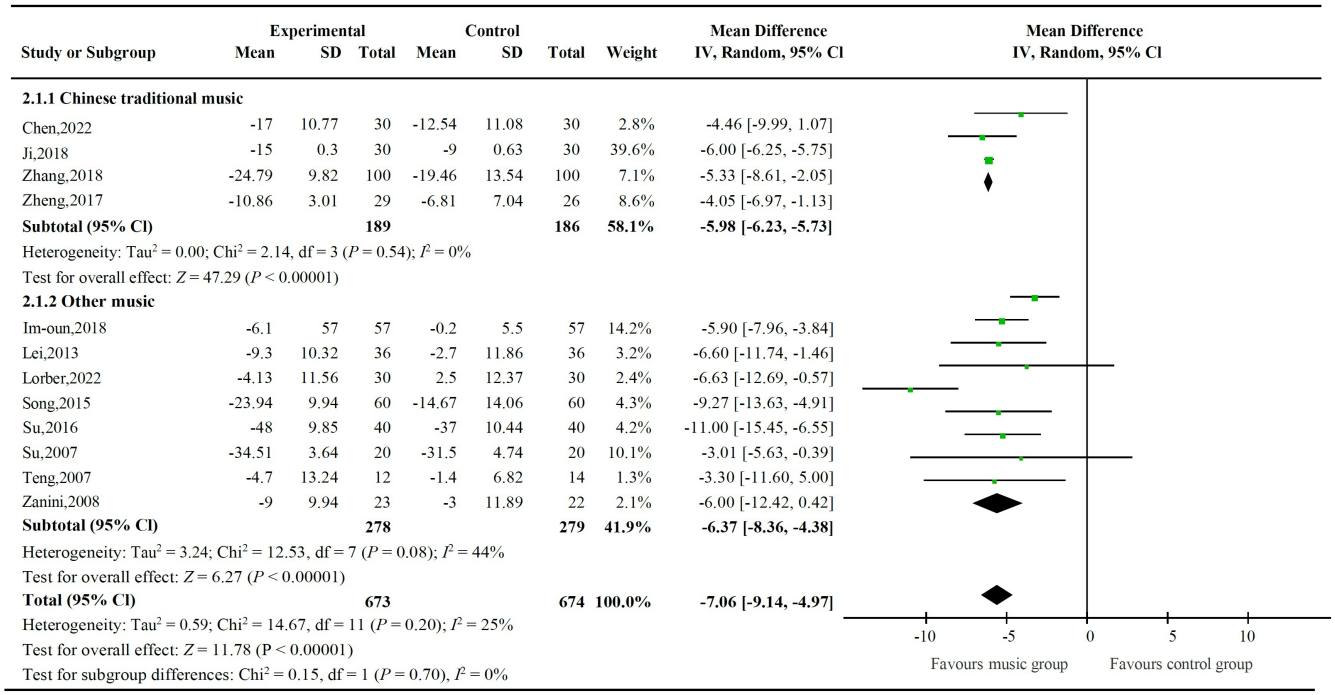

Figure 5. Effect of different music types on DBP levels in patients with essential hypertension. DBP, diastolic blood pressure; CI, confidence interval; SD, standard deviation.

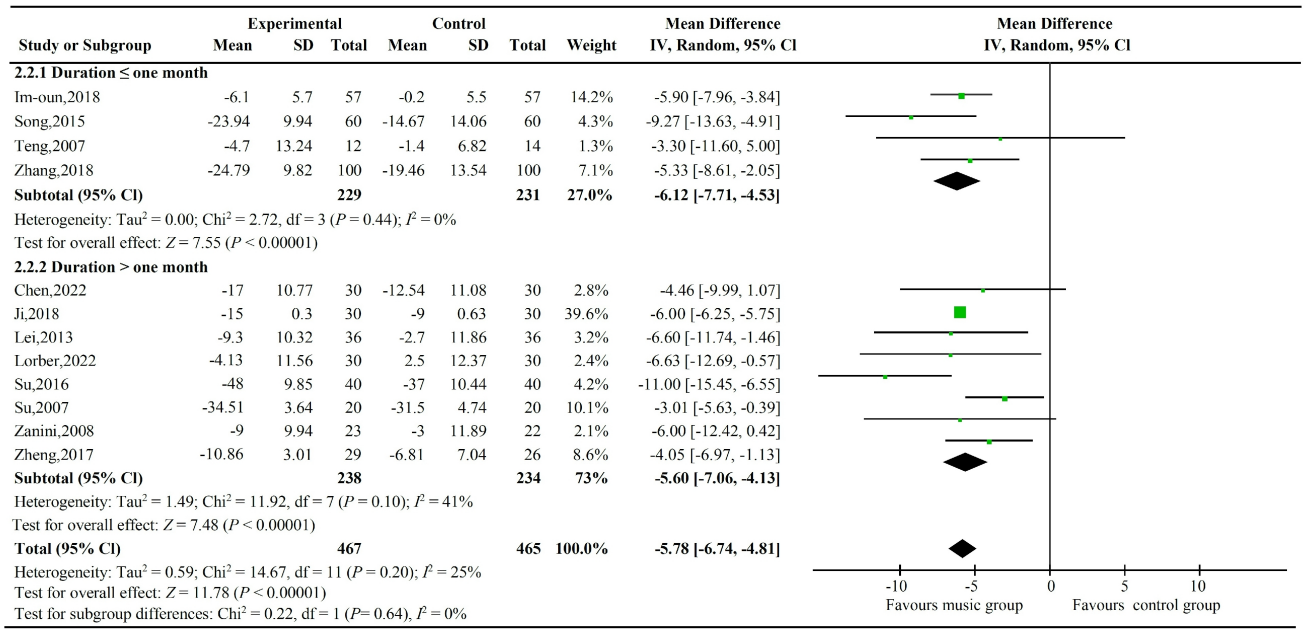

Figure 6. Effect of different duration on DBP levels in patients with essential hypertension. DBP, diastolic blood pressure; CI, confidence interval; SD, standard deviation.

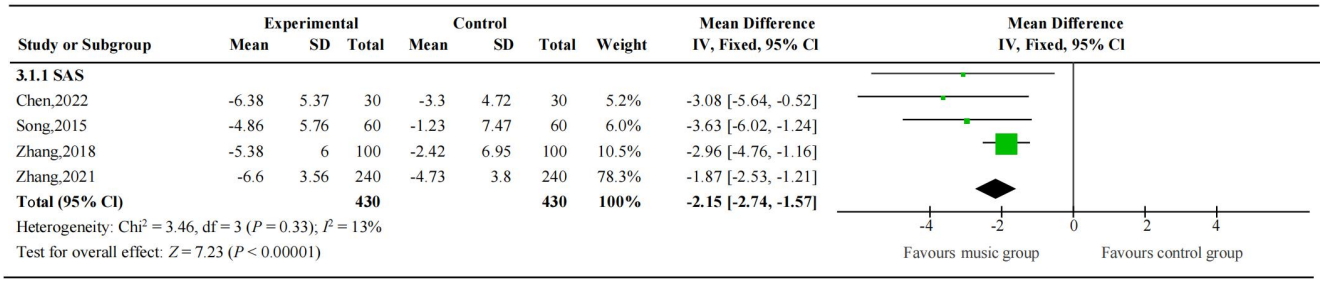

Figure 7. Effect of MT on anxiety in patients with essential hypertension. MT, music therapy; CI, confidence interval; SD, standard deviation.

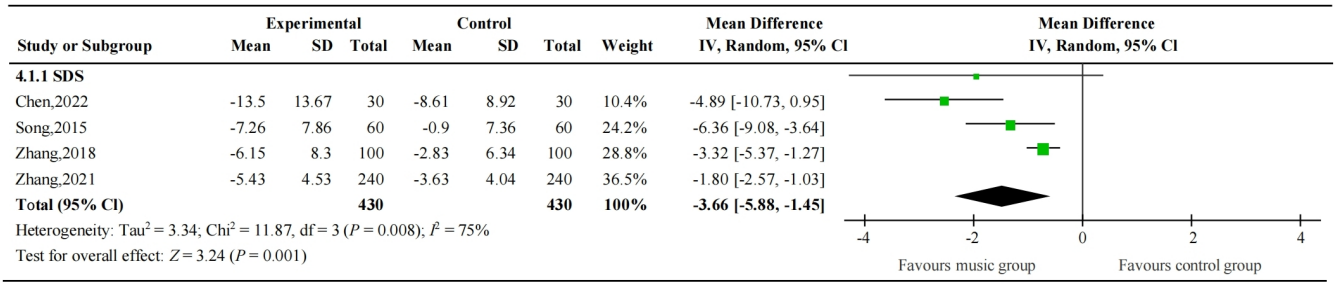

Figure 8. Effect of MT on depression in patients with essential hypertension. MT, music therapy; CI, confidence interval; SD, standard deviation.

meta-analysis and compared the differences in efficacy between music types and intervention cycles.

Fourteen RCTs were included in this review, with changes in blood pressure levels as the primary outcome indicator and SAS, SDS, and SF-36 as secondary outcome indicators. Meta-analysis showed that the MT group effectively reduced SBP and DBP and had a stronger effect on lowering blood pressure than the CG ($P < 0.05$). Subgroup analysis showed that TCM-FEMT and other types of music were consistent in reducing SBP and DBP, both could improve patients' blood pressure, and the intervention cycle seemed to have more significant efficacy within one month.

A

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
5.1.1 Functional capacity								
Lei,2013	10.5	23.05	36	−2.5	28.48	36	64.4%	13.00 [1.03, 24.97]
Zanini,2008	10.6	24.94	23	−3.9	29.83	22	35.6%	14.50 [-1.60, 30.60]
Total (95% CI)			**59**			**58**	**100%**	**13.53 [3.93, 23.14]**
Heterogeneity: $Chi^2 = 0.02$, df = 1 ($P = 0.88$); $I^2 = 0\%$								
Test for overall effect: $Z = 2.76$ ($P = 0.006$)								
5.1.2 Physical aspects								
Lei,2013	23.1	38.78	36	1.4	42.44	36	65.1%	21.70 [2.92, 40.48]
Zanini,2008	21.8	40.88	23	2.2	46.49	22	34.9%	19.60 [-6.02, 45.22]
Total (95% CI)			**59**			**58**	**100%**	**20.97 [5.82, 36.11]**
Heterogeneity: $Chi^2 = 0.02$, df = 1 ($P = 0.90$); $I^2 = 0\%$								
Test for overall effect: $Z = 2.71$ ($P = 0.007$)								
5.1.3 Pain								
Lei,2013	24.6	29.93	36	5	31.26	36	62%	19.60 [5.46, 33.74]
Zanini,2008	25.7	30.65	23	5.4	31.11	22	38%	20.30 [2.25, 38.35]
Total (95% CI)			**59**			**58**	**100%**	**19.87 [8.74, 31.00]**
Heterogeneity: $Chi^2 = 0.00$, df = 1 ($P = 0.95$); $I^2 = 0\%$								
Test for overall effect: $Z = 3.50$ ($P = 0.0005$)								
5.1.4 General state of health								
Lei,2013	18	17.05	36	2	23.74	36	61.5%	16.00 [6.45, 25.55]
Zanini,2008	19.7	17.2	23	2.1	23.46	22	38.5%	17.60 [5.54, 29.66]
Total (95% CI)			**59**			**58**	**100%**	**16.62 [9.13, 24.10]**
Heterogeneity: $Chi^2 = 0.04$, df = 1 ($P = 0.84$); $I^2 = 0\%$								
Test for overall effect: $Z = 4.35$ ($P < 0.0001$)								

Mean Difference IV, Fixed, 95% CI

-20 -10 0 10 20

Favours control group Favours music group

B

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
5.1.5 Vitality								
Lei,2013	15.8	25.56	36	1.5	29.86	36	62.6%	14.30 [1.46, 27.14]
Zanini,2008	14.9	25.51	23	2.4	30.96	22	37.4%	12.50 [-4.12, 29.12]
Total (95% CI)			**59**			**58**	**100%**	**13.63 [3.47, 23.79]**
Heterogeneity: $Chi^2 = 0.03$, df = 1 ($P = 0.87$); $I^2 = 0\%$								
Test for overall effect: $Z = 2.63$ ($P = 0.009$)								
5.1.6 Social aspects								
Lei,2013	15.7	31.43	36	1.7	34.09	36	60.8%	14.00 [-1.15, 29.15]
Zanini,2008	15.4	30.72	23	2.8	33.72	22	39.2%	12.60 [-6.27, 31.47]
Total (95% CI)			**59**			**58**	**100%**	**13.45 [1.64, 25.26]**
Heterogeneity: $Chi^2 = 0.01$, df = 1 ($P = 0.91$); $I^2 = 0\%$								
Test for overall effect: $Z = 2.23$ ($P = 0.03$)								
5.1.7 Emotional aspects								
Lei,2013	29.4	33.61	36	-2.2	41.54	36	64.6%	31.60 [14.15, 49.05]
Zanini,2008	29.3	36.63	23	-1.5	43.62	22	35.4%	30.80 [7.21, 54.39]
Total (95% CI)			**59**			**58**	**100%**	**31.32 [17.29, 45.35]**
Heterogeneity: $Chi^2 = 0.00$, df = 1 ($P = 0.96$); $I^2 = 0\%$								
Test for overall effect: $Z = 4.37$ ($P < 0.0001$)								
5.1.8 Mental health								
Lei,2013	15.2	22.34	36	-6.1	25.81	36	60.8%	21.30 [10.15, 32.45]
Zanini,2008	15.3	20.88	23	-5.1	26.2	22	39.2%	20.40 [6.52, 34.28]
Total (95% CI)			**59**			**58**	**100%**	**20.95 [12.25, 29.64]**
Heterogeneity: $Chi^2 = 0.01$, df = 1 ($P = 0.92$); $I^2 = 0\%$								
Test for overall effect: $Z = 4.72$ ($P < 0.00001$)								

Mean Difference IV, Fixed, 95% CI

-20 -10 0 10 20

Favours control group Favours music group

-50 -25 0 25 50

Favours control group Favours music group

Figure 9. Effect of MT on quality of life in patients with essential hypertension. (A) Functional capacity, physical aspects, pain, general state of health; (B) Vitality, social aspects, emotional aspects, mental health. MT, music therapy; CI, confidence interval; SD, standard deviation.

Four RCTs reported changes in SAS and SDS scales before and after treatment. The SAS and SDS scales each included 20 self-rated items, and the standard score of each scale was $\geqslant$ 50, suggesting the presence of anxiety and depressive mood states. Meta-analysis showed that the MT group had a significant advantage in relieving anxiety and depression compared with the CG ($P < 0.05$). Two RCTs reported the changes in SF-36 scale scores. The SF-36 scale consists of 36 entries in 8 modules, including physical functioning, pain, emotion,

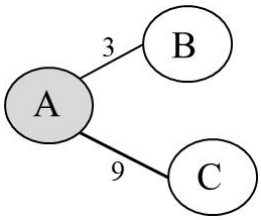

Figure 10. Network relationship comparing the efficacy of different music types on systolic blood pressure levels. A represents the CG; B represents TCM-FEMT; C represents other music types. CG, control group; TCM-FEMT, traditional Chinese medicine five-element music therapy.

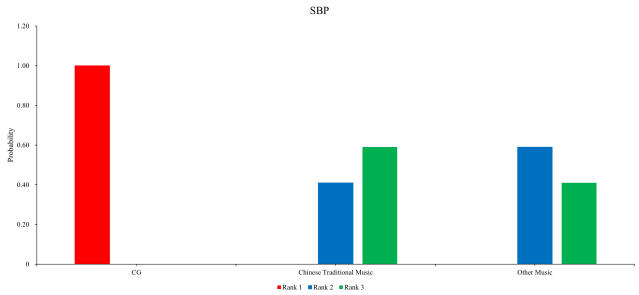

Figure 11. Probabilistic ranking of different music types on SBP levels in patients with essential hypertension. SBP, systolic blood pressure; CG, control group.

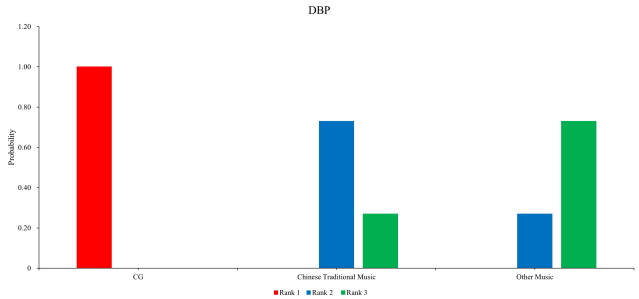

Figure 12. Probabilistic ranking of different music types on DBP levels in patients with essential hypertension. DBP, diastolic blood pressure; CG, control group.

mental health, and general health status, with a higher scores indicating higher quality of life. Meta-analysis showed that compared with the CG, the MT group could help patients with chronic diseases improve their physical and mental health ($P < 0.05$), resulting in a high quality of life activity status.

Unlike previous systematic reviews (do Amaral *et al.*, 2016), our review searched multiple databases around this topic, and the articles dealt with a wide range of issues, not only to explore the efficacy of MT on essential hypertension but also to compare the differences in efficacy between TCM-FEMT and other music types by subgroup analysis and network Meta-analysis,

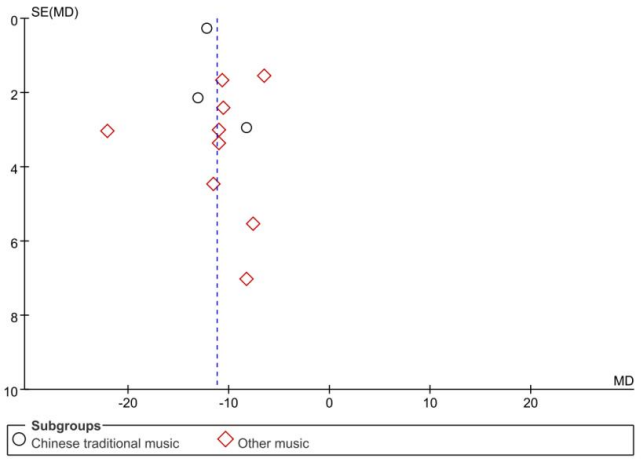

Figure 13. Funnel plot of the included studies. MD, mean difference; SE, standard error.

providing some reference and basis for the selection of music genres in clinical applications. Based on the results of the probability ranking, TCM-FEMT was the most effective in reducing systolic blood pressure in patients with essential hypertension, but other music genres were more effective in reducing diastolic blood pressure, which may be related to the inclusion of only four RCTs on TCM-FEMT, and further studies are needed to clarify the results.

Hypertension is associated with high levels of anxiety and depression, and negative emotions not only have a significant predisposing effect on hypertension but also reduce the efficacy of antihypertensive medications and patient adherence to them (Hamam *et al.*, 2020; Paine *et al.*, 2015). Combined with the previous research base, we hypothesize that the possible biological mechanisms of MT for the treatment of essential hypertension are: MT stimulates an increase in a central, calcium/calmodulin-dependent dopamine (DA) synthesis in the brain, and that the subsequent increase in DA inhibits sympathetic activity *via* D2 receptors, increases parasympathetic activity, and reduces the individual's sense of nervousness, and has a sedative effect on mood, autonomic nervous system activity, and thus reduces heart rate and blood pressure (Kühlmann *et al.*, 2018); MT decreases plasma catecholamine secretion and plasma renin activity, which inhibits the release of angiotensin II and reduces its vascular wall tension, thus allowing blood pressure to fall (Kunikullaya *et al.*, 2016); MT can change the chemical environment of the brain by inducing the release of 5-Hydroxytryptamine and DA neurotransmitters, improving anxiety, depression and sleep quality, which in turn improves blood pressure control in patients (Mavridis, 2015; Park *et al.*, 2023); Music acts on the brain in the form of sound waves, and synchronous and harmonious sonic resonance occurs when the frequency, rhythm and intensity of the

incoming sound wave vibrations are harmonized with the cellular vibrational frequency (Galińska, 2015), synchronous and harmonious acoustic resonance occurs, which makes the patient produce physiological, psychological and emotional resonance, and contributes to the positive regulation of the body's physiological functions. In addition, the change in music amplitude can stimulate the limbic system and brainstem reticular system related to emotion regulation, adjust the cortical function state, relieve anxiety and tension, and achieve a better antihypertensive effect (Koelsch *et al*., 2006; Xiao *et al*., 2023).

Historical records-music book has recorded: "Music is that which can be used to move the blood, to circulate the spirit, and to calm the heart. "TCM-FEMT is based on the five-phase theory, combining the five tones (Jue, Zhi, Gong, Shang, and Yu) with the five-phase, five Zang-organs and the five emotions. The sound waves of different tunings resonate with the Zang-Fu viscera and meridians of the body, promoting the transportation of Qi in the body and coordinating the functions of the Zang-Fu viscera and the circulation of Qi, blood, and body fluids (Lin, 2019). Li *et al*., (2022b) first investigated the effects of three different types of music (Western classical music, rock music, and Chinese classical music) on blood pressure in essential hypertension model rats. The results show that Chinese classical music and rock music have a more significant hypotensive effect than Western classical music, which has no significant improvement. We suspect that this may be because previous studies of Western classical music have targeted a small segment of the Western population and are somewhat influenced by confounding factors such as cultural background, lifestyle, or musical preference. However, the ancient Chinese text "miraculous pivot" classifies the human constitution into five types according to the yin and yang attributes of the human body, namely the "five-type personality theory", which are the Taiyin, Shaoyin, Taiyang, Shaoyang, and Yin Yang Ping He. TCM-FEMT follows the "five-type personality theory" view of physique, and the five sounds correspond to the five body types, reducing the intervention of mixed factors (Lin, 2017). Five-element music targets the regulation of qi, which can nourish yang qi, protect the heart and promote blood circulation. The five-element music takes the five Zang-organs as the general principle; for example, the "Jue" tune music is bright, fresh, and vigorous, enters the "liver" meridian, and with the characteristics of "wood." Due to "liver storing blood", part of the blood will flow back to the liver for storage. Therefore, "Jue" tune music can lower blood pressure and clear blood quality by regulating liver fire (Zheng *et al*., 2017).

In addition, most non-pharmacological interventions focus on physical exercise, diet/weight control, and smoking/alcohol cessation (Unger *et al*., 2020). However, However, non-pharmacological therapies have not yet been recognized for their long-term effectiveness, although they can reduce blood pressure and slow down the progression of hypertensive disease in hypertensive patients in the short term has not yet been recognized for their long-term effectiveness, although they can reduce blood pressure and slow down the progression of hypertensive disease in hypertensive patients in the short term (Shao *et al*., 2023). Therefore, there is an urgent need to investigate other non-pharmacological therapies to improve the treatment rate and adherence. Studies have reported that a 10 mmHg reduction in SBP reduces the risk of major cardiovascular disease events by 20%, coronary heart disease by 17%, stroke by 27%, and heart failure by 28% (Ettehad *et al*., 2016). A reasonable decrease in blood pressure can improve the quality of life of hypertensive patients and reduce the risk of hypertension complications. In the future, if relevant studies can prove that MT is effective, it will provide a non-invasive and low-cost adjunctive therapeutic measure.

There are relatively limited RCTs on MT to improve essential hypertension, with inherent limitations. Subgroup analysis of music genres other than TCM-FEM have not been performed; studies must be published in both Chinese and English, which may lead to bias in study selection; the duration, type, and specific intervention protocols (MP3, live performance, *etc*.) of MT are inconsistent, and the included studies have not standardized MT, which may be subject to some bias; the CG (non-MT) in trials also differed, which led to extensive clinical heterogeneity across studies, and it is uncertain whether MT is superior to monotherapy as an adjunctive treatment. In addition, the studies included in this review failed to fully account for confounding factors such as stage of hypertension, medications, and music preference, which may affect outcome indicators of hypertension. However, without limiting the above confounding factors, it may be possible to assess MT's efficacy on essential hypertension fully.

CONCLUSION

In conclusion, our results showed that MT effectively reduced SBP and DBP in patients with essential hypertension and had significant advantages in alleviating negative emotions and improving quality of life. MT has the advantages of being inexpensive, safe, and easily implemented. After professional training, nurses can select or develop an appropriate MT program for patients, thus helping hypertensive patients to self-manage their rehabilitation at home. Moreover, we also emphasized the unique advantages of TCM-FEM. Future researchers need to conduct more high-quality, large-

sample, multi-center RCTs to verify this conclusion.

DECLARATIONS

Acknowledgement
None.

Author contributions
Li ZW: Conceptualization, Investigation, Methodology, Data curation, Writing—original draft preparation, Writing—review & editing. Zhang Y: Formal analysis, Software, Supervision, Writing—review & editing.

Source of funding
This work was supported by the National Natural Science Foundation of China General Project (82374556) and the National Key R&D Program (2018YFC1706005).

Ethical approval
Not applicable.

Informed consent
Not applicable.

Conflict of interest
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.The article was subject to the journal's standard procedures, with peer review handled independently of the editor and the affiliated research groups.

Use of large language models, AI and machine learning tools
This work did not use any artificial intelligence tools.

Data availability statement
No additional data.

REFERENCES

Albanese, E., Bütikofer, L., Armijo-Olivo, S., Ha, C., & Egger, M. (2020). Construct validity of the Physiotherapy Evidence Database (PEDro) quality scale for randomized trials: Item response theory and factor analyses. *Research Synthesis Methods*, *11*(2), 227-236. https://doi.org/10.1002/jrsm.1385

Bekiroğlu, T., Ovayolu, N., Ergün, Y., & Ekerbiçer, H. Ç. (2013). Effect of Turkish classical music on blood pressure: A randomized controlled trial in hypertensive elderly patients. *Complementary Therapies in Medicine*, *21*(3), 147-154. https://doi.org/10.1016/j.ctim.2013.03.005

Carey, R. M., Whelton, P. K., & 2017 ACC/AHA Hypertension Guideline Writing Committee. (2018). Prevention, detection, evaluation, and management of high blood pressure in adults: Synopsis of the 2017 American college of cardiology/American heart association hypertension guideline. *Annals of Internal Medicine*, *168*(5), 351-358. https://doi.org/10.7326/M17-3203

Carnovale, C., Perrotta, C., Baldelli, S., Cattaneo, D., Montrasio, C., Barbieri, S. S., Pompilio, G., Vantaggiato, C., Clementi, E., & Pozzi, M. (2023). Antihypertensive drugs and brain function: mechanisms underlying therapeutically beneficial and harmful neuropsychiatric effects. *Cardiovascular Research*, *119*(3), 647-667. https://doi.org/10.1093/cvr/cvac110

Chen, F., Jin, Y., Jiang, Q., & Chen, H. (2022). [Analysis of the effects of a five-tone therapeutic disease intervention on low- and intermediate-risk patients with essential hypertension]. *Modern Practical Medicine*, *34*(3), 383, 420. https://doi.org/10.3969/j.issn.1671-0800.2022.03.045

Chow, C. K., Teo, K. K., Rangarajan, S., Islam, S., Gupta, R., Avezum, A., Bahonar, A., Chifamba, J., Dagenais, G., Diaz, R., Kazmi, K., Lanas, F., Li, W., Lopez-Jaramillo, P., Lu, F., Ismail, N. H., Puoane, T., Rosengren, A., Szuba, A., Temizhan, A., Wielgosz, A., Yusuf, R., Yusufali, A., McKee, M., Liu, L., Mony, P., Yusuf, S., & PURE Study investigators. (2013). Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. *JAMA*, *310*(9), 959-968. https://doi.org/10.1001/jama.2013.184182

Cumpston, M., Li, T., Page, M. J., Chandler, J., Welch, V. A., Higgins, J. P., & Thomas, J. (2019). Updated guidance for trusted systematic reviews: A new edition of the Cochrane Handbook for Systematic Reviews of Interventions. *Cochrane Database of Systematic Reviews*, *10*(10), ED000142. https://doi.org/10.1002/14651858.ED000142

Daghbouche-Rubio, N., López-López, J. R., Pérez-García, M. T., & Cidad, P. (2022). Vascular smooth muscle ion channels in essential hypertension. *Frontiers in Physiology*, *13*, 1016175. https://doi.org/10.3389/fphys.2022.1016175

do Amaral, M. A. S., Neto, M. G., de Queiroz, J. G., Martins-Filho, P. R. S., Saquetto, M. B., & Carvalho, V. O. (2016). Effect of music therapy on blood pressure of individuals with hypertension: A systematic review and meta-analysis. *International Journal of Cardiology*, *214*, 461-464. https://doi.org/10.1016/j.ijcard.2016.03.197

Egan, B. M., Kjeldsen, S. E., Grassi, G., Esler, M., & Mancia, G. (2019). The global burden of hypertension exceeds 1.4 billion people: Should a systolic blood pressure target below 130 become the universal standard? *Journal of Hypertension*, *37*(6), 1148-1153. https://doi.org/10.1097/HJH.0000000000002021

Ettehad, D., Emdin, C. A., Kiran, A., Anderson, S. G., Callender, T., Emberson, J., Chalmers, J., Rodgers, A., & Rahimi, K. (2016). Blood pressure lowering for prevention of cardiovascular disease and death: A systematic review and meta-analysis. *The Lancet*, *387*(10022), 957-967. https://doi.org/10.1016/S0140-6736(15)01225-8

Fujita, M., & Fujita, T. (2016). The role of CNS in the effects of salt on blood pressure. *Current Hypertension Reports*, *18*(2), 10. https://doi.org/10.1007/s11906-015-0620-7

Galińska, E. (2015). Music therapy in neurological rehabilitation settings. *Psychiatria Polska*, *49*(4), 835-846. https://doi.org/10.12740/PP/25557

Hamam, M. S., Kunjummen, E., Hussain, M. S., Nasereldin, M., Bennett, S., & Miller, J. (2020). Anxiety, depression, and pain: Considerations in the treatment of patients with uncontrolled hypertension. *Current Hypertension Reports*, *22*(12), 106. https://doi.org/10.1007/s11906-020-01117-2

Im-Oun, S., Kotruchin, P., Thinsug, P., Mitsungnern, T., Techa-Atik, P., & Pongchaiyakul, C. (2018). Effect of Thai instrumental folk music on blood pressure: a randomized controlled trial in stage-2 hypertensive patients. *Complementary Therapies in Medicine*, *39*, 43-48. https://doi.org/10.1016/j.ctim.2018.05.014

Ji, M., Zhang, H., Xu, Z., & Zhang, W. (2018). [Effect of commercial music therapy on the regulation of blood pressure in hypertensive patients with hyperactive liver fire]. *Journal of Clinic Nursing's Practicality*, *3*(45), 60-61. https://doi.org/10.3969/j.issn.2096-2479.2018.45.051

Jiang, Y., Xie, Y., & Zhao, M. (2022). [The association between cardiovascular disease and cognitive impairment based on the theory of "heart governing the spirit light"]. *Journal of Beijing University of Traditional Chinese Medicine*, *45*(4), 334-341. https://doi.org/10.3969/j.issn.1006-2157.2022.04.002

Johnson, A. K., & Xue, B. (2018). Central nervous system neuroplasticity and the sensitization of hypertension. *Nature Reviews. Nephrology*, *14*(12), 750-766. https://doi.org/10.1038/s41581-018-0068-5

Kearney, P. M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P. K., & He, J. (2005). Global burden of hypertension: Analysis of worldwide data. *The Lancet*, *365*(9455), 217-223. https://doi.org/10.1016/S0140-6736(05)17741-1

Koelsch, S., Fritz, T., Cramon, D. Y. V., Müller, K., & Friederici, A. D. (2006). Investigating emotion with music: An fMRI study. *Human Brain Mapping, 27*(3), 239-250. https://doi.org/10.1002/hbm.20180

Kühlmann, A. Y. R., de Rooij, A., Hunink, M. G. M., De Zeeuw, C. I., & Jeekel, J. (2018). Music affects rodents: A systematic review of experimental research. *Frontiers in Behavioral Neuroscience*, *12*, 301. https://doi.org/10.3389/fnbeh.2018.00301

Kulinski, J., Ofori, E. K., Visotcky, A., Smith, A., Sparapani, R., & Fleg, J. L. (2022). Effects of music on the cardiovascular system. *Trends in Cardiovascular Medicine*, *32*(6), 390-398. https://doi.org/10.1016/j.tcm.2021.06.004

Kunikullaya, K. U., Goturu, J., Muradi, V., Hukkeri, P. A., Kunnavil, R., Doreswamy, V., Prakash, V. S., & Murthy, N. S. (2016). Combination of music with lifestyle modification versus lifestyle modification alone on blood pressure reduction - a randomized controlled trial. *Complementary Therapies in Clinical Practice*, *23*, 102-109. https://doi.org/10.1016/j.ctcp.2015.05.004

Lee, E. K. P., Poon, P., Yip, B. H. K., Bo, Y., Zhu, M. T., Yu, C. P., Ngai, A. C. H., Wong, M. C. S., & Wong, S. Y. S. (2022). Global burden, regional differences, trends, and health consequences of medication nonadherence for hypertension during 2010 to 2020: A meta-analysis involving 27 million patients. *Journal of the American Heart Association*, *11*(17), e026582. https://doi.org/10.1161/JAHA.122.026582

Lei, X., Li, C., & Zhang, L. (2013). [Effect of music therapy on quality of life and blood pressure in hypertensive patients]. *Shandong Medical Journal*, *53*(20), 90-91. https://doi.org/10.3969/j.issn.1002-266X.2013.20.035

Li, G., Chen, H., Xiao, W., Wang, S., & Hong, C. (2022). [Discussion on the mechanism of five elements music therapy with the two-way adjustment of intestinal flora-gut-brain axis in treating hypertension combined with anxiety]. *China Journal of Traditional Chinese Medicine and Pharmacy*, *37*(6), 3136-3140.

Li, J., Yang, Z., Zhang, C., Hu, Y., Li, H., Zhang, M., Bu, P., Wang, S., Zhang, C., & Li, W. (2022). Chinese classical music lowers blood pressure and improves left ventricular hypertrophy in spontaneously hypertensive rats. *Frontiers in Pharmacology*, *13*, 826669. https://doi.org/10.3389/fphar.2022.826669

Li, Y., Li, X., Lou, Z., & Chen, C. (2022). Long short-term memory-based music analysis system for music therapy. *Frontiers in Psychology*, *13*, 928048. https://doi.org/10.3389/fpsyg.2022.928048

Liao, J., Papathanassoglou, E., Zhang, X., Li, Q., Gupta, A., Lu, F., Wu, Y., & Frishkopf, M. (2023). A cross-cultural randomized pilot trial of western-based and five elements music therapy for psychological well-being. *Explore*, *19*(4), 571-577. https://doi.org/10.1016/j.explore.2022.11.001

Lin, F. (2017). [Exploring the application of five elements of music in the five states and five elements of people based on the somatic view]. *China Journal of Traditional Chinese Medicine and Pharmacy*, *32*(11), 4940-4942.

Lin, F. (2019). [Mechanism of five notes of ancient China's pentatonic scale in disease treatment based on meridian and collateral theory]. *Journal of Beijing University of Traditional Chinese Medicine*, *42*(6), 465-468. https://doi.org/10.3969/j.issn.1006-2157.2019.06.005

Liu, L., Wang, W., & Yao, C. (2010). [Guidelines for the prevention and treatment of hypertension in China (2009 Grassroots Edition) (II)]. *Chinese Community Doctors*, *26*(26), 9.

Liu, M. Y., Li, N., Li, W. A., & Khan, H. (2017). Association between psychosocial stress and hypertension: A systematic review and meta-analysis. *Neurological Research*, *39*(6), 573-580. https://doi.org/10.1080/01616412.2017.1317904

Loganathan, L., Gopinath, K., Sankaranarayanan, V. M., Kukreti, R., Rajendran, K., Lee, J. K., & Muthusamy, K. (2020). Computational and pharmacogenomic insights on hypertension treatment: Rational drug design and optimization strategies. *Current Drug Targets*, *21*(1), 18-33. https://doi.org/10.2174/1389450120666190808101356

Lorber, M., & Divjak, S. (2022). Music therapy as an intervention to reduce blood pressure and anxiety levels in older adults with hypertension: A randomized controlled trial. *Research in Gerontological Nursing*, *15*(2), 85-92. https://doi.org/10.3928/19404921-20220218-03

Ma, J., & Chen, X. (2022). Advances in pathogenesis and treatment of essential hypertension. *Frontiers in Cardiovascular Medicine*, *9*, 1003852. https://doi.org/10.3389/fcvm.2022.1003852

Mahmood, S., Shah, K. U., Khan, T. M., Nawaz, S., Rashid, H., Baqar, S. W. A., & Kamran, S. (2019). Non-pharmacological management of hypertension: In the light of current research. *Irish Journal of Medical Science*, *188*(2), 437-452. https://doi.org/10.1007/s11845-018-1889-8

Malakoutikhah, A., Dehghan, M., Ghonchehpoorc, A., Parandeh Afshar, P., & Honarmand, A. (2020). The effect of different genres of music and silence on relaxation and anxiety: A randomized controlled trial. *Explore*, *16*(6), 376-381. https://doi.org/10.1016/j.explore.2020.02.005

Mavridis, I. N. (2015). Music and the nucleus accumbens. *Surgical and Radiologic Anatomy*, *37*(2), 121-125. https://doi.org/10.1007/s00276-014-1360-0

Mills, K. T., Bundy, J. D., Kelly, T. N., Reed, J. E., Kearney, P. M., Reynolds, K., Chen, J., & He, J. (2016). Global disparities of hypertension prevalence and control: A systematic analysis of population-based studies from 90 countries. *Circulation*, *134*(6), 441-450. https://doi.org/10.1161/CIRCULATIONAHA.115.018912

Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature Reviews. Nephrology*, *16*(4), 223-237. https://doi.org/10.1038/s41581-019-0244-2

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of Internal Medicine*, *151*(4), 264-269, W64. https://doi.org/10.7326/0003-4819-151-4-200908180-00135

Monteiro, J. L. G. C., da Silva Barbirato, D., Moraes, S. L. D., Pellizzer, E. P., & do Egito Vasconcelos, B. C. (2022). Does listening to music reduce anxiety and pain in third molar surgery? -a systematic review. *Clinical Oral Investigations*, *26*(10), 6079-6086. https://doi.org/10.1007/s00784-022-04640-5

Oparil, S., Acelajado, M. C., Bakris, G. L., Berlowitz, D. R., Cífková, R., Dominiczak, A. F., Grassi, G., Jordan, J., Poulter, N. R., Rodgers, A., & Whelton, P. K. (2018). Hypertension. *Nature Reviews Disease Primers*, *4*(1), 18014. https://doi.org/10.1038/nrdp.2018.14

Paine, N. J., Watkins, L. L., Blumenthal, J. A., Kuhn, C. M., & Sherwood, A. (2015). Association of depressive and anxiety symptoms with 24-hour urinary catecholamines in individuals with untreated high blood pressure. *Psychosomatic Medicine*, *77*(2), 136-144. https://doi.org/10.1097/PSY.0000000000000144

Park, J. I., Lee, I. H., Lee, S. J., Kwon, R. W., Choo, E. A., Nam, H. W., & Lee, J. B. (2023). Effects of music therapy as an alternative treatment on depression in children and adolescents with ADHD by activating serotonin and improving stress coping ability. *BMC Complementary Medicine and Therapies*, *23*(1), 73. https://doi.org/10.1186/s12906-022-03832-6

Rennie, C., Irvine, D. S., Huang, E., & Huang, J. (2022). Music therapy as a form of nonpharmacologic pain modulation in patients with cancer: A systematic review of the current literature. *Cancers*, *14*(18), 4416. https://doi.org/10.3390/cancers14184416

Shao, T., Liang, L., Zhou, C., Tang, Y., Gao, W., Tu, Y., Yin, Y., Malone, D. C., & Tang, W. (2023). Short-term efficacy of non-pharmacological interventions for global population with elevated blood pressure: A network meta-analysis. *Frontiers in Public Health*, *10*, 1051581. https://doi.org/10.3389/fpubh.2022.1051581

Song, Y., & Li, K. (2015). [Effects of music therapy on anxiety, blood

pressure and sleep status in elderly patients with hypertension]. *Chinese Journal of Gerontology*, *35*(7), 1967-1968. https://doi.org/10.3969/j.issn.1005-9202.2015. 07.107

Su, M. (2007). [Effect of music therapy on blood pressure in patients with hypertension]. *Modern Clinical Nursing*, *2007*(6), 8-9. https://doi.org/10.3969/j.issn.1671-8283.2007.06.004

Su, X. (2016). [Effect of music therapy on the regulation of blood pressure and mental status in elderly patients with hypertension]. *Chinese Journal of Convalescent Medicine*, *25*(3), 253-254. https://doi.org/10.13517/j.cnki.ccm.2016.03.012

Teng, X. F., Wong, M. Y. M., & Zhang, Y. T. (2007). The effect of music on hypertensive patients. *2007 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society,* 2007, 4649-4651. https://doi.org/10.1109/IEMBS.2007.4353376

Tong, A., Flemming, K., McInnes, E., Oliver, S., & Craig, J. (2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Medical Research Methodology*, *12*, 181. https://doi.org/10.1186/1471-2288-12-181

Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., Ramirez, A., Schlaich, M., Stergiou, G. S., Tomaszewski, M., Wainford, R. D., Williams, B., & Schutte, A. E. (2020). 2020 international society of hypertension global hypertension practice guidelines. *Hypertension*, *75*(6), 1334-1357. https://doi.org/10.1161/HYPERTENSIONAHA.120.15026

Verdecchia, P., Reboldi, G., & Angeli, F. (2020). The 2020 International Society of Hypertension global hypertension practice guidelines - key messages and clinical considerations. *European Journal of Internal Medicine*, *82*, 1-6. https://doi.org/10.1016/j.ejim.2020.09.001

Wang, J., Yang, H., Li, N., & Zhang, C. (2018). [Treating hypertension based on syndrome differentiation of Sanjiao theory]. *China Journal of Traditional Chinese Medicine and Pharmacy*, *33*(2), 469-472.

Xiao, X., Chen, W., & Zhang, X. (2023). The effect and mechanisms of music therapy on the autonomic nervous system and brain networks of patients of minimal conscious states: A randomized controlled trial. *Frontiers in Neuroscience*, *17*, 1182181. https://doi.org/10.3389/fnins.2023.1182181

Zanini, C. R., Jardim, P. C. B. V., Salgado, C. M., Nunes, M. C., Urzêda, F. L., Carvalho, M. V. C., Pereira, D. A., deS Jardim, T., & Souza, W. K. (2009). [Music therapy effects on the quality of life and the blood pressure of hypertensive patients]. *Arquivos Brasileiros de Cardiologia*, *93*(5), 534-540. https://doi.org/10.1590/s0066-782x2009001100015

Zhang, M., & Luan, M. (2018). Effects of Chinese medicine five elements music therapy on blood pressure and anxiety in hypertensive patients. *The Journal of Medical Theory and Practice*, 450-452. https://doi.org/10.19381/j.issn.1001-7585.2018.03.080

Zhang, M., & Shi, W. (2021). [Effect of five elements music therapy on blood pressure and emotion of patients with hypertension of hyperactivity of liver Yan]. *Journal of Xinjiang Medical University*, *44*(11), 1289-1293. https://doi.org/10.3639/j.issn.1009-5551.2021.11.017

Zheng, L., Wu, L., & Chen, F. (2017). [Effects of angular tuning music on vascular endothelial function in hypertensive patients with hyperactive liver yang syndrome]. *Chinese Journal of Gerontology*, *37*(8), 1926-1928. https://doi.org/10.3969/j.issn.1005-9202.2017.08.0