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REVIEW
SPORT CARDIOLOGY

Effects of regular dance therapy intervention on blood pressure in hypertension individuals: a systematic review and meta-analysis

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ABSTRACT

INTRODUCTION: Dance therapy is a non-conventional aerobic exercise in cardiovascular rehabilitation. This meta-analysis aimed to update and assess evidence from randomized controlled trials of dance therapy on patients with hypertension.

EVIDENCE ACQUISITION: PubMed, web of science, EBSCO, EMBESE, Cochrane Central Register of Controlled Trials and China National Knowledge Infrastructure databases in English or Chinese were searched and randomized controlled trials were conducted for this meta-analysis to investigate the effects of dance therapy on blood pressure in hypertension patients. Weighted mean difference (WMD) and 95% confidence intervals (CIs) were calculated. Heterogeneity was assessed by I^2 test.

EVIDENCE SYNTHESIS: Five studies were included according to the eligibility criteria. Dance therapy could significantly reduce the systolic/diastolic pressure of hypertension individuals (SBP:WMD -11.07mmHg; 95%CI, -14.3 to -8.12mmHg, P<0.00001;DBP:WMD-4.16mmHg;95% CI, -6.44to-1.88mmHg, P=0.0004) when compared with the control group. low heterogeneity was observed in this research (P=0.65; I^2=0% to SBP; P=0.57; I^2 =0% to DBP). Subgroup analysis results showed that the subgroup of less than 12 weeks intervention group reduce the blood pressure more than those of 12 weeks intervention. Dance therapies reduce the SPB of hypertension individuals in African region better than Europe and America hypertension population.

CONCLUSIONS: Despite the limited number of studies and people involved, the meta-analysis further demonstrated that dance therapy could reduce SBP and DBP in patients with hypertension. The effect of dance therapy intervention on hypertension might be related to duration of intervention and population gene.

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KEY WORDS: Dance therapy; Hypertension; Blood pressure; Exercise; Meta-analysis.

Introduction

Hypertension is one of the major chronic diseases that threaten the health of the people, and it is also an important risk factor for many kinds of heart, brain and kidney vascular diseases. Lancet reported that the rates of hypertension prevalence and control were 37.2% and 5.7% respectively until 2017 in China.[1] The prevalence of hypertension among adults in the united states was 29.0% in 2011-2014, and the prevalence rates of hypertension increased with age, for instance, people aged 60 and over had 64.9% of the prevalence rates of hypertension.[2] Therefore, high blood pressure is a global public health problem, the number of hypertension patients will increase with the expansion of the aging population in the future.

The occurrence of high blood pressure is related to an unhealthy lifestyle. At present, the clinical treatment of hypertension involves antihypertensive medications and life-

style intervention such as reduction of salt intake, a diet rich in fruits and vegetables, exercise and maintaining a healthy body weight.[3] Although antihypertensive medications are the main treatment, aerobic exercise has become an important recommendation to hypertension patients.[4] A growing number of researches indicated that regular aerobic exercise help hypertension patients to control blood pressure.[5] Some researches demonstrated low and moderate intensity aerobic exercise and resistance training help adults and the aging to improve arterial compliance.[6, 7] Previous study reported that exercise effectively help patients to control blood pressure, which was associated with the improved cardiovascular autonomic nerve regulation mechanism.[8] In addition, the literature suggested that regular aerobic exercise improves lipid abnormalities and endothelial function. A study used aerobic walking training to intervene 15 post menopause hypertension women for three months, and the result showed that HDL increased by approximately 29.96%, LDL decreased by approximately 27.01% and TG decreased by approximately 17.70%.[9] Endothelial function plays an important role in maintaining vascular health, aerobic exercise induces the level of nitric oxide (NO) increase, which in turn improve endothelial-dependent dilation, soften arterial vascular and reduce vascular resistance and vascular tone of peripheral arteries.[10] The above-mentioned physiological mechanism may be the reason why exercise-assisted antihypertensive drugs reduce systolic blood pressure. Nine trials were included in a meta-analysis, and the review reported that increased physical activity can reduce systolic pressure of 5-10 and diastolic blood pressure 1-6 mmHg respectively.[11]

Dancing is a rhythmic moderate intensity physical activity accompanied with music. In recent years, a great deal of health benefits of dancing has been realized. Some scholar defined dance movement therapy (DMT) as the psychotherapeutic, which used movement and dance linked to cognitive, emotional, social and physical conditions. A meta-analysis reported that structured dance of any kind is equally effective to other kinds of structured exercise prescription for promoting a number of health outcome measures. Dance movement therapy effectively improved the cardiovascular function, self-perceived mobility, body composition and musculoskeletal function of subjects.[12] Dance therapy can also help the patients of cardiovascular disease recover. Some previous studies showed that dance therapy (Waltz, Greek traditional dances) improved the patients of chronic heart failure's VO_{2max} and the quality of life of patients.[13, 14] Low to moderate intensity of dance therapy has demonstrated that it may control the hypertension individuals blood pressure based on the Antihypertensive drug treatment.[15]

At present, there is only one systematic review related to dance therapy intervening hypertension individuals, and it showed that compared with control group, dance therapy group reduced systolic blood pressure by 12.01mmHg and diastolic blood pressure by 3.38 mmHg respectively.[15]The systematic review included four randomized controlled trials (RCTs), Although PubMed, Scopus, LILACS, IBECS, MEDLINE and SciELO databases were searched, the lack of Web of science, Cochrane library and EMBASE, which are important biomedical research databases, may lead to the lack of literatures. On the other hand, different methods and indicators were used to evaluate exercise capability (VO_2max and six minutes walking test) in the research, the results showed that the analysis outcomes of the exercise capability in patients with hypertension had a higher heterogeneity.

Therefore, this meta-analysis will search both English and Chinese databases about dance therapy intervention in patients with hypertension individuals to update research data and incorporate research results from more ethnic groups population. The purpose of this systematic review and meta-analysis was to investigate the effects of regular dance therapy intervention on blood pressure and blood lipid with hypertension individuals, and to provide reference for the prescription research of dance movement therapy in hypertensive individuals.

Evidence acquisition

Search Strategy

We did this research of systematic review following the PRISMA (Preferred Reporting Items for systematic Reviews and Meta-Analyses) guidelines.[16] The identification of RCTs were searched from PubMed, web of science, EBSCO CINAHL, EMBASE, Cochrane Central Register of Controlled Trials and CNKI (China National Knowledge Infrastructure) Databases. The range of search time is from the above databases inception to March 1, 2020. The key words that we used were "dance" or "dancing" or "dance therapy" or "dance movement therapy" or "waltz" or "ballet" in combination with "hypertension" or "hypertensive disease" or "high blood pressure" or "cardiovascular diseases." The search language was limited to English or Chinese. Other potentially relevant literatures were searched from the reference lists of selected articles (Supplementary Digital Material 1: Supplementary Text File 1).

Inclusion criteria

The eligibility criteria were determined, which followed the PICOT elements, for example, population, intervention, comparison, outcome measures and the type of study.

Regarding the type of studies, only RCTs that investigated dance therapy intervention on individuals with hypertension for analysis were selected, no language restrictions of the publication.

The participants included that patients were diagnosed as hypertension (include stage I and stage II hypertension) or prehypertension regardless of whether they were receiving antihypertensive treatment or not.

The interventions of experimental group participants were dance therapy or dance therapy combined with antihypertensive treatment. The type of dance had no restrictions and usually performed with music. The primary outcomes were SBP and DBP in mmHg.

Data extraction and quality assessment

Two reviewers independently extracted data from the inclusion papers using predefined criteria, which included information of study characteristics (*e.g.*, first author, publication year, country or region), participants characteristics (*e.g.*, age, sample size, gender and hypertension level), study design (*e.g.*, dance type, the description of interventions and duration period and research outcomes). according to the title, abstract of study or full text, determined that the study whether be included. If there were disagreements, they were resolved by discussion between data extractors, or consultation with a third reviewer and determined by a third reviewer. This meta-analysis used the calculation formula from Revman 5.1 handbook:[17]

$$SD_{E,change}=\sqrt{SD^2_{E,baseline}+SD^2_{E,final}-(2\times Corr\times SD_{E,baseline}\times SD_{E,final}}$$

The risk of bias of the included literatures was assessed by two independent reviewers who used the PEDro scale tool to assess it.[18] The information what was assessed including of concealed allocation, blinding of subjects, therapists, assessors, and so on. If there were disagreements, they were resolved by adjudication of the third author.

Statistical data

Review Manager (RevMan5.3)[17] and Stata 12.0 (StataCorp LLC, Lakeway Drive, College Station, TX, USA) software were applied to conduct the data analysis, and a random effects model was used for calculation in the meta-analysis. The changes between the baseline and post-intervention points were used for this meta-analysis, because the blood pressure and blood lipid values were continuous data. This paper analyzed the main treatment effect by using the standardized mean difference or the weighted mean difference (WMD) and 95%confidence intervals (CIs). Means and standard deviation (SD) were extracted from each included study, $P<0.05$ as statistically significant. If continuous data was reported as the median and within an interquartile range (IQR), the median would be assumed to be equivalent to the mean, and the relationship of the IQR with the standard deviation was roughly SD=IQR/1.3519.

Heterogeneity of dance therapy treatment outcomes was assessed by Cochran's Q-test ($P<0.1$) and the inconsistency I^2 test.[19] The I^2 values less than 25% indicated the minimal heterogeneity, I^2 values more than 30% but less than 50% was moderate heterogeneity, I^2 values more than 50% was to be substantial heterogeneity. Sensitivity analysis was conducted by removing each research individually to evaluate the quality and consistency of the outcomes. Publication bias was assessed by Egger's test, which was assessed by funnel plot asymmetry.

Evidence synthesis

Selection outcome

In total, there were 326 records be searched from six English and Chinese databases. After duplicate checking by Endnote software, 286 potentially relevant abstracts were screened.[20, 21] According to analysis the title and abstract, there were 276 references which were not related with this meta-analysis be excluded. The remaining 10 studies were considered as potentially relevant, after the full-text of 10 references were read, five studies were excluded for the following reasons: non-randomized clinical trials(N.=2),[19, 20] review (N.=1),[15, 21] content repetition(N.=2),[22-24] the flow diagram of studies in this meta-analysis was showed in Figure 1).[22, 25-27]

Included study characteristics

The total number of participants in all included studies was 283,[22, 23, 25-27] with 147 participants in the dance therapy intervention group and 136 participants in the control group, respectively. The minimum or maximum number of subjects in all studies was respectively 38 or 88 individuals. Two studies of Maruf *et al*.[23, 27] recruited 183 subjects in all, 53 individuals from which withdrew resulted from knee joint pain, personal reasons and BP rose into the severe range. 7 individuals quitted in the study of Kaholokula *et al.*,[22] and other research did not reported that the

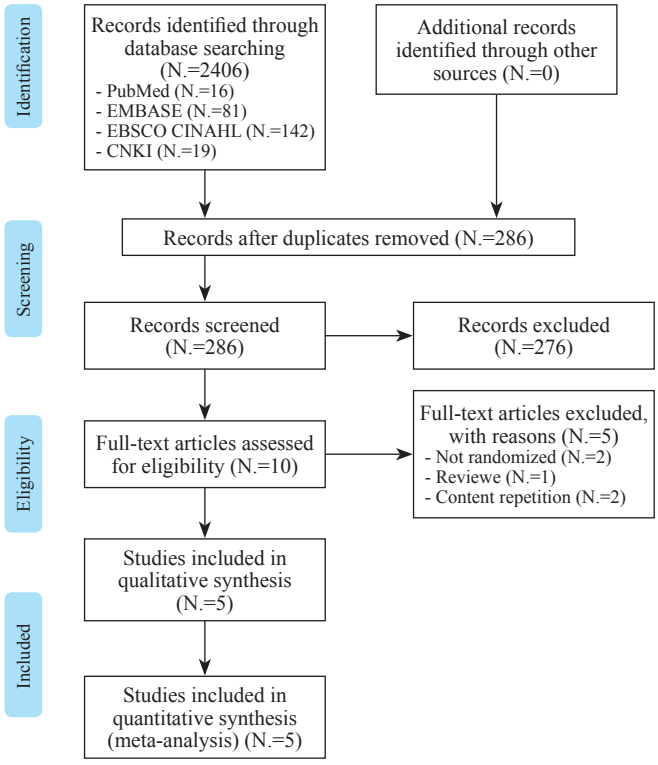

Figure 1.—Flow diagram of study selection.

data about subjects' loss. The average age of the subjects ranged from 44 to 69 years old, and only Serrano *et al*.[25] and Aweto[26] reported that the gender distribution of subjects in their studies, nonetheless, all five studies did not compare the different BP data between male and female in detail. Moreover, all studies included participants with essential hypertension, excluded stage III hypertension stroke cancer ischemic heart disease, but only Kaholokula's[22] study included partly hypertension individuals combined with diabetes.

There were 3 researches came from African, and the rest of studies came from Spain and Hawaii. All the essential hypertension subjects included in studies received antihypertensive medication treatment. All studies used the same measure devices, procedure and time to evaluated outcomes before and after intervention. Each study used the automated device to evaluate blood pressure except Aweto,[26] which used a sphygmomanometer stethoscope in their research. There were some differences of blood pressure measurement in these researches, which were the device, time used and so on. In addition, standardized protocols were applied to evaluate blood pressure only in the studies of Kaholokula *et al*.[22] and Aweto *et al*.[26]

Characteristics of intervention program

All included studies apply reported the dance therapy protocols. The duration of dance therapy ranged from 4 to 12 weeks, and the training time varied from 45 to 60 min per session. The frequency of dance therapy was two or three times per week, and the types of dance therapy were different between the included studies. The studies by Aweto *et al*.[26] and Maruf *et al*.[23, 27] used the aerobic dance practices, which divided the session into 3 phases: warm-up, dance practices and cool down phases. Kaholokula *et al*.[22] used Hula-Ola Hou style while Serrano used the Spanish dance and ballet. Maruf *et al*.[23, 27] reported that the intensity of using dance was about 50-70% heart rate reserve, and the dance intensity of study of Kaholokula *et al*.[22] was about 40-85% VO_2max, but two other researches did not reported the intensity of dance practices. Most of studies did not provided supervision and monitoring in the dance intervention process except Maruf *et al*.,[23, 27] and only Kaholokula *et al*.[22] reported that the Hula-Ola Hou was taught by profession Hula teacher. One or two anti-hypertensive drugs treatment, health educational sessions and usual activities or free exercises were included in control groups. None of them included dietary nutritional control interventions. In addition, previous studies did not compare the antihypertensive effect of dance therapy with conventional aerobic exercise and resistance training. The characteristics of participants, intervention protocols and outcomes in all included studies were summarized in (Table I).[22, 25-27]

Risk of error assessment

The methodological quality of all included studies was assessed by PEDro scale tool (Table II).[22, 25-27] All authors introduced how they had generated the random allocation in their articles. Dance therapy is a self-administered training; hence, it is very difficult to apply a credible placebo-control arm in designing a dance intervention experiment. In five articles, the allocation concealment or blinding of participants and personnel were hardly used. Only Serrano *et al*.[25] used the Concealed allocation and Blind assessors in the research, which led to a high risk of bias. In addition, only two articles (Serrano *et al*. and Kaholokula *et al*.)[22, 25] had an adequate follow-up period. Four articles used the intention to treat as their primary analysis, method except Aweto *et al*.[26]

Blood pressure outcome and publication bias

Compared with control group, the meta-analysis of five included studies results showed that dance therapy could

TABLE I.—*Characteristics of the included studies.*

Source year	Country/ region	Participant characteristic, sample size	Experimental group		Control group	Main outcomes		Others
			Dance style	Intensity/time/frequency/ duration weeks		Aerobic capacity	Blood pressure	
Aweto *et al*. 2012[26]	African	Prehypertension, stage I and stage II hypertension; all on anti-hypertensive drugs; EG:23(10 males and 13 females); CG:15(6 males and 9 females)	Dance movement therapy	Intensity(unknown)/50min/2 times week/4 weeks; 50-minute DMT session: Include warm-up exercise; cool down phase; 30min fast music practice and 5min rest	anti-hypertensive drugs; educational sessions 2 times a week	VO2max	SBP, DBP	RHR-MHR
Maruf *et al*.[27] 2013	Nigeria	Mild-moderate hypertension; EG: 32, age50.38±8.4; CG:31, age 55.3±8.1; 21 persons did not finish the intervention (EG:11, CG:10)	Aerobic dance	50-70% heart rate reserve/45 min/3 times /12 weeks; include warm-up exercise; cool down phase; 30 min aerobic dance (supervision)	Normoretic: hydrochlorothiazide +amiloride hydrochloride, and Amlodipine		SBP, DBP	Number of antihypertensive drugs
Maruf *et al*.[23] 2014	Nigeria	Mild-moderate hypertension; EG: 60, age 50.80±8.31; CG:60, age 54.75±8.56; 32 persons did not finish the intervention (EG:15, CG:17)	Aerobic dance	50-70% heart rate reserve/45 min/3 times /12 weeks; include warm-up exercise; cool down phase; 30min aerobic dance (supervision)	Normoretic: hydrochlorothiazide +amiloride hydrochloride, and Amlodipine		SBP, DBP	Serum lipid levels, body mass index
Kaholokula *et al*.[22] 2017	Hawaiians	NHPI with a systolic blood pressure (SBP)≥140mmHg; EG: 25, age 55±10; CG:23, age 55±12	Hula- Ola Hou	40–85% VO2max/60min/2times /12weeks; 3 hours hypertension education	Free to perform exercise or participate other health promotion program	6min walking test	SBP, DBP	HRQL
Serrano *et al*.[25] 2016	Spanish	Prehypertensive and hypertensive women; EG:35 women, age 69.07±4.4; CG: 32woman, age 69.48±3.2	Dance therapy (Spanish dance and ballet)	Intensity(unknown)/50 min/3 times /8weeks; include warm-up exercise; cool down phase; 30min aerobic dance	Usual activities and medication		SBP, DBP	Pittsburgh Sleep Quality Index

EG: experimental group; CG: control group; SBP: systolic blood pressure; DBP: diastolic blood pressure; HRQL: health-related quality of life; RHR: resting heart rate; MHR: maximum heart rate.

TABLE II.—*Risk of bias assessment of included studies.*

Article (year)	Random allocation	Concealed allocation	Baseline comparability	Blind subjects	Blind therapists	Blind assessors	Adequate follow-up	Intention to treat analysis	Between-group comparisons	Piont estimates and variability
Aweto *et al*.[26] 2012	Yes	No	Yes	No	No	No	No	No	Yes	Yes
Maruf *et al*.[27] 2013	Yes	No	Yes	No	No	No	No	Yes	Yes	No
Maruf *et al*.[23] 2014	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes
Kaholokula *et al*.[22] 2017	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Serrano *et al*.[25] 2016	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

significantly reduce the systolic blood pressure of hypertension individuals (-11.07mmHg; 95%CI, -14.3 to -8.12 mmHg, P<0.00001 (Figure 2A).[22, 25-27] The heterogeneity was very low (P=0.65; I^2=0%), Egger's test was applied only for SBP, There was publication bias for SBP (asymmetry test, P=0.236) .This research also indicated an obvious reduction effect in diastolic blood pressure (-4.16 mmHg; 95%CI, -6.44 to -1.88 mmHg, P=0.0004) (Fig-

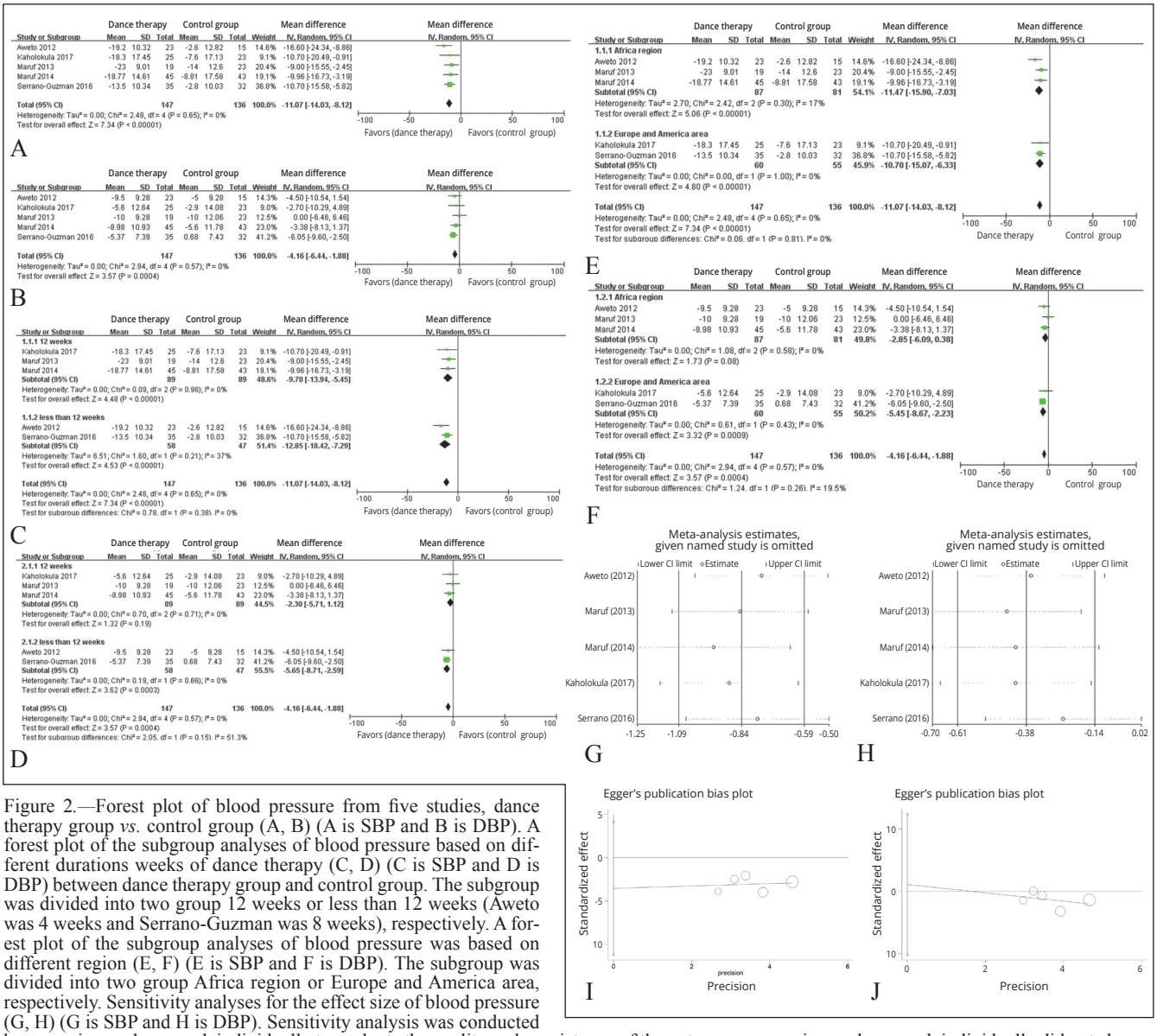

Figure 2.—Forest plot of blood pressure from five studies, dance therapy group *vs.* control group (A, B) (A is SBP and B is DBP). A forest plot of the subgroup analyses of blood pressure based on different durations weeks of dance therapy (C, D) (C is SBP and D is DBP) between dance therapy group and control group. The subgroup was divided into two group 12 weeks or less than 12 weeks (Aweto was 4 weeks and Serrano-Guzman was 8 weeks), respectively. A forest plot of the subgroup analyses of blood pressure was based on different region (E, F) (E is SBP and F is DBP). The subgroup was divided into two group Africa region or Europe and America area, respectively. Sensitivity analyses for the effect size of blood pressure (G, H) (G is SBP and H is DBP). Sensitivity analysis was conducted by removing each research individually to evaluate the quality and consistency of the outcomes, removing each research individually did not change the statistical confidence interval. Publication bias for the effect size of blood pressure (I, J) (I is SBP and J is DBP). Egger's test was applied only for SBP and DBP($P<0.01$).[20-24]
SD: standard deviation; 95% CI: 95% confidence intervals; IV: inverse variance.

ure 2B).[22, 25-27] The heterogeneity was very low (P=0.57; I^2=0%), Egger's test was applied only for DBP, There was publication bias for DBP (asymmetry test, P=0.780, Figure 2I, J).[22, 25-27] In order to investigate the potential sources of heterogeneity, this article deleted any of the included studied to make sensitive analysis, which did not substantially change the results (Figure 2G, H).[22, 25-27]

Subgroup analysis outcome

According to the duration weeks of dance therapy to make the subgroup analysis, the results showed that the SBP and DBP values of less than 12 weeks intervention (SBP: -12.85mmHg, 95%CI, -18.42 to -7.29, P<0.00001; DBP: -5.65mmHg, 95%CI, -8.71 to -2.59, P=0.0003, Figure 2C, D)[22, 25-27] the

decrease of both values were more than those of 12 weeks (SBP: -9.70mmHg, 95% CI, -13.94 to -5.45, P<0.00001, DBP: -2.30mmHg, 95%CI, -5.71 to 1.12, P=0.19, Figure 2C, D).[22, 25-27] In addition, the subgroup analysis showed that dance therapy reduce the SPB of hypertension individuals in African region (SBP: -11.47mmHg, 95%CI, -15.9 to -7.03, P<0.00001, Figure 2E, F)[22, 25-27] better than Europe and America hypertension population (SBP: -10.70mmHg, 95%CI, -15.07 to -6.33, P<0.00001, Figure 2E, F).[22, 25-27]

Discussion

In this systematic review, meta-analysis of five studies demonstrated a significant reduction in SBP and DBP in dance therapy among the hypertension individuals when compared with the control group. Moreover, the meta-analysis was firstly based on the duration week of dance intervention training or research region to make a subgroup analysis which was aimed to indicate the time effect. It preliminarily showed that SBP and DBP values of less than 12 weeks' intervention both reduce more than the values of 12 weeks. Dance therapies reduce the SPB of hypertension individuals in African region better than Europe and America hypertension population.

The high accidence rate of hypertension disease is a worldwide public health issue. Hypertension is an important risk factor for death from myocardial infarction and stroke. However, previous study showed that regular lifestyle could effectively control blood pressure and reduce the risk of cardiovascular events caused by hypertension. Based on the evidence of clinical studied, it demonstrated that resistance training prescription and aerobic exercise training could effectively reduce blood pressure of hypertension individuals.[28] American Heart Association made aerobic exercise prescription as a "A" level of evidence and "I" class were recommended to hypertension individuals and clinical doctor to prevent and treat high blood pressure.[29] A meta-analysis of Semlitsch *et al*.[11] reported that increasing physical activity can reduce systolic and diastolic blood pressure by 5-10 and 1-6 mmHg respectively. Another meta-analysis also reported that aerobic exercise reduces systolic and diastolic blood pressure by around -3.5mmHg and -3mmHg.[30] It is also preliminary demonstrated dancing, as a non-traditional physical activity accompanied by music and combined with culture can reduce systolic blood pressure and diastolic blood pressure by 12.01mmHg and 3.38mmHg with hypertension individuals, respectively.[15] This meta-analysis showed that dance therapy could significantly reduce the systolic blood pressure of hypertension individuals (-11.07mmHg) and indicated an obvious reduction effect in diastolic blood pressure (-4.16mmHg), which was in accordance with previous data. Moreover, previous study found that a 5mmHg reduction of SBP could significantly decrease the risk of stroke by 13%.[31] Another paper indicated that even a reduction of around 3.8 mmHg SBP could respectively decrease about the risk 5% and 8% of developing coronary heart disease and stroke. Most importantly, it could reduce all-cause mortality by 4%.[2] In addition, Faselis *et al*.[32] analyzed the relationship between exercise capacity and all-cause mortality in elderly male veterans with hypertension. It showed that with every 1-MET increasing in exercise capacity, the risk of mortality decreased by 11%. When the exercise capacity was more than 8 METs, the mortality risk was 48% lower than that of the group with less than 4 MET. According to the research evidence above, dance therapy helps patients with hypertension to control the blood pressure, which has important clinical application value and basis. However, currently there are insufficient evidence that dance therapy is as efficient as conventional exercise training in reducing SBP and DBP. because the included studies designing antihypertensive drugs, behavior education and free activity as control group, however, lack of research compared with aerobic exercise and resistance training intervention. On the other hand, although this meta-analysis preliminarily showed that SBP and DBP values of less than 12weeks intervention were both lower than those of 12weeks, therefore, it was necessary to interpret and to apply this outcome of research with caution. There is a high risk of bias due to the inclusion of less research and literature. How to maintain the long-term and positive effect of dance therapy is a question that must be explored in the future research.

Although dance therapy is a non-conventional type of rehabilitation exercise training, some evidence showed that dance therapy was a low-cost exercise rehabilitation therapy without obvious side effects. It can be widely used to control the blood pressure of hypertension patients,[15] improved the exercise capacity of patient with chronic heart failure[33] and reduced the risk of cardiovascular in the elderly.[34] Therefore, this meta-analysis which provides a new evidence for the application of dance therapy in controlling the blood pressure of hypertension individuals is important and necessary. Based on previous literature, firstly, this meta-analysis expanded search scope of the literature and increased some new studies from 2017 to 2019. Secondly, it included the European data and expanded to the ethnic population. Three of all included five literatures are about dance therapy used in hypertension individuals of African region, it preliminarily showed that dance therapy reduces the SPB of hypertension individuals in Afri-

can region better than Europe and America hypertension population, however, the two studies of Maruf showed that the significantly effective of dance therapy improve blood pressure in Nigerian hypertensive individuals. There are many different ethnic groups in Africa, it is hardly that current research data truthfully revealed the dance therapy treatment increase BP control rate of the whole African hypertension population, the results may change with a larger sample size. However, there were very highly prevalence of hypertension and lowly BP control rate in African population, it is necessary to develop dance therapy as an important strategy to complement antihypertension drugs. Unfortunately, we cannot do subgroup analysis to distinguish the difference effect of dance therapy between different gender and age population. Due to five studies included did not compare the different BP data between male and female in detail, we should discuss the different effect of dance therapy in different gender individuals with hypertension and whether the female individuals with hypertension are in better compliance and antihypertensive effect to dance therapy in the future. In addition, the studies included did not compare the antihypertensive effect of dance therapy with conventional aerobic exercise and resistance training, we also need to explore whether dance therapy have better compliance and antihypertensive effect in blood pressure control than other aerobic exercise or activity.

In addition, we will explore individualized, systematized and structured hypertension exercise prescriptions to improve compliance of patients, security of exercise therapy and to acquire favorable blood pressure response by combining with dance culture, music, identification, social involvement and other sociological factors. It is noteworthy that this meta-analysis has a lower heterogeneity in SBP and DBP combined with data analysis, which may be related to the concentration of hypertension population in the same region. Three of five studies came from African, and two studies were conducted by Maruf, including the population of Nigeria. The heterogeneity of this meta-analysis is lower than that of Lino *et al*.[15] By comparing with the method of the data extraction, we find differences of $SD_{E\ change}$ values calculation formula between the two studies. Although this meta-analysis has a lower heterogeneity, it should be cautious to interpret, because the hypertension diagnose criteria were not stated clearly by authors. Most of included studies lack adequate follow-ups to observe the long-term effects of dance therapy on hypertension. However, dancing is a type of physical activity which combines movements with social interaction, music and fun. People who participate in the projects of dance intervention might be better-motivated to continue and have a lower rate of withdrawal than conventional exercise. Belardinelli *et al*.[14] found that the adherence of patient with chronic heart failure to waltz was higher than that in conventional exercise training. Meanwhile, they demonstrated waltz is safe to the patient with chronic heart failure. Five studies included in this meta-analysis also did not have cardiovascular accident in the dance practice, which is in accordance with the study of Belardinelli *et al*.[14] and Kaltsatou.[13] Therefore, dance therapy has the wide application prospect as an adjuvant therapy of patient with hypertension in clinical treatment. Further research is needed to determine the essential attributes of dance (dance style, intensity, frequency, duration, sessions of time) to achieve the best therapeutically effects.

Conclusions

This meta-analysis revealed that dance therapy could decrease SBP and DBP in patients with hypertension. There was no significant increase in the effect on and improvement in blood pressure during dance therapy interventions over 8 weeks. Current evidence suggests that dance therapy may be an effective treatment for hypertension in Africa. Owing to including the limited number of studies and people involved in this analysis, it limits a pragmatic recommendation of dance therapy as an alternative intervention in individuals with hypertension. However, it could be suggested for being used in combination with conventional aerobic exercise and dietary nutrition intervention or in those who prefer dancing to other forms of exercise. In order to demonstrate the effects of dance therapy on hypertension individuals, it is necessary to make of dance therapy intervention on hypertension more clearly, which requires larger, well-designed and high-quality RCTs.

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