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Feature Article

The effect of music therapy on reducing depression in people with dementia: A systematic review and meta-analysis

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ABSTRACT

The aim of this study was to determine the effectiveness of music therapy on reducing depression for people with dementia during different intervention intervals. A systematic review with a meta-analysis of randomized controlled trials. The databases surveyed include AgeLine, CINAHL, MEDLINE, PsycINFO, PubMed, and Cochrane. Seven studies were included in this review. The result revealed that music therapy significantly reduced depression at six, eight, and 16 weeks. This study also supported that music therapy significantly improved depression when the results of six studies with medium-term interventions were pooled. However, no evidence of effect of music therapy on depression was observed at three, four, 12 weeks, and five months during intervention, and one and two months after the cease of music therapy. Music therapy without a music therapist involved did not significantly reduce depression at any time. Medium-term of music therapy might be appropriate in reducing depression for people with dementia.

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Introduction

Depression is a serious health issue in older populations with cognitive problems. The prevalence of dementia is 5–8% in people aged 60 or older, it is estimated that the current population of older adults with dementia is 47.5 million worldwide.¹ This population is projected to reach 75.6 million in 2030 and 135.5 million in 2050.¹ The prevalence of depression in older adults with dementia is reported to be between 14 and 50%.^{2–4} A recent study found that 25% of people with dementia and 16% of people with mild cognitive impairment (MCI) have depressive symptoms, respectively.³ This complication of depression reduces quality of life⁵ and causes caregiver burden.^{6,7}

General depression was defined and diagnosed by the DSM-V.⁸ Lawrence, Murray, Banerjee, Turner, Sangha, Byng, Bhugra, Huxley, Tylee, Macdonald⁹ interviewed older people and concluded that the concept of depression is variable in different ethnic groups and may be regarded as an illness, as a low mood and hopelessness, or as a state of worry. Alexopoulos, Abrams, Young, Shamoian¹⁰ concluded that the symptoms of depression in older people with dementia included loss of interest in activities, loss of appetite, irritability,

difficulty falling asleep, anxiety and suicide ideation by reviewing the literature and obtaining information from psychiatrists and experts.

Depression is associated with cognitive function impairment. In a survey with 1470 participants conducted in memory or outpatient clinics, Knapskog, Barca, Engedal¹¹ found lower levels of depression in patients without dementia than in those with dementia. In a review study, Engmann¹² revealed that depression was correlated with a higher occurrence of cognitive impairment in older adults. Chan, Lam, Tam, Lui, Chan, Wong, Wong, Tham, Ho, Chan, Chiu¹³ investigated community-dwelling older adults and found that people with impaired cognition had poorer depressive symptoms than those with intact cognition. In a survey of non-demented Chinese older adults, Tam, Lam¹⁴ pointed out that increasingly severe depression was associated with lower scores on cognitive assessments.

It is unclear whether depressive symptoms cause cognitive impairments or the other way around. However, evidence supports the positive relationship between them. Moreover, depressive symptoms are related to poor health outcomes in people with cognitive impairments. A recent systematic review study revealed that pharmacologic treatment was a common approach in managing depressive symptoms and problematic behaviours in demented patients.¹⁵ Although demented patients could be benefited from non-pharmacologic interventions, such as music therapy, this type of approach was less likely to be implemented.¹⁵ There are various types of non-pharmacologic interventions, such as music

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therapy, bright light therapy, exercise training, walking, and social interaction. The evidence that supports the effect of music therapy on depressive symptoms and problematic behaviours is controversial. For instance, a recent meta-analysis on musical intervention for patients with cognitive impairments showed a significant overall effect on reducing depressive symptoms,¹⁶ while another earlier meta-analysis reported a non-significant overall effect on affective outcomes.^{7,17}

Music therapy is defined as “the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program.”¹⁸ However, Music therapy is generally conducted by qualified music therapists. Music therapists are permitted by clinical training to develop work that meets individual needs and to provide reassurance and emotional support.^{18,19} Music therapy can be undertaken in various forms, including listening to music that the therapist sings or selected, or playing instruments.

Music therapy is a systematic intervention that focuses on mental, social or physiological disorders or symptoms.²⁰ For people with dementia, music therapy is beneficial on their mood, depression, anxiety, or even problematic behaviors.^{21,22} Furthermore, music therapy is associated with memory functioning in general,²³ as well as people with cognitive impairment.^{22,24} Several individual research studies used music therapy to determine whether it can improve depression in people with dementia. The results of these studies are inconclusive, due to the differences in duration of the intervention, small sample sizes, and varying results. Previous studies have endeavored to pool studies to analyze the effect of music therapy in depression.^{16,25,26} However, the length of intervention was not analyzed. Instead of music therapist, some of music therapy interventions were conducted by musicians, nurses, occupational therapists, nursing assistance, and volunteers, many not trained in music therapy. The goal of the present meta-analysis was to examine whether music therapy reduced depression in people with dementia when interventions had different duration and to analyze the role of music therapists in music therapy.

Methods

Search method

The databases used in this meta-analysis to systematically search for studies included AgeLine, CINAHL, MEDLINE, PsycINFO, PubMed and Cochrane. All searches were made during April 2016. The search terms were music, sing, singing, dementia, Alzheimer, and depression*. References listed in the systematic review and meta-analysis studies were also reviewed to retrieve individual articles. The inclusion criteria for the studies were (1) the use of randomized controlled trials (RCTs), including parallel and crossover methods; (2) an examination of the intervention effects of music therapy on dementia patients with depression or depressive symptoms; (3) published in English or Chinese. The exclusion criteria were (1) music therapy combined with pharmaceutical treatment, (2) a control group with any type of music intervention, and (3) the inclusion of patients with psychoses or other diseases, (4) the main intervention was not music therapy.

Two authors independently checked the title, the abstract or both of each research article in the electronic database to assess the eligibility of the full article, which would be subject to review in the presence of any doubts. Any discrepancies were resolved through discussions with a third author.

Quality appraisals

The quality of the methodological trial was assessed by 3-dimension instrument Jadad scale.²⁷ Data pertinent to the search terms randomized/described randomized, double blind/described double blind, and

description of withdrawals and dropouts were scored. If the method of allocation randomization was described, one additional point was given. In contrast, if the method was not described or the random description was inappropriate, such as participants' allocated groups by order of enrollment, one point was deducted. The same protocol was applied for the method of double blinding, which was described as appropriate or inappropriate, and one point was either given or deducted, respectively. Scores range from 0 to 5, with a higher score indicating higher quality of the RCTs design. A total score of 3 or above is considered strong quality, but a score below 3 is indicative of a weak RCT design.²⁸ Quality assessments were conducted independently by the two authors in a standardized manner.

Meta-analysis

Data synthesis was conducted with MetaView Review Manager Version5.3.²⁹ We pooled the retrieved research studies by (1) similar measurement times of the interventions, (2) conducted with music therapist or not, and (3) similar levels of dementia. This study estimated post-test statistical outcomes between an experimental group and a control group. Standardized mean differences (SMD) were calculated if the research studies used different depression scales. Mean differences were used when research studies used the same rating scale and only one individual trial was analyzed. The heterogeneity among the studies was assessed using the I^2 statistic,³⁰ with values of 0% indicating no heterogeneity, 25% indicating low heterogeneity, 50% indicating moderate heterogeneity and 75% or greater indicating high heterogeneity.³⁰ The results of the clinically homogenous studies were estimated by random-effect models when the I^2 value was greater than 50% (fix modes were performed for I^2 values less than 50%). The effect-size was calculated by 95% confidence intervals (CI). Publication bias, assessed by funnel plot, was not performed when the number of the included studies was less than 10.³¹

Results

Search outcomes

A total of 167 published articles were identified after removing duplicated articles. Two authors independently checked the titles, abstracts or both to assess eligibility. Then, 136 articles were excluded, leaving 31 articles for the analysis. The full texts of five research articles met all the inclusion criteria after independent assessments by the two authors. The following full-text research studies were excluded ($n=26$): those with non-RCT designs ($n=9$), review or meta-analysis studies ($n=7$), those without measurements of depression outcomes ($n=4$), non-music therapy intervention studies ($n=3$), those music therapy was not main intervention³² ($n=1$), those with combined drug therapy ($n=1$), and those with psychosis participants ($n=1$). Two research studies^{33,34} were retrieved from the meta-analysis study reference list.¹⁶ Therefore, a total of seven research studies were included in the present study for a systematic review and meta-analysis^{33–39} (Fig. 1). Two of these music therapy research studies did not conduct interventions with a music therapist, including Cooke et al. Cooke, Moyle, Shum, Harrison, Murfield,³⁸ and Guétin et al. Guétin, Portet, Picot, Pommie, Messaoudi, Djabelkir, Olsen, Cano, Lecourt, Touchon.³⁹ Four of these research studies, which did not provide efficiency results from the trials for statistical analysis, were requested for raw data from the authors.^{33–35,37} In the Janata³⁷ study, after noon shift²⁶ data were estimated rather than before noon shift (AM) data since the music program occurred during PM hours.

Quality assessment

Quality appraisal of our study was conducted using Jadad scale. Accordingly, as if the research study was randomized (one

point) with appropriate randomized method stated (one point), two points would be given. Seven studies conducted randomized control trials, so one point was given to each study. Five studies described methods of randomized, including an online randomization program,³⁵ blocked randomization,^{36,39} computer-generated program,³⁸ and the randperm function in MATLAB,³⁷ so one additional point was given. One study described a randomization method that was conducted with non-standardized randomization criteria (assigned by enrolled order)³⁴ and another did not describe a randomization method.³³ Therefore, one point was deducted in the latter two research studies.

The research studies should be described as double-blind and the method of blinding should be appropriate. We assessed the risk of a blinding bias across the following domains: 1) blinding of the participants and personnel and 2) blinding of the outcome assessments. It is not feasible to blind participants due to the nature of music therapy interventions. The score for double-blinding was zero in each study. Blinding in outcome assessors or caregivers was described in five studies^{33,34,37–39} and the other two studies described the randomization of the participants into two groups in a blinded manner.^{35,36} Therefore, an additional point was given to the seven studies.

The withdrawal rate in each group must be stated in a research study. If the number and the reason for withdrawal were stated, 1 point was given. Six studies stated the number and the reasons for withdrawal during intervention,^{33,34,36–39} therefore, 1 point was given. One study, however, only stated the number of dropouts without providing the reasons for withdrawal,³⁵ so no point was given to this study.

The total Jada scores were 3 or greater in seven studies: four studies' scores were 4, and three studies' score were 3, indicating high-quality RCT designs (Table 1).

Settings and participants

Five countries were included in these 7 research studies. Three research studies took place in Italy,^{33–35} one in America,³⁷ one in Australia,³⁸ one in France,³⁹ and one in Taiwan.³⁶ The settings of these seven research studies were nursing home/Alzheimer's Assisted Living facilities, including one study with a confirmed setting by author.³⁵ Most of the participants were over 65 years old, except the participants from one study³⁷ who were 56 years and older. Cognitive function assessed by Mini-Mental State Examination (MMSE) ranged from mild to severe (MMSE from 0–24).

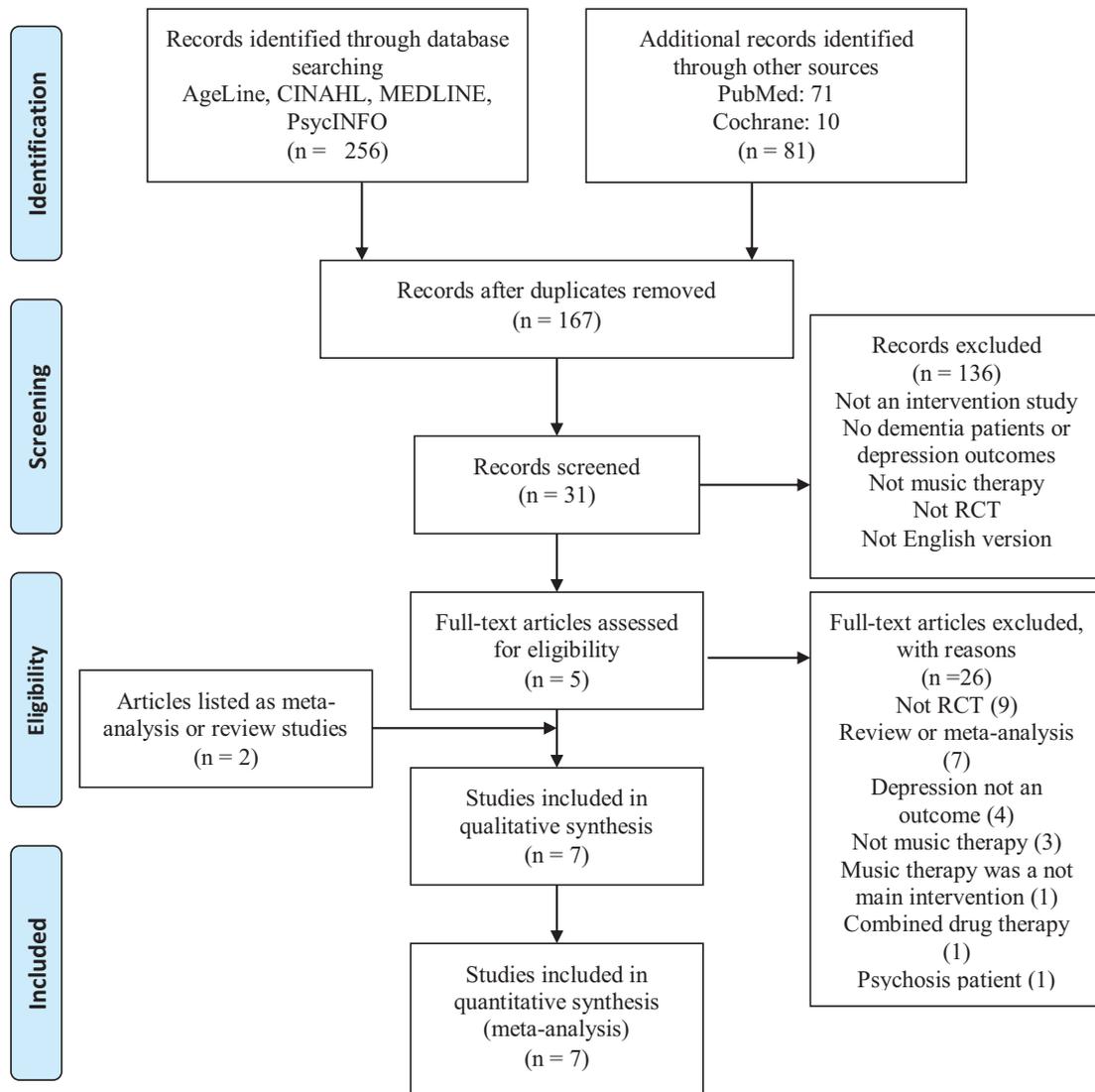


Fig. 1. Flow diagram of the literature search.

Table 1
Summary of the included studies.

Study	Participants	Setting (country/location)	Intervention characterization	Frequency/Duration	Measurement	Outcome	Quality score
Ceccato et al. (2012).	Mild to moderate dementia Age \geq 65 y/o N = 50 (Intervention 27, control 23)	Italy / Nursing home	E: Sound training for attention and memory C: Standard care	2 times / week (45 min) / 12 weeks	GDS	There was no significant difference on GDS level between intervention and control groups.	Jadad score: 3 1. Randomized: yes 2. Randomized described: yes 3. Double-blind: no 4. Blinding described: yes 5. Withdrawals: no
Chu et al. (2014)	Mild to moderate dementia Age \geq 65 y/o N = 104 (Intervention 52, control 52)	Taiwan / Nursing home	E: Musical instrument activity, singing, music listening C: Usual nursing home care	2 times / week (30 min) / 6 weeks	CSDD	Depression level (CSDD) was significantly improved between the music therapy and control groups over time.	Jadad score: 4 1. Randomized: yes 2. Randomized described: yes 3. Double-blind: no 4. Blinding described: yes 5. Withdrawals: yes
Cooke et al. (2010)	Mild to moderate dementia Age \geq 65 y/o N = 47 (Intervention 24, control 23)	Australia/long-term care facilities	E: Song-singing; listening, play instrument C: Reading	3 times / week (40 min) / 8 weeks	GDS	Depression scores decreased significantly over time in music group ($F(2, 22) = 8.129, P < .01$).	Jadad score: 4 1. Randomized: yes 2. Randomized described: yes 3. Double blind: no 4. Blinding described: yes 5. Withdrawals: yes
Guetin et al. (2009)	Mild to moderate dementia Age 74–93 y/o N = 30 (Intervention 15, control 15)	France/nursing home	E: Individual receptive music therapy C: Rest and reading	1 time / week (20 min) / 16 weeks	GDS	Significant improvements in depression ($P < .01$) in music group over four weeks period.	Jadad score: 4 1. Randomized: yes 2. Randomized described: yes 3. Double blind: no 4. Blinding described: yes 5. Withdrawals: yes
Janata et al. (2012)	Moderate to severe dementia N = 38 (Intervention 19, control 19)	USA/ Somerford Place Alzheimer's Assisted Living facility	E: Frequent personalized music program times C: No treatment	4 times / day (21 to 65 min per session) / 12 weeks	CSDD	No effect of music treatment on depression in dementia group over times.	Jadad score: 4 1. Randomized: yes 2. Randomized described: yes 3. Double-blind: no 4. Blinding describe: yes 5. Withdrawals: yes
Raglio et al. (2008)	Mild to severe Age 73–95 y/o N = 59 (Intervention 30, control 29)	Italy/nursing home	E: Interaction using musical instruments C: Educational and entertainment activities	3 times / week (30 min) / 16 weeks	NPI Test	NPI total score significantly decreased in the experimental group over time.	Jadad score: 3 1. Randomized: yes 2. Randomized described: no 3. Double-blind: no 4. Blinding described: yes 5. Withdrawals: yes
Raglio et al. (2010)	Moderate to severe dementia Age 69–99 y/o N = 60 (Intervention 30, control 30)	Italy/nursing home	E: Interaction using musical instruments C: Standard care	3 times / week (30 min) / 5 month	NPI Test	From baseline to follow-up, depression was improved significantly both in the experimental and in the control groups over time.	Jadad score: 3 1. Randomized: yes 2. Randomized described: no 3. Double-blind: no 4. Blinding described: yes 5. Withdrawals: yes

CSDD: Chinese Version of the Cornell Scale for Depression in Dementia; GDS: Geriatric Depression Scale; NPI: Neuropsychiatry Inventory.

Intervention and control group characteristics

The intervention in the retrieved studies included sound training for attention and memory, playing musical instruments, singing songs, and listening to music. Sound training for attention and memory consisted of stimulus, reaction to acoustic stimulus, shifting attention, and orderly and inverted repetition. The frequency of music therapy was generally two to three times per week for 30 to 45 min in five research studies.^{33–36,38} One study conducted listening music therapy four times per day for 21 to 65 min per session,³⁷ and another study conducted the therapy once a week for 20 min.³⁹ The control group included standard care or usual care, reading, no treatment, and educational and entertainment activities.

Outcome measurements

The outcome measurements were the Cornell Scale for Depression in Dementia (CSDD) in two studies,^{36,37} the Geriatric Depression Scale (GDS) in three studies,^{35,38,39} and a subscale of the Neuropsychiatry Inventory (NPI) in two studies.^{33,34} The summary result of the meta-analysis was presented in [table 2](#).

The effectiveness of music therapy at different times during treatment

There was a significant difference between music therapy and control groups at six weeks, eight weeks, and sixteen weeks. Of the included studies, only one study³⁶ examined the effect of music therapy at week 6. In this study, the sample size was 100, and the mean difference was -5.56 (95% CI $-8.86, -2.26, p < .001$). Three reviewed studies^{34,38,39} analyzed the effect of music therapy at week 8. For these studies, the combined sample size was 129, and the standardized mean difference (SMD) was -0.37 (95% CI $-0.72, -0.02, p = .04, I^2 = 28\%$). Two studies^{34,39} were combined to examine the effect of music therapy at sixteen weeks. The combined sample size was 83, and the SMD was -0.48 (95% CI $-0.92, -0.04, p = .03$).

Current analysis also revealed no significant difference between the music therapy group and control group at short durations of intervention time (one month or less). One study³⁶ with a sample size of 100 tested the effect of music therapy at three weeks, and the result showed a non-significant difference (mean difference = -3.19 , 95% CI $-6.94, 0.56, p = .10$) between the two groups. Another study³⁹ tested the music therapy effect at four weeks, and the result was not significant ($N = 30$, mean difference = 1.00 , 95% CI $-3.78, 5.78, p = .68$). For durations longer than three months, the results showed no

Table 2
Comparison music therapy versus Control at each time.

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size; P value
Three weeks music therapist (Yes)	1	100	Mean Difference (IV, Fixed, 95% CI)	-3.19 [-6.94, 0.56]; <i>p</i> = .10
Four weeks music therapist (No)	1	30	Mean Difference (IV, Fixed, 95% CI)	1.00 [-3.78, 5.78]; <i>p</i> = .68
Six weeks music therapist (Yes)	1	100	Mean Difference (IV, Fixed, 95% CI)	-5.56 [-8.86, -2.26]; <i>p</i> = .001
Eight weeks music therapist (Yes)	3	129	Std. Mean Difference (IV, Fixed, 95% CI)	-0.37 [-0.72, -0.02]; <i>p</i> = 0.04
music therapist (Yes)	1	58	Mean Difference (IV, Fixed, 95% CI)	-1.90 [-3.27, -0.53]; <i>p</i> = .006
music therapist (No)	2	71	Mean Difference (IV, Fixed, 95% CI)	-0.29 [-1.75, 1.16]; <i>p</i> = 0.69
Twelve weeks music therapist (Yes)	2	84	Std. Mean Difference (IV, Fixed, 95% CI)	-0.04 [-0.47, 0.39]; <i>p</i> = .87
Sixteen weeks music therapist (Yes)	2	83	Std. Mean Difference (IV, Fixed, 95% CI)	-0.48 [-0.92, -0.04]; <i>p</i> = .03
music therapist (Yes)	1	57	Mean Difference (IV, Fixed, 95% CI)	-1.13 [-2.31, 0.05]; <i>p</i> = .06
music therapist (No)	1	26	Mean Difference (IV, Fixed, 95% CI)	-2.30 [-6.16, 1.56]; <i>p</i> = 0.24
Five months music therapist (Yes)	1	56	Mean Difference (IV, Fixed, 95% CI)	-0.54 [-1.74, 0.66]; <i>p</i> = .38
One month after treatment music therapist (Yes)	2	157	Std. Mean Difference (IV, Fixed, 95% CI)	-0.12 [-0.43, 0.19]; <i>p</i> = .45
Two months after treatment music therapist (No)	1	24	Mean Difference (IV, Fixed, 95% CI)	0.40 [-5.28, 6.08]; <i>p</i> = .89

difference between music therapy and control groups. There were two studies^{35,37} combined to analyze the effects of music therapy at twelve weeks (*N* = 84), and their combined SMD showed no significant difference between the two groups (SMD = -0.04, 95% CI -0.47, 0.39, *p* = .87, *I*² = 0%). One study³³ (*N* = 56) examined the music therapy effect at five months, and the results showed no significant difference (mean difference = -0.54, 95% CI -1.74, 0.66, *p* = .38).

The effectiveness of music therapy at different times after complete treatment

Data synthesis revealed no significant differences between the control group and the experimental group one month after treatment was completed. These data were analyzed from two combined studies^{34,36} with *N* = 157 (SMD = -0.12, 95% CI -0.43, 0.19, *p* = .45, *I*² = 0%). Additionally, analysis was conducted for music therapy effects two months after ceasing treatment. These data resulted from one study³⁹ (*N* = 24) (mean difference = 0.40, 95% CI -5.28, 6.08, *p* = .89).

The effectiveness of music therapy without music therapist involved

Two studies^{38,39} included music therapy interventions without music therapists, and the pooled estimation showed no difference between the music therapy and control groups (total *N* = 71, mean difference -0.29, 95% CI -1.75, 1.16, *p* = .69, *I*² = 0%). Of the two studies excluding music therapists, one³⁹ was measured at sixteen weeks, and the results showed no difference between music intervention and control groups (*N* = 26, mean difference = -2.30, 95% CI = -6.16 to 1.56, *p* = .24).

The effectiveness of music therapy in medium-term interventions

Six studies^{34–39} were pooled for the current medium-term intervention estimation (*N* = 313). The duration of interventions ranged from six weeks to twelve weeks. The analysis with the random effect models revealed that music therapy significantly reduced depression (SMD = -0.37, 95% CI -0.59, -0.14, *p* = .001, *I*² = 35%) (Fig. 2).

The effect of music therapy by dementia level

The levels of dementia among the included studies varied from mild to severe, and they were assessed using different measurement scales, which did not facilitate a stratified analysis of different levels of dementia. Therefore, the effect of music therapy on depression by the level of dementia was not determined in this study.

Discussion

The current meta-analysis examined the effect of music therapy on depression for people with dementia. Seven research studies with randomized controlled trials were retrieved, all of which had high quality assessment scores. The music therapy duration and inclusion of a music therapist were examined in this analysis. Five studies were conducted by music therapists, while the other two were not. The result of the current meta-analysis revealed that music therapy was significantly associated with decreasing the degree of depression for medium-term interventions (six to 12 weeks). No significant differences in depressive levels were found between music therapy and

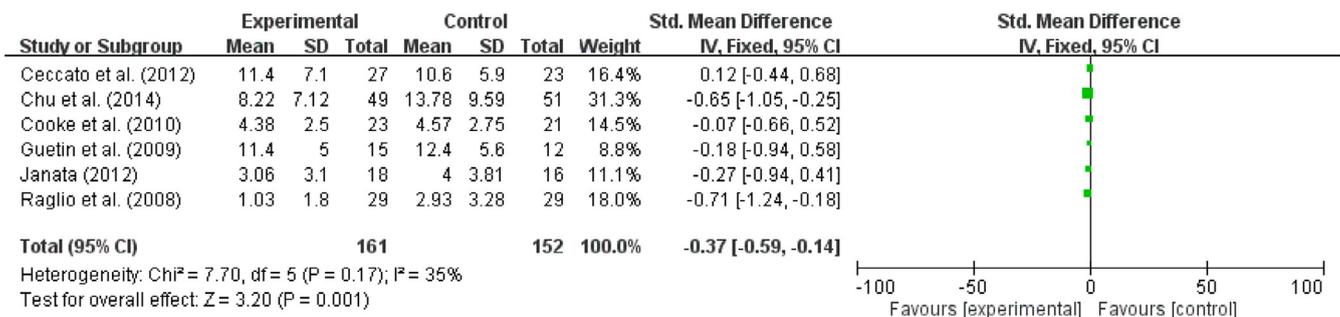


Fig. 2. Meta-analysis of music therapy in medium-term interventions.

control groups in short-term interventions (three or four weeks). The effects of medium-term music therapy may contribute to improved depression in people with dementia, while short-term interventions may not. A similar meta-analysis study suggested that short-term music therapy might not be able to improve cognitive function for people with dementia.⁴⁰

The current meta-analysis also revealed two other important time factors related to music therapy intervention. First, there was no significant difference between music therapy and control groups at five months of intervention, suggesting that long periods of music therapy intervention may not relate to the improvement of depression in people with dementia. A possible explanation is that the patients' dementia levels may have worsened during this long period of time.⁴¹ Therefore, regular and similarly patterned music therapy did not significantly reduce depression. Moreover, only three studies analyzed long periods of music therapy intervention, and the rather limited sample size may have resulted in this insignificant difference. Further studies are needed to evaluate the long-term effects of music therapy on depression. Second, no significant effect on depression was observed at one and two months after music therapy was completed. It is possible that people with dementia tend to lose their interaction skills quickly.⁴² The cessation of music therapy not only ended the musical stimulation but also decreased the opportunity for social interaction. Whether the effect of music therapy was maintained in reducing depression when music therapy was discontinued should be explored in further studies.

Finally, music therapy without the involvement of a music therapist did not significantly reduce depression at any time. Participants used the music language to express their emotions during music therapy. Qualified music therapists were requested to attend a rigorous training course and to pass certification examinations. The current meta-analysis suggests the important role of music therapists in music therapy sessions. However, only two studies were retrieved for analysis. The influence of music therapists in music therapy is another area requiring further study.

Strengths and limitations

The strengths of this meta-analysis include the selection of studies utilizing random control trials, and their high quality appraisal. The strategy of using music therapy interventions, whether directed by music therapists or not, was also analyzed. Moreover, this meta-analysis grouped studies with similar intervention assessment times, suggesting clinical implications to design interventions of appropriate lengths to reduce depression.

There were a few limitations in the current meta-analysis. First, only seven research studies were retrieved. The effects of each study were pooled and compared at certain durations of music therapy intervention; therefore, only one or two individual studies were pooled at a given duration, leading to limited power for subgroup analysis. Second, this meta-analysis also failed to analyze the effects of music therapy by the level of dementia due to the limited number of retrieved research studies. Moreover, most of the study settings were nursing homes, which more likely include patients with severe levels of dementia, thus potentially threatening the generalizability of the results. Finally, a comprehensive search of the available databases revealed large numbers of relevant research studies, but unpublished research studies could have been missed. Therefore, publication bias cannot be excluded from this study.

Implication for further research

Only seven randomized controlled trial studies were included in this systematic meta-analysis. Our research reveals that medium-term music therapy is associated with reducing depression in people

with dementia, but the same effects are not seen with long-term music therapy or after the music therapy session has ended. Thus, more qualified studies in related topics are recommended, especially for designing interventions for the long term and after ending music therapy. The subjects of our study primarily resided in long-term care facilities or nursing homes, and may have advanced dementia or depressive symptoms. Further research is recommended in examining the relation between residents' location and severity of dementia with the effect of music therapy. Furthermore, the effect of including music therapists is recommended for further research.

Conclusion

This meta-analysis confirmed that medium-term music therapy interventions can effectively reduce depression in people with dementia. Further studies are recommended to demonstrate the effect of long-term interventions and outcomes after ending music therapy in this study population. The importance of music therapists in music therapy interventions was also shown in this study. Further validated trials are recommended to support this result and provide evidence for the effect of music therapy on people with different levels of dementia.

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Author contributions

Li, Wang and Lu conceived the idea and contributed to the manuscript. Lu and Lee assessed the research studies' eligibility and evaluated the methodological quality. Chen provided statistical advice.

Role of the funding source

None declared

Conflict of interest

The authors have no personal conflicts in this paper

Sponsor's role

None

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.gerinurse.2019.03.017](https://doi.org/10.1016/j.gerinurse.2019.03.017).

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