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# Group Music Intervention Using Percussion Instruments to Reduce Anxiety Among Elderly Male Veterans with Alzheimer Disease

Authors' Contribution:  
Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

**ABDG 1-4 Mu-N Liu**  
**AC 1,2 Ying-Jay Liou**  
**ABCD 5,6 Wan-Chuan Wang**  
**DEF 5 Kuan-Chen Su**  
**B 7 Heng-Liang Yeh**  
**FG 8-12 Chi-ieong Lau**  
**DF 1,2 Li-Yu Hu**  
**ADEG 1,2,3 Shih-Jen Tsai**  
**ADG 5,13 Hsin-Yi Chen**

1 Department of Psychiatry, Taipei Veterans' General Hospital, Taipei, Taiwan, R.O.C.  
2 Division of Psychiatry, School of Medicine, National Yang-Ming University, Taipei, Taiwan, R.O.C.  
3 Institute of Brain Science, National Yang-Ming University, Taipei, Taiwan, R.O.C.  
4 Memory and Aging Center, University of California San Francisco, San Francisco, CA, U.S.A.  
5 Taipei Rosyclouds Foundation for Education, Taiwan, R.O.C.  
6 Music Department, Taipei National University of The Arts, Taiwan, R.O.C.  
7 Health Care Group, Taipei Veterans Home, New-Taipei, Taiwan, R.O.C.  
8 Dementia Center, Department of Neurology, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan, R.O.C.  
9 Applied Cognitive Neuroscience Group, Institute of Cognitive Neuroscience, University College London, London, U.K.  
10 College of Medicine, Fu-Jen Catholic University, Taipei, Taiwan, R.O.C.  
11 Institute of Biophotonics, National Yang-Ming University, Taipei, Taiwan, R.O.C.  
12 University Hospital, Taipa, Macao, S.A.R.  
13 National Taiwan University of the Arts, Taipei, Taiwan, R.O.C.

**Corresponding Authors:**  
**Source of support:**

Shih-Jen Tsai, e-mail: [tsai610913@gmail.com](mailto:tsai610913@gmail.com), Hsin-Yi Chen, e-mail: [rosyclouds2012@gmail.com](mailto:rosyclouds2012@gmail.com)

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**Background:** This study aimed to assess the impact of a group music intervention on anxiety and depression of elderly male veterans with dementia.


**Material/Methods:** In total, 50 elderly men with Alzheimer disease were randomly divided into intervention and control groups. Patients in the intervention group attended a 60-minute group music session that used percussion instruments with familiar music in the morning once a week for 12 weeks, whereas those in the control group received a rest and reading session at the same intervals and under the same conditions. The Hamilton Anxiety Rating Scale and Geriatric Depression Scale were used to assess anxiety and depression at baseline, week 6, and week 12. The Primary Measures of Music Audiation (PMMA) was used to assess musical aptitude at the baseline.

**Results:** A significant reduction in the anxiety level following the 12-week music sessions was observed in the intervention group ( $P < .001$ ), but there was no significant change in the control group. However, the change in depressive symptoms between the 2 groups was nonsignificant. In the intervention group, when stratifying patients based on music aptitude determined through PMMA assessment, patients with high PMMA scores had significantly reduced anxiety symptoms over time compared with those with low scores.

**Conclusions:** For elderly male veterans with dementia, participating in a group music intervention reduced anxiety symptoms. In patients with high musical aptitude, the treatment effects on anxiety reduction were satisfactory. Measures of music aptitude may provide valuable information regarding patients' response to music intervention.

**Keywords:** **Aged • Alzheimer Disease • Anxiety • Aptitude • Music • Veterans**

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## Background

Dementia is a clinical syndrome defined as a cluster of symptoms including memory difficulties, language and other cognitive function disturbances, behavior changes, and impairment of daily living activities [1]. The number of patients with dementia is expected to double every 20 years, reaching 43.2 million by 2020 and 81.1 million by 2040 [2]. Alzheimer disease (AD) is a chronic and progressive neurodegenerative disorder, and is the most common type of dementia [1]. With the anticipated 2-fold increase in the number of cases in the next few decades, this progressive disease has become a major public health problem.

Although cognitive decline is the cardinal characteristic of AD, neuropsychiatric symptoms associated with AD account for increased disability rates and seriously affect patient and caregiver quality of life [3]. Untreated depression and anxiety can contribute to worsening of functional status and may trigger behavioral disturbance in those with AD, which may further lead to institutionalization [3]. Patients with dementia and depression and/or anxiety are often managed with antidepressant and anxiolytic medications [3]. However, because of concerns regarding adverse effects from psychotropic medication and the relatively high likelihood of patients with dementia failing to comply with treatment [4], the use of nonpharmacological care strategies is vital in managing neuropsychiatric symptoms of patients with AD [5,6].

Music is a major means of triggering emotions. Music-based intervention stimulates intellectual function and reduces anxiety and depression, and thus significantly improves autonomy in patients with neurodegenerative disorders [5-8]. This is because the music is chosen on the basis of personal experience, with an aim of stimulating memory by evoking autobiographical events [9]. Several studies have assessed the effect of different types of music interventions on depression and anxiety symptoms for people with AD, such as passively listening to music alone or together with others and singing or playing instruments in a group setting [7]. Among these music approaches, playing percussion instruments may create a rich and stimulating music experience for patients with dementia [10], making it a beneficial and nonpharmacological intervention to alleviate neuropsychiatric symptoms [11].

Measures of musical aptitude provide valuable information about likely patient response that can be used for designing music intervention and strategies. Moreover, the effect of music intervention is greater among people with high musical aptitude because they are inclined to appreciate music and receive happiness and satisfaction when listening to it, as opposed to those with low musical aptitude [12]. Furthermore, a study indicated that people with high musical aptitude have a superior ability to process and transform auditory stimulation

related to emotions than those without such aptitude [13]. Therefore, investigating the effect of baseline musical aptitude on response to music intervention is critical.

Most elderly Taiwanese veterans came to Taiwan during their teenage years toward the end of the 1940s from hometowns throughout mainland China [14]. Most of them are men, have a minimal extent of formal education, and live in government-sponsored long-term care institutions known as veterans' homes. Because of the passage of time and changing social structures, elderly veterans now lack a support system and have become a distinct minority group in Taiwan [15]. In addition, elderly veterans are vulnerable to dementia and neuropsychiatric symptoms [16] and prone to adverse effects from medications [4]. Therefore, the efficacy of nonpharmacological interventions should be explored in this vulnerable population [6]. To the best of our knowledge, few studies have assessed the impact of group music percussion interventions on male veterans with dementia. This study aimed to determine (1) whether the use of percussion in group music intervention could reduce depression and anxiety levels in elderly male veterans with AD and (2) whether the baseline musical aptitude could affect the response to a music intervention. Our findings can serve as a foundation for future nonpharmacological programs for elderly men with AD.

## Material and Methods

### Patients

We selected 50 patients from veterans' homes in northern Taiwan. The patients usually lived in the veteran's homes in a long-term stay setting or dementia center. All patients had to meet the following inclusion criteria: (1) a resident of veterans' homes; (2) male gender, (3) aged 75 years or older; (4) meeting the diagnostic criteria for probable AD according to the National Institute of Neurological and Communicative Disorders [17], in a mild or moderate stage based on the Clinical Dementia Rating scale (CDR, 1 and 2); (5) in a mild level of anxiety based on HAMA score below 17 [18]; (6) receiving stable psychotropic or anxiolytic treatment for 3 months; (7) able to communicate in Mandarin or Taiwanese; (8) no severe hearing impairment; (9) able to follow simple instructions and participate in easy and simple activities, and (10) capable of engaging in the evaluation and intervention. Patients and their relatives and caregivers at the veteran's homes signed informed consent forms prior to inclusion in the study. The study was approved by the Ethics Committee of Taipei Veterans' General Hospital.

### Randomization

Patients with AD were randomized into an intervention or a control group with a 1: 1 ratio after matching by age and

CDR level. An external expert who had no direct contact with the patients generated the randomization list using a spreadsheet software program and kept each patient's allocation concealed. The assessor, the music facilitator, and the participants were not able to know the group allocation in advance. Only the outcome assessor was blinded to the group allocation throughout the trial. At the time of assessments, participants were reminded not to reveal their allocation to the assessor.

## Study Design

In the intervention group, patients received 12 weeks of music intervention once per week (a total of 12 sessions). In the control group, without active participation in music intervention, patients participated in a rest and reading session, at the same intervals and under the same conditions. All participants were assessed for level of depression and for anxiety severity using the Geriatric Depression Scale – short form (GDS) [19], and the Hamilton Anxiety Rating Scale (HAMA) [20] at baseline, week 6, and week 12. Musical aptitude was assessed using the Primary Measures of Music Audiation (PMMA) at baseline. Within the intervention group, patients were further stratified into 2 groups categorized by PMMA overall scores; 0-20 (low musical aptitude subgroup) or 21-100 (high musical aptitude subgroup) [21].

## Group Music Intervention

In the intervention group, patients received the 60-minute group music intervention delivered by a trained music facilitator in the morning once a week for 12 weeks in the activity room in the veterans' homes. The intervention contained a 10-minute warm-up session of fingers and upper-extremities exercises and breathing exercises. Then, the participants used percussion instruments to practice simple rhythmic patterns, engaged in a 40-minute group music session with familiar music, and finally engaged in a 10-minute review session in which they returned to earlier rhythmic patterns used during the same day's session. A collection of preferred and familiar songs from participants, which were assessed prior to the intervention by asking them, their caregivers, family members, or institutional staff, was used with the music session. The music collections contained pleasant rhythm and moderate tempo from 1930-1970s' Chinese and Taiwanese popular songs. Participants were asked to follow the instruction to play various kinds of percussion instruments (such as wrist bell, tambourine, maracas, triangle, double-tone woodblock, hand drum, castanet) by moving their upper extremities with their familiar songs.

## Outcome Measurements

HAMA is a 14-item scale designed to assess anxiety severity, measured on a 5-point Likert scale ranging from 0 (not present)

to 4 (severe), with the total score ranging from 0 to 56 [20]. The survey of GDS score consisted of 15 questions with a set of yes or no answers. The total possible score ranges from 0 to 15; each 'yes' response received 1 positive point. The GDS score has been used to represent the degree of depression severity [19]. The PMMA contains 40 pairs of audio clips, whereas participants were asked to compare the difference of tonal sequence or rhythmic pattern within each pair of clips [21].

## Data Analysis

Data are presented with means±standard deviations for continuous variables or with numbers and percentages for categorical variables. Normality of distribution was confirmed through Kolmogorov-Smirnov testing. The unpaired *t* test or Mann-Whitney U test (for non-normal distributions) was used for between-group comparisons. Categorical variables were compared through chi-squared testing.

Repeated-measures analysis of variance (repeated-measure ANOVA) was performed to compare the differences in HAMA and GDS scores between the intervention and control groups over time. There were 3 time-points (baseline, week 6, and week 12) throughout the trial. Time-dependent effects of the music intervention on HAMA or GDS between intervention and control groups were assessed by fitting a "time x group" interaction term. If the "time x group" interaction effect on GDS or HAMA was statistically significant, a post hoc *t* test was used to compare the mean difference of GDS or HAMA at each assessment time point. Within the intervention group, we further compared the differences in clinical symptoms over time between low and high musical aptitude subgroups using the same repeated-measures ANOVA followed by post hoc *t* tests. The SPSS 17.0 software package (SPSS, Inc., Chicago, IL, USA) was used for statistical analysis. A *P* value of less than 0.05 was considered statistically significant.

## Results

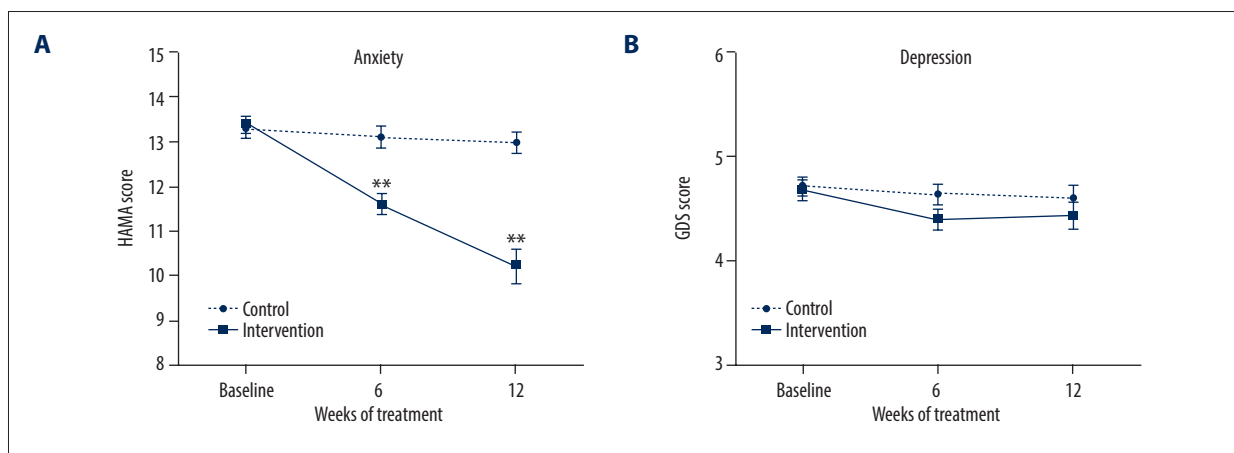
Fifty elderly male veterans with AD were randomly divided into 2 groups: a music intervention group (n=25) or a control group (n=25). In each group, dementia was mild in 9 patients (CDR=1) and moderate in 16 patients (CDR=2). The average age was 86.6±4.5 years for the intervention group and 86.9±5.7 years for the control group. The 2 groups were homogeneous in terms of age, education, frequency distribution of dementia severity, and baseline clinical symptoms (Table 1).

Regarding the change in clinical symptoms between groups before and after the intervention, time ( $P<0.001$ ), group ( $P<0.001$ ), and time×group interaction ( $P<0.001$ ) had significant effects on HAMA scores throughout the trial. Post hoc analyses with

**Table 1.** Demographic characteristics and measurements of depression and anxiety of patients with Alzheimer disease in the intervention and control groups.

	Intervention (n=25)	Control (n=25)	p
Age	86.56±4.54	86.92±5.73	0.807
Education	6.96±3.17	7.80±3.72	0.394
Mild Dementia; CDR=1, (n,%)	9 (36%)	9 (36%)	1.0
PMMA	34.2±20.8	25.8±21.6	0.168
GDS			
Baseline	4.68±0.48	4.72±0.46	1.0
6 weeks	4.40±0.50	4.64±0.49	0.4
12 weeks	4.44±0.65	4.60±0.65	0.387
HAMA			
Baseline	13.36±0.95	13.24±0.97	0.661
6 weeks	11.60±1.23	13.08±1.22	<0.001**
12 weeks	10.20±1.94	12.96±1.21	<0.001**

Values are expressed as mean±SD. Statistical analysis was performed by repeated-measures ANOVA and post hoc analyses with independent *t* test: \*\**p*<0.001 to compare intervention vs control groups. PMMA – Primary Measures of Music Audiation; HAMA – Hamilton Anxiety Rating Scale; GDS – Geriatric Depression Scale.



**Figure 1.** Effects of group music intervention. (A) Hamilton Anxiety Rating Scale (HAMA) score. (B) Geriatric Depression Scale (GDS) score. Intervention group: solid line (n=25); control group: dashed line (n=25). Values are expressed as mean±standard error of the mean. Repeated-measures ANOVA and post hoc analyses with independent *t* tests: \*\* *P*<0.001 to compare the intervention group with control group.

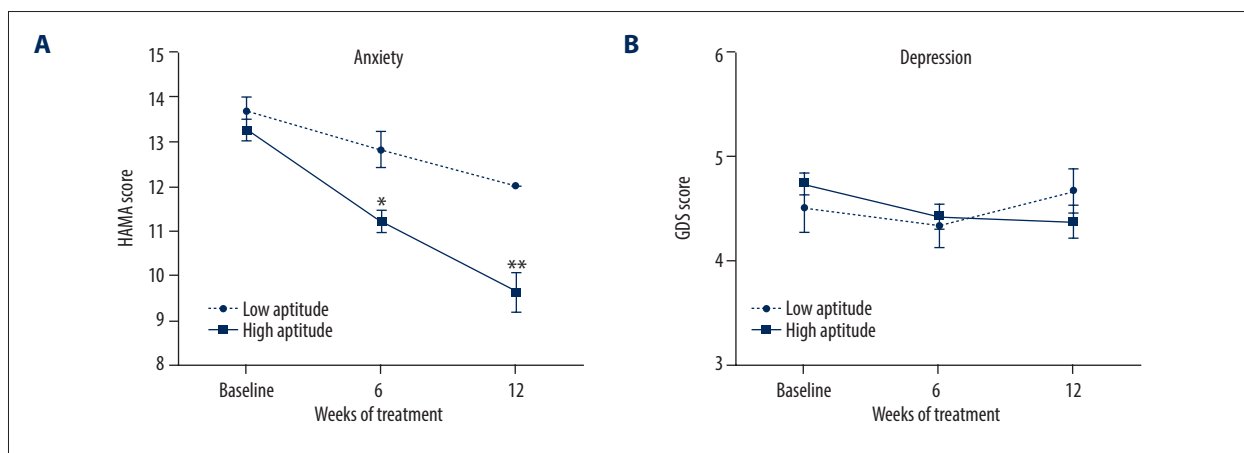
independent *t* tests showed that the mean difference between 2 groups was statistically significant both at week 6 (*t*=4.277, *P*<0.001) and week 12 (*t*=6.048, *P*<0.001). At weeks 6 and 12, patients with AD in the intervention group demonstrated significant reduction in HAMA scores compared with patients in the control group (Figure 1A, Table 2). For depression severity, time (*P*=0.039) but not group (*P*=0.214) or time×group interaction (*P*=0.482) had a significant effect on GDS scores throughout the trial (Figure 1B, Table 2).

Within the intervention group, time (*P*<0.001), group (*P*=0.006), and time×group interaction (*P*=0.019) had significant effects on HAMA scores throughout the trial. Post hoc analyses with independent *t* test revealed that the mean differences between low- and high-aptitude subgroups were statistically significant both at week 6 (*t*=3.393, *P*=0.003) and week 12 (*t*=5.457, *P*<0.001). At weeks 6 and 12, patients with AD with high aptitude exhibited significantly lower HAMA scores than those with low aptitude (Figure 2A, Table 2). For depression severity, time (*P*=0.504), group (*P*=0.960), and time×group interaction

**Table 2.** Demographic characteristics and measurements of depression and anxiety in the high and low musical aptitude subgroups.

	High music aptitude subgroup (n=19)	Low music aptitude subgroup (n=6)	P
Age	86.53±4.95	86.67±3.27	0.949
Education	6.79±3.54	7.50±1.64	0.508
Mild Dementia; CDR=1, (n,%)			
PMMA	40.37±20.25	14.67±2.34	<0.001
GDS			
Baseline	4.74±0.45	4.50±0.55	0.298
6 weeks	4.42±0.51	4.33±0.52	0.716
12 weeks	4.37±0.68	4.67±0.52	0.338
HAMA			
Baseline	13.26±0.99	13.67±0.82	0.341
6 weeks	11.21±1.03	12.83±0.98	0.003*
12 weeks	9.63±1.89	12.00±0.00	<0.001**

Values are expressed as mean±SD. Statistical analysis was performed by repeated-measures ANOVA and post hoc analyses with independent *t* test \*/\*\* *p*<0.01/0.001 to compare high- vs low-aptitude subgroups. PMMA – Primary Measures of Music Audiation; HAMA – Hamilton Anxiety Rating Scale; GDS –Geriatric Depression Scale.



**Figure 2.** Effect of musical aptitude on the response to music intervention. (A) Hamilton Anxiety Rating Scale (HAMA) score. (B) Geriatric Depression Scale (GDS) score. High musical aptitude subgroup: solid line (n=19); low musical aptitude subgroup: dashed line (n=6). Values are expressed as mean±standard error of the mean. Repeated-measures ANOVA and post hoc analyses with independent *t* tests: \* *P*<0.01, \*\* *P*<0.001 to compare high- and low-aptitude subgroups.

(*P*=0.085) had no significant effects on GDS scores throughout the trial (Figure 2B, Table 2).

## Discussion

Our study results indicate that the group music percussion intervention significantly reduced the anxiety scores of institutionalized elderly male veterans with AD. Moreover, the baseline musical aptitude could be related to response to the music intervention. Compared with controls, patients in the

intervention group showed a significant reduction in anxiety level after participating in the group percussion intervention. We further stratified the intervention group into 2 subgroups, namely high and low musical aptitude subgroups, and observed that the music intervention resulted in significantly greater reductions in anxiety symptoms in the high-aptitude subgroup than in the low-aptitude subgroup. The present study suggests that group music percussion interventions should be considered in the elderly demented veterans with anxiety symptoms, which could prevent adverse effect from anti-anxiety medications in this eligible population.

A potential benefit of the group music intervention is to reduce participants' anxiety through active, reciprocal music-making by using songs and musical instruments with simple rhythm patterns. This facilitates interpersonal relationships between the music facilitator and persons with dementia and between participants in the group. Another important role of the group music intervention is to match the psychosocial needs of each individual participant, resulting in reducing anxiety and improving overall emotional and social well-being [7]. Group music interventions aim to work in the "here and now" by reacting to participants' immediate affective feeling, containing and incorporating them into musical expressions for beneficial effect [7,22]. Singing songs, playing instruments, listening, and moving with the music are all common behaviors in group music interventions. Among them, playing percussion instruments can motivate those with AD to participate in the music intervention session and experience various sensory and auditory stimulations [10]. Furthermore, facilitators used touch to assist participants in playing percussion instruments, referred to as instrumental touch, was particularly prepared for individual participants, and this has been proved to be effective in extending alert behavior states and building better rapport among people with dementia compared with physical touch alone [10].

Elderly adults with dementia have a lowered stress threshold, and thus are unable to effectively handle external stimuli and deal with stress [23]. The inability to handle external stimuli may lead to a progressive deterioration in the level of stress threshold and increase the probability of developing neuropsychiatric symptoms such as anxiety. Music percussion interventions may improve stress tolerance, which can prevent anxiety development [10]. Listening to familiar recorded music effectively reduces anxiety [7,10]. Among elderly individuals, preferred music can be based on what was popular or what they liked during their adolescence or early adulthood. The familiar and preferred tunes can help them recollect how they were in their younger days [10]. Music can be a pleasing stimulus to arouse positive emotions when it connects to one's personal preferences [10]. In patients with dementia, music can redirect their attention and provide an interpretable stimulus that can override meaningless or confusing stimuli in the environment [7,10]. Preferred music that elicits positive memories from young adulthood can prevent or ease symptoms [9]. Moreover, music can modulate the main stress systems (the endocrine and autonomic nervous systems) in elderly patients with dementia [24]. Furthermore, holding interactive group sessions promotes social relationships and reduces participant anxiety [10]. Taken together, all these factors may contribute to the benefits of music interventions to reduce anxiety.

In this study, all participants showed reduction in depressive symptoms after a total of 12 group sessions, irrespective of whether they received the music intervention or control. However, there was no significant difference in the level of depression reduction between the 2 groups. Our findings suggest that improvement in depression may be attributable to the 12-week group sessions but not to a music intervention specifically. A previous study reported that improving social interaction among older adults effectively reduces depression symptomatology [25]. Groups were small in our study, which can provide opportunity and motivates group members to interact with one another; hence, all these factors may contribute to the beneficial effect of the 12-week group sessions on depression reduction. Conversely, the music intervention did not show statistically significant beneficial effects on depression symptoms. This result was similar to Raglio's report [22] that no significant reduction was observed in depression level of patients with AD after 16 weeks of music-based group intervention. However, other studies have reported a beneficial effect from group music interventions on depression reduction in patients with dementia [5,7]. Differences in the clinical impacts of group music interventions may stem from the type, frequency, and duration of interventions [6]. Further studies with rigorous methodology and large sample sizes should be conducted to assess the effect of these variables on interventional outcomes.

In the intervention group, HAMA scores of participants with a relatively high level of musical aptitude were more reduced than were those of individuals with lower musical aptitude. Individuals with high musical aptitude can efficiently process auditory cues related to emotions [13]. Listening to music can trigger positive emotions in them due to their appreciation for the music [12]. Because successful music intervention experiences are maximized through the formulation of appropriate goals and objectives and these in turn depend in part on the musical aptitude of one's clients, an improved understanding of musical aptitude may lead to more effective clinical practice. Although this study reflects some trends in the musical aptitude of elderly individuals with dementia, future research is warranted for to yield additional information.

### Limitations

Study limitations must be considered when interpreting these results. The small sample size of participants with AD and restrictions in the population sample (only male veterans in Taiwan) are the main limitations of the study. Subsequent studies should include a larger sample size with other populations; for example, nonveterans, females, and non-Han populations. Secondly, not all participants received brain imaging before enrollment; therefore, the possibility of "vascular dementia" was excluded only through clinical history and physical

examination. Future research should use magnetic resonance imaging examinations to exclude cancer, vascular dementia, or other neurological illness. Thirdly, we enrolled patients with mild- or moderate-stage AD, and the PMMA musical aptitude test might be too lengthy for patients with late-stage AD to complete. Therefore, the current result may not be applied to patients with severe AD. Fourthly, except for musical aptitude, we did not explore other music elements that could affect response to music intervention, such as musical perception, musical preferences, and attention to or enjoyment of music [26]. Fifthly, the HAMA is not a criterion standard to examine anxiety in dementia, and valid tools are needed to assess the level of anxiety in persons with dementia. Finally, we did not assess other neuropsychiatric symptoms such as behavioral disturbances, delusions, or hallucinations. The impact of music interventions on these symptoms must be evaluated in future studies.

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## Conclusions

The results from this study suggest that the music intervention was effective in treating anxiety in elderly male veterans with AD. Moreover, patients' musical aptitude may be related to their therapeutic response. The musical aptitude of patients with dementia must be considered and assessed before providing a group music intervention. Music interventions are a low-cost approach that staff at veterans' homes can introduce in their everyday activities to reduce neuropsychiatric symptoms and alleviate caregivers' stress and burden of care. Further studies are needed to verify our conclusions.

## Conflict of Interest

None.