
**EFFECTS OF GROUP MUSIC INTERVENTION ON
BEHAVIORAL AND PSYCHOLOGICAL SYMPTOMS
IN PATIENTS WITH DEMENTIA: A
PILOT-CONTROLLED TRIAL**

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Received 21 February 2008.

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We investigated the effects of group music intervention on behavioral and psychological symptoms in patients with dementia. Twenty patients were nonrandomly allocated to either a music-intervention group, or an usual care group. The music-intervention group received 50 minutes of music intervention 3 times per week for 5 consecutive weeks. After 15 sessions, the music-intervention group showed significant improvement with regard to agitation, and the total scores of both patients and caregivers were lower, compared with the control group. These findings suggest that music can improve behavioral and psychological symptoms, especially in patients with dementia and their caregivers.

Keywords agitation, caregiver, dementia, music intervention

INTRODUCTION

The incidence of dementia is increasing worldwide due to the extended average longevity of human beings. This disease is a syndrome of intellectual deterioration characterized by memory problems, loss of communication skills, and changes in personality severe enough to interfere with occupational or social performance (Goodall & Etters, 2005). As dementia progresses, behavioral disturbances such as agitation, aggressiveness, wandering, and general confusion increase as well (Goodall & Etters, 2005). Treatment not only involves appropriate drug therapy, but also counseling, allied health intervention, and, commonly, management of their agitated behavior (Livingston, Johnston, Katona, Paton & Lyketsos, 2005). The chronic and debilitating symptoms of dementia often lead patients to turn to complementary medicine for their alleviation (McGonigal-Kenny & Schutte, 2006; Sung & Chang, 2005).

Music therapy is one option for controlling dementia (Sung & Chang, 2005). Studies have found that music provides a means of reducing distress behavior in patients with dementia. Music therapy can be defined as the controlled use of music and its influence on the human being to aid in physiological, psychological, and emotional integration of the individual during the treatment of an illness or disease (Munro & Mount, 1978). Several previous trials and reviews have determined that music therapy is beneficial for pain control (Hilliard, 2005; Kneafsey, 1997; Krout, 2001; O'Callaghan, 1996; Tsao & Zeltzer, 2005), anxiety reduction (Evans, 2002; Kain et al., 2004; Wang, Kulkarni, Dolev, & Kain, 2002), stress (Lindblad, Hogmark, & Theorell, 2007; Wiesenthal, Hennessy, & Totten, 2000), anger and agitation (Sung, & Chang, 2005), and improving mood states (Saarikallio, & Erkkila, 2007). It is used as psychotherapy under certain conditions and in various populations (Keen, 2004; Kim et al., 2006; Talwar et al., 2006). Based on these findings, it is reasonable

to assume that music intervention may also help patients with dementia as well their caregivers' distress. However, no studies have been conducted on this. The present study clinically assesses the effects of music intervention on behavioral and psychological symptoms in both patients and caregivers.

PARTICIPANTS AND METHODS

Participants

Patients with dementia were recruited from a special dementia day care unit in South Korea, advertising a 15-week music-intervention program. Twenty-two patients were approached and for these, 20 caregivers accepted the invitation. Patients were eligible to participate in the program if (a) they could walk, (b) they were able to understand the content of the questionnaires, and (c) they were diagnosed as having dementia by a psychiatrist. Twenty patients were nonrandomly allocated to either a music-intervention group, or an usual care group.

Subjects and their caregivers were informed of the music-intervention program, and the nature of dementia and the study procedures were explained to them. The study received approval from the Institutional Review Board of the University Hospital before the subjects were approached, all of whom provided written informed consent. No adverse effects occurred during the experiment.

Outcome Measures

Mini-Mental State Examination (MMSE). The MMSE is a brief mental status examination designed to quantify cognitive status by assessing performance on the following cognitive domains: orientation, language, calculation, memory, and visuospatial reproduction [Folstein et al., 1975 cited in (O'Hara et al., 2002)]. A score of 23 or less (maximum = 30) is generally considered evidence of cognitive impairment. This measure takes approximately 10 minutes to administer.

Geriatric Depression Scale (GDS). The 30-item GDS is a widely used depression screening device specifically designed for the elderly [Yesavage et al., 1983 cited in (O'Hara et al., 2002)]. A yes/no format was purposely chosen for ease of administration. The GDS has high internal consistency and test-retest reliability.

Geriatric Quality of Life (GQoL). The GQoL is a brief inventory designed to quantify quality of life by assessing the following domains: physical and psychological health status, social relationships, living environment, global

health, and life satisfaction (Lee et al., 2003). A score of 35T or less (maximum 60T) is generally considered evidence of low quality of life.

Neuropsychiatric Inventory-Questionnaire (NPI-Q). The NPI-Q is used to measure 12 categories of behavioral disturbance: (1) Delusions, (2) Hallucinations, (3) Anxiety, (4) Depression/Dysphoria, (5) Agitation/Aggression, (6) Elation/Euphoria, (7) Disinhibition, (8) Irritability/Liability, (9) Apathy/Indifference, (10) Motor Disturbance, (11) Nighttime Behavior Problems, and (12) Problems with Appetite/Eating [Kaufer et al., 2000 cited in (O'Hara et al., 2002)]. The NPI-Q is completed by a caregiver and asks whether the patient exhibits any of the above behaviors. The caregiver then ranks the severity of the behavior exhibited on a scale of 1 to 3, with 3 being the most severe. The NPI-Q yields a total severity score for the patient, which is the sum of the severity scores obtained for each behavioral category. Additionally, the caregiver ranks their level of distress resulting from each behavior, on a scale of 1 to 5, with 5 indicating the most severe level of distress. The NPI-Q yields a total distress score, which is the sum of the distress scores obtained for each behavioral category.

Music-Intervention Program

Music intervention includes singing songs, analysis of libretto, making musical instruments, playing instruments such as pianos and hand bells, song drawing, and song writing. The intervention was provided to all 10 patients for 50 minutes three times a week for 5 weeks, for a total of 15 sessions. The sessions occurred between 11 a.m. and 12 noon in a special dementia-care unit by three certified professional music therapists (one of them has worked as a therapist for 10 years, and the other two have been therapists for 3 years).

The music intervention comprised four phases. In the first, the program focused on building a rapport with the patients and caregivers. The second phase aimed at improving cognitive functions, memory and concentration ability. During the third phase, patients expressed themselves by playing a musical instrument. This also helped them to improve their muscle movement, concentration, and cooperation. In the fourth and final phase, the program focused on providing happiness and enjoyment to the participants. This program was developed with three certified professional music therapists based on previous clinical application (over 8 years) of group music intervention for individuals with dementia.

Patients in the control group received usual care, and did not participate in any structured therapeutic programs during the study period. Control patients

Table 1. Demographic characteristics of subjects

	Music (<i>n</i> = 10)	Control (<i>n</i> = 10)	<i>t</i> or χ^2	<i>P</i>
Age, mean \pm SD (years)	77.2 \pm 6.5	72.6 \pm 9.9	-1.23	0.24
Gender (M/F)	2/8	2/8	0.71	1.00
Diagnosis			0.42	0.81
Alzheimer's type	6	5		
Vascular dementia	3	3		
Other type	1	2		

were contacted by researchers each week by telephone to confirm they were not taking part in any other exercise activities, and to provide an impetus to keep them engaged in the study. Control-group patients who were interested in music intervention were provided with a complementary music-intervention program after the study was completed.

Statistical Analysis

The results were statistically analyzed using SPSS windows (ver 13.0). All data satisfied normality tests, which were conducted via the Kolmogorov-Smirnov test. All outcomes were compared using paired *t*-tests across treatment time for each group. Unpaired *t*-tests and χ^2 were used to evaluate statistical differences in the demographic data and to compare differences between the control and music groups.

RESULTS

The demographic characteristics of the subjects are listed in Table 1. The groups did not differ significantly in age or gender. All subjects completed the study, with no dropouts or withdrawals, so the data from all the participants was available for analysis.

MMSE, GDS, GQoL

The mean baseline and the after-treatment level of the MMSE did not differ between the two groups (Table 2). The pretreatment GDS and GQoL scores did not differ significantly between the groups, but were significantly improved in the music-intervention group, while there was no change in the control group. However, there were no significant differences following treatment between the two groups.

Table 2. Mean MMSE, GDS, and GQoL values for each behavioral category in two groups

	Music (<i>n</i> = 10)			Control (<i>n</i> = 10)			<i>t</i> *	<i>p</i> *
	Pre	Post	Change	Pre	Post	Change		
MMSE	14.6 ± 2.7	15.0 ± 2.6	0.4 ± 1.0	13.7 ± 2.9	13.5 ± 2.9	-0.20 ± 1.0	-1.34	0.20
GDS	15.7 ± 4.7	13.5 ± 3.9*	-2.2 ± 3.0	15.1 ± 5.5	15.3 ± 4.7	0.20 ± 1.0	1.83	0.08
GQoL	31.4 ± 6.3	35.7 ± 6.8*	-4.3 ± 5.3	34.3 ± 6.6	34.1 ± 7.5	0.20 ± 5.3	1.91	0.07

Values are expressed as mean ± standard deviation.

MMSE: Mini-Mental State Examination; GDS: Geriatric Depression Scale; GQoL: Geriatric quality of life.

*The changes of all outcomes were compared between two groups using paired *t*-tests.

NPI-Q

The mean baseline scores NPI-Q did not differ between the two groups in severity in patients (Table 3) and distress in caregivers (Table 4). After 15 sessions, there were significant inter-group differences in the scores of agitation/aggression and total scores in both severity and distress. There were also significant improvements with regard to hallucination, agitation/aggression, disinhibition, and irritability/lability for the music-therapy group compared with the baseline (all, $p < 0.05$) in severity, whereas no differences existed in the control group. With regard to caregivers' distress, there was significant improvement in depression, anxiety, and irritability, whilst no differences were reported in the control group.

DISCUSSION

This preliminary controlled clinical trial was conducted to investigate the effects of music intervention on behavioral and psychological symptoms in patients with dementia. Patients in the music-intervention group showed greater improvement in the severity of symptoms after 15 sessions than the control group, especially with regard to agitation. This result is in line with previous findings that music intervention is beneficial in reducing the agitation of patients with dementia. There were also beneficial effects of music intervention on caregiver distress and on the total distress and agitation scores.

In this pilot study, we adopted active group music intervention as a treatment for patients with dementia. We included singing songs, analyses of libretti, playing instruments such as hourglass-shaped drums, making simple instruments, and listening to various kinds of songs as concentration processes.

Table 3. Mean NPI-Q severity value for each behavioral category in two groups (patients)

NPI-Q (Severity)	Music (<i>n</i> = 10)				Control (<i>n</i> = 10)				<i>t</i>	<i>p</i>
	Pre	Post	Change	Pre	Post	Change				
Total score	11.1 ± 2.4	7.9 ± 4.2*	-3.2 ± 3.1	9.8 ± 2.9	10.3 ± 2.6	0.5 ± 0.8	3.3	0.004		
Delusions	0.8 ± 0.6	0.9 ± 0.9	0.1 ± 0.6	1.0 ± 0.7	1.1 ± 0.6	0.1 ± 0.7	0.0	1.00		
Hallucinations	0.4 ± 0.5	0.5 ± 0.7*	0.1 ± 0.6	0.4 ± 0.5	0.0 ± 0.7	0.2 ± 0.6	0.4	0.71		
Agitation	1.3 ± 0.5	0.6 ± 0.5*	-0.7 ± 0.7	0.9 ± 0.7	1.0 ± 0.7	0.1 ± 0.7	2.5	0.02		
Depression	1.3 ± 0.5	0.5 ± 0.7	-0.8 ± 0.6	1.1 ± 0.7	0.9 ± 0.6	-0.2 ± 0.6	1.9	0.08		
Anxiety	1.2 ± 0.6	0.8 ± 0.6	-0.4 ± 0.8	1.0 ± 1.1	1.0 ± 0.7	0.0 ± 0.9	1.0	0.33		
Euphoria	0.1 ± 0.3	0.3 ± 0.7	0.2 ± 0.4	0.3 ± 0.7	0.5 ± 0.7	0.2 ± 0.4	0.0	1.00		
Apathy	1.2 ± 0.6	0.8 ± 0.6	-0.4 ± 0.7	1.0 ± 0.7	0.9 ± 0.6	-0.1 ± 0.7	0.9	0.36		
Disinhibition	1.1 ± 0.6	0.7 ± 0.7*	-0.4 ± 0.5	0.9 ± 0.6	0.9 ± 0.6	0.0 ± 0.5	1.8	0.09		
Irritability	1.4 ± 0.5	0.8 ± 0.6**	-0.6 ± 0.5	1.1 ± 0.7	1.1 ± 0.7	0.0 ± 1.1	1.6	0.12		
Aberrant Motor	0.6 ± 0.7	0.5 ± 0.7	-0.1 ± 0.6	0.5 ± 0.7	0.8 ± 0.6	0.3 ± 0.7	1.4	0.17		
Nighttime Disturbances	1.0 ± 0.7	1.0 ± 0.9	0.0 ± 0.7	0.9 ± 0.7	0.7 ± 0.7	-0.2 ± 0.8	-0.6	0.55		
Appetite	0.5 ± 0.5	0.5 ± 0.7	0.0 ± 0.7	0.7 ± 0.7	0.8 ± 0.6	0.1 ± 0.6	0.4	0.72		

Values are expressed as mean ± standard deviation.

NPI-Q: Neuropsychiatric Inventory-Questionnaire.

*The changes of all outcomes were compared between two groups using paired *t*-tests.

Table 4. Mean NPI-Q distress value for each behavioral category in two groups (caregivers)

NPI-Q (Distress)	Music (<i>n</i> = 10)			Control (<i>n</i> = 10)			<i>t</i> *	<i>p</i> *
	Pre	Post	Change	Pre	Post	Change		
Total score	25.0 ± 5.0	17.6 ± 8.6*	-7.4 ± 8.2	22.7 ± 7.1	25.2 ± 8.4	2.5 ± 4.0	3.5	0.003
Delusions	2.1 ± 1.6	1.9 ± 1.8	-0.2 ± 1.5	2.3 ± 1.3	2.7 ± 1.3	0.4 ± 1.4	0.9	0.36
Hallucinations	1.1 ± 1.4	1.1 ± 1.5	0.0 ± 1.3	1.0 ± 1.3	1.5 ± 1.6	0.5 ± 1.4	0.4	0.71
Agitation	2.9 ± 0.9	1.6 ± 1.4	-1.3 ± 1.8	2.1 ± 1.8	2.5 ± 1.6	0.4 ± 1.7	2.2	0.05
Depression	2.9 ± 1.0	1.2 ± 1.2*	-1.7 ± 2.0	2.8 ± 1.8	2.30 ± 1.4	-0.5 ± 1.8	1.4	0.14
Anxiety	2.6 ± 1.2	1.4 ± 0.6*	-1.2 ± 1.4	2.2 ± 2.0	2.1 ± 1.4	-0.1 ± 1.8	1.5	0.17
Euphoria	0.3 ± 0.9	0.6 ± 1.3	0.3 ± 0.7	0.7 ± 1.5	1.1 ± 1.5	0.4 ± 1.2	0.2	0.82
Apathy	2.3 ± 0.9	1.8 ± 1.5	-0.5 ± 1.5	2.1 ± 1.3	2.4 ± 1.3	0.3 ± 1.3	1.3	0.23
Disinhibition	2.6 ± 1.4	1.7 ± 1.6	-0.9 ± 1.7	2.1 ± 1.4	2.4 ± 1.5	0.3 ± 1.0	2.0	0.06
Irritability	3.2 ± 0.6	1.7 ± 1.3*	-1.5 ± 1.6	2.6 ± 1.5	2.5 ± 1.6	-0.1 ± 1.8	1.9	0.08
Aberant Motor	1.4 ± 1.7	1.2 ± 1.8	-0.2 ± 1.2	1.2 ± 1.6	1.8 ± 1.5	0.6 ± 1.4	1.4	0.18
Nighttime Disturbances	2.5 ± 1.6	2.5 ± 1.9	0.0 ± 2.1	2.1 ± 1.7	2.0 ± 1.9	-0.1 ± 2.2	-0.1	0.92
Appetite	1.3 ± 1.4	1.0 ± 1.4	-0.3 ± 1.7	1.5 ± 1.5	1.9 ± 1.4	0.4 ± 1.3	1.0	0.31

Values are expressed as mean ± standard deviation.

NPI-Q: Neuropsychiatric Inventory-Questionnaire.

*The changes of all outcomes were compared between two groups using paired *t*-tests.

In the program, the use of instruments was structured to involve all the sensory organs (Pacchetti et al., 2000). The rhythmic and melodic components of music may be used as specific stimuli to obtain certain motor and emotional responses, thus combining motor movement with stimulation of different sensory pathways, that is, auditory and tactile (multiple sensory stimulation) with well-established emotional quality (Pacchetti et al., 2000). Active group music intervention may enhance life force through classic biophysiological responses such as movement, relaxation, and emotional catharsis, as well as through self-discovery, awareness, and increased self-esteem and pleasure (Lippin & Micozzi, 2006).

Possible mechanisms include relaxation effects (Lindblad et al., 2007), which may modulate the endocrinal responses and stabilize the autonomic nervous system (Freeman, 2001; Suzuki et al., 2004; Watkins, 1997). Music intervention also affects brain functions resulting in neural network activation, and ultimately leads to the activation of different regions of the brain, if performed regularly (Schmithorst & Holland, 2003). These effects also produce better physical and psychological functioning, and therefore, have beneficial effects on stress responses; reducing anxiety, improving mood, and lessening pain perception (Hillecke, Nickel, & Bolay, 2005; Sacks, 2006).

This study has several limitations including the small sample size, lack of randomization, and absence of appropriate controls. Absence of no difference in several subcategories is most likely due to a Type II error caused by the sample size. Another limitation is that the absence of attention to the control group, or an equivalent treatment of the control group, means that it can not be determined whether music intervention was the effective factor in reducing aggression. Along the same line, it is not possible to separate the effects from the method itself, or from the specific effects of individual characteristics of the therapists. Future studies should be done with equivalent treatment of the control group, or at least attention to the control group, to estimate an expectation or attention effect. Also, a randomized clinical trial with adequate allocation concealment or at least assessor blinding to avoid selection bias should be conducted.

In conclusion, our results show that music intervention may improve the behavioral and psychological symptoms in both patients with dementia and their caregivers, especially with regard to agitation. However, further randomized studies with larger sample sizes based on appropriate calculations, measurements after multiple sessions, and long-term follow-up are needed to verify the effect of music intervention on behavioral and psychological symptoms in patients with dementia and their caregivers.

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