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# The effect of individualized music on agitation for home-dwelling persons with dementia

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## ABSTRACT

**Purpose: The purpose of this study was to test the effect of individualized music on agitation for home-dwelling patients with dementia. Method: One group pre-post test was used for research design and a total of 26 subjects participated in this study. Individualized music intervention was subjects' listening to their preferred music for 30 minutes prior to peak agitation time twice a week for a total of four sessions. The subject's agitation levels were measured for three different points: thirty minutes prior to listening to music, 30 minutes while listening to the music, and after listening to the music throughout the 4 sessions. To measure the agitation level, the modified Cohen-Mansfield Agitation Inventory was used. A Paired t-test was used for data analysis. Results: Most subjects were female (73.1%), Caucasian (92.4%), Protestant (50%), and independent activity (53.8%). The mean of the subjects' MMSE scores was 8.08 (8.17). The most favorite music types included country/western music (31.0%), religious music (26.9%), and big band (26.9%). Agitation level decreased while listening to the music compared to the baseline ($t = 3.70$, $p < .001$). Conclusion: The findings of this study would provide meaningful data to develop an individualized music intervention protocol to control agitation for home-dwelling patients with dementia.**

**Keywords:** Music; Agitation; Dementia

## 1. INTRODUCTION

Persons with dementia experience many problems such as cognitive decline, behavioral problems, and being a burden on their caregivers [1,2]. Among these problems, behavioral problems have been an important issue because they increase the use of chemical limitations and decrease the clients' quality of life [3,4]. Agitation is a major part of the behavioral problems, and it increases the use of hospital care and the burden on caregivers [5].

Agitation is defined as "an inappropriate verbal, vocal, or motor activity that is not explained by needs or confusion per se" [6]. Thirty to fifty persons with dementia staying at nursing care facilities showed agitation and over fifty percent of community-dwelling persons with dementia showed agitation [7,8], and the most frequent agitation included general restlessness, constant unwarranted requests for attention, complaining, and negativism [6]. Agitation occurred depending on the time of day. Aggressive behaviors were shown often during lunch and in the evening. Most repetitious mannerisms peaked in the late morning and pacing peaked during the early afternoon.

Many factors such as gender, personality, activities, social interactions, and environments are significantly related to agitation. Female gender was a predictor of non-verbally aggressive behaviors [9] and extroverted residents were significantly less agitated when there was a low level of social interaction compared with a high level [10]. More physically inactive persons with dementia showed more agitation [11]. Persons showing aggressive behaviors and verbally agitated behaviors had no intimate social networks, while those agitated behaviors were physically non-aggressive had social networks that were neutral in intimacy [12]. Agitation is also correlated with the physical environment such as light levels, tactile stimulation, homelike accouterments, the cleanliness of public areas, maintenance, kitchen availability, and staff treatment of residents [13].

To control agitation, medications are often necessary. The medications include antipsychotics, antidepressants, benzodiazepine, busprion, and anticonvulsants, but they bring undesirable effects such as extrapyramidal symptoms, hypotension, parkinsonism, and a higher risk of death in the acute care setting [14,15]. Because of these limitations of medications, non-pharmacological inter-

ventions need to be combined to control agitation. The non-pharmacological interventions include environmental therapy, aroma therapy, occupational therapy, music intervention, indoor gardening, acupressure, and simple pleasure interventions [16-19]. Among these intervenetions, music intervention has been offered because it is relatively easy to provide and non-invasive to persons.

Many previous studies have reported the positive effects of music intervention on agitation in persons with dementia [18,20,21], but the most studies were limited to offer music intervention with group basis and provide music to nursing homes clients. Gerdner (2005) offered individualized music to control agitation in persons with dementia to consider the peak agitation time and short attention span in each client [22]. The individualized music is defined as "music selected on an individual basis according to a verbalized personal preference" [20]. Park and Specht (2009) tested Gerdner (2000)'s evidence-based protocol of individualized music for home-dwelling persons with dementia because there was no music intervention study to control agitation for home-dwelling persons with dementia even though over fifty percent of community-dwelling persons with dementia show agitation [7,20,23], but the study was limited to a pilot study with small sample size. Therefore, there is a need to test the effect of individualized music on agitation for home-dwelling persons with dementia using a reasonable sample size. The purpose of this study is to test the effects of individualized music on agitation for home-dwelling persons with dementia. The following hypotheses were tested in this study:

Hypothesis 1: Persons with dementia will experience lower agitation scores while listening to music than prior to listening to the music.

Hypothesis 2: Persons with dementia will experience lower agitation scores while listening to music than after listening to the music.

Hypothesis 3: Persons with dementia will experience lower agitation scores after listening to music than prior to listening to the music.

The research protocol, a consent form, and potential risks and benefits were reviewed and approved by the University Human Subjects Institutional Review Board.

## 2. METHOD

### 2.1. Design

One-group pretest-posttest design was used. A non-probability convenience sample was used. Persons with dementia were recruited from the Alzheimer's Association, the Alzheimer's project, and the Administration on Aging in Iowa and Florida, USA. A total of twenty-six persons with dementia from Iowa and Florida had participated in this study.

### 2.2. Sample Selection

The sample size was determined by Power calculation based on Cohen's effect-size formulas using power .80 and effect size 0.50 [24]. Based on the calculation, 26 subjects had completed this study. Persons with dementia who met the following inclusion criteria were included in this study: 1) diagnosed with dementia; 2) scoring under 25 on the MMSE; 3) living at home or in an assisted living facility; 4) exhibiting agitation at least one time a week; 5) able to hear a normal speaking voice at a distance of 1.5 feet; 6) able to express personal music preference for a person or a family member; and 7) able to get consent from a person or a family member. Persons with psychiatric disease or severe pain were excluded for enrollment in the study.

### 2.3. Procedure

Patients with dementia were recruited from the Alzheimer's Association, the Alzheimer's project, and the Administration on Aging in Iowa and Florida. Directors from the organizations were contacted by the PI, and the content of this study was presented to the directors. The directors and the PI had distributed the invitation letter to this study to the patients with dementia using the services of the organizations and families. When the patients with dementia and families showed interests to participate in this study, the PI had visited their homes to present whole procedure of this study and strengths and weakness of this study one more time. After the presentation, if persons with dementia and families agreed to participate in the study, an informed consent form was obtained.

After the consent to participate, the subjects' demographic data, cognitive level, peak agitation time, and subjects' preferred music were assessed at baseline. Two music CDs were chosen for individualized music intervention based on the findings of the Assessment of Personal Music Preference (APMP) [25]. The CDs were played before music intervention started to confirm that the persons liked the music. If so, the two music CDs were selected for the music intervention.

Music intervention time was planned for 30 minutes prior to peak agitation time and it was offered twice a week for a total of four sessions. The two days were usually designated as Tuesday or Friday, but they were interchangeable by another day depending on the subjects' schedule. If subjects wanted to listen to the music more than twice a week, it was allowed. Music intervention was limited to 30 minutes because of the limited attention span in persons with dementia [26]. Music intervention was provided for 30 minutes prior to peak agitation time because it was previously presented to be effective

 

in other studies [18,20].

The subjects' families used a CD player to play the subjects' preferred music, but the research assistants did if families were not available. If the subjects had their own music CD players at home, they used the CD players, but if not, a new music CD player was offered to the subjects by the PI. The subjects listened to their preferred music individually at home and the music was played any room where the people preferred such as a living room or a private room. Agitation levels were measured for 90 minutes throughout the three different times: 1) 30 minutes prior to listening to music; 2) 30 minutes with the music; and 3) 30 minutes after withdrawal of the music.

## 2.4. Instruments

The demographic data form included age, gender, race, marital status, religion, education level, medical history, pain control medications, and activity level.

### 2.4.1. Assessment of Personal Music Preference: Music Preference

The patients' music preferences were assessed using the Assessment of Personal Music Preference (APMP) at baseline [25]. The APMP is designed to obtain specific information regarding the subject's musical preference at baseline. It includes the questions about preferences of genre, performers, music albums, and music activities. Based on the findings of the APMP, two music CDs were determined to meet their music preference and offered to persons.

### 2.4.2. Modified Cohen-Mansfield Agitation Inventory: Peak Agitation Time

To determine the patients' peak agitation time, Cohen-Mansfield Agitation Inventory (CMAI) was modified [6]. The original CMAI was designed to assess the frequency of agitated behaviors, and include 29 behaviors on a scale of 1 (no agitation) to 7 points (several times per hour). The modified CMAI remained the 29 behaviors from the original CMAI, but family members and research assistants were asked to write down the times that they had noticed the agitation for seven consecutive days. Based on the findings of the modified CMAI, the most common time of agitation manifestation was determined as the peak agitation time. For example, if a subject showed agitation at 9 a. m., 11 a. m., 11 p. m. on Monday, 11 a. m. on Tuesday, 9 a. m., 11 a. m. on Thursday, and 11 p. m. on Saturday, the patients' peak agitation time was determined as 11 a. m. The validity of the original CMAI ranged from 0.64 to 0.95, and the reliability of the CMAI in the three units has ranged 0.92 (n = 16), 0.92 (n = 23), and 0.88 (n = 31) [12,27].

### 2.4.3. Modified Cohen-Mansfield Agitation Inventory: Agitation Level

The CMAI was also modified to measure agitation level. The modified CMAI to measure agitation level retained the 29 behaviors from the original CMAI, but with a scale of 0 (none) to 3 (severe). When the caregivers noticed agitated behaviors on the list of the modified CMAI, the severity of agitation were checked. The total of possible scores of the modified CMAI ranged 0 to 87. Agitation levels were measured for: 1) 30 minutes before listening to music; 2) 30 minutes while listening to the music; and 3) 30 minutes after listening to the music.

## 2.5. Ethical Approval

The study was approved by University IRB. Prior to enrolment, each participant received oral and written presentation about the aim and procedure of the study, and it was emphasized that participation was voluntary. All participants were informed about procedures for ensuring anonymity and confidentiality.

## 2.6. Analysis

Descriptive statistics were used to describe subjects' demographical characteristics. The nonparametric Wilcoxon signed ranks test was used to answer the three hypotheses.

# 3. RESULTS

## 3.1. Subjects' Characteristics

A total of twenty-six subjects had completed this study. The subjects' characteristics were presented in **Table 1**. The mean of the subjects' age was 82.19 (7.80%). Most subjects were female (73.1%), Caucasian (92.4%), Protestant (50.0%), married (50.0%) and independent (53.8%). The most favorite music types of the subjects included country/western music (31.0%), spiritual/religious music (26.9%), and big band/swing (26.9%). Their most favorite musicians Elvis Presley (15.4%) following, Frank Sinatra (11.5%), Loretta Lynn (7.7%), Glen Miler (7.7%), and Jony Cash (7.7%). The most common peak agitation times of the subjects were 2 p. m. (15.4%) and 4 p. m. (15.4%).

## 3.2. Hypotheses Findings

The subjects' agitation scores at the three different times through 4 sessions are displayed in **Table 2** and a graphic display is presented in **Figure 1**. Agitation level while listening to the music reduced through all 4 sessions compared to the baseline but the agitation level increased back when the music was removed (**Table 3**).

Hypothesis 1: Subject's agitation levels while listening to 30 minutes of music were significantly lower than

 

**Table 1.** Subjects' characteristics (N = 26).

| Characteristics | Categories | N (%) | Q (MR) |
|---|---|---|---|
| Age | | | 84 (80) |
| Gender | Male | 7 (26.9) | |
| | Female | 19 (73.1) | |
| Race | Caucasian | 24 (92.4) | |
| | Asian American | 1 (3.8) | |
| | African American | 1 (3.8) | |
| Education | Middle-High school | 13 (50.0) | |
| | Diploma-Graduate | 13 (50.0) | |
| Religion | Protestant | 13 (50.0) | |
| | Catholic | 3 (11.5) | |
| | Others | 8 (31.0) | |
| | None | 2 (7.5) | |
| Marital status | Married | 13 (50.0) | |
| | Widowed | 12 (46.2) | |
| | Divorced | 1 (3.8) | |
| Activity level | Independent | 14 (53.8) | |
| | Partially dependent | 10 (38.5) | |
| | Totally dependent | 2 (7.7) | |
| MMSE | | | 7 (14.5) |
| Types of favorite songs | Country and Western | 8 (31.0) | |
| | Spiritual/Religious | 7 (26.9) | |
| | Big Band/Swing | 7 (26.9) | |
| | Others | 4 (15.2) | |
| Preferred album | Elvis Presley | 4 (15.4) | |
| | Frank Sinatra | 3 (11.5) | |
| | Loretta Lynn | 2 (7.7) | |
| | Glen Miler | 2 (7.7) | |
| | Jony Cash | 2 (7.7) | |
| | Others | 13 (50.0) | |
| Peak agitation time | 2pm | 4 (15.4) | |
| | 4pm | 4 (15.4) | |
| | 10am | 3 (11.5) | |
| | 11am | 3 (11.5) | |
| | 1:30pm | 3 (11.5) | |
| | Others | 9 (34.7) | |

before listening to the music ($Z = -3.070$, $p = .002$). Therefore, hypothesis one was supported.

Hypothesis 2: Subjects' agitation levels while listening to music were not significantly lower than after listening to the music ($Z = -0.878$, $p = .380$). Therefore, hypothesis two was not supported.

Hypothesis 3: Subjects' agitation levels after listening to music were significantly lower than before listening to the music ($Z = 2.139$, $p = .032$). Therefore, hypothesis three was supported.

**Table 2.** The mean of agitation scores by the sessions (N = 26).

| Sessions | Agitation for 30 minutes prior to music intervention | Agitation for 30 minutes with music intervention | Agitation for 30 minutes after music intervention |
|---|---|---|---|
| | Q (MR) | Q (MR) | Q (MR) |
| 1 | 2 (8.5) | 0 (7.5) | 1 (6.0) |
| 2 | 1 (4.0) | 0 (3.5) | 1 (9.0) |
| 3 | 1 (9.0) | 0 (10.5) | 1 (10.5) |
| 4 | 1 (5.0) | 0 (2.5) | 1 (3.5) |
| Total | 1 (9.0) | 0 (10.5) | 1 (10.5) |

**Table 3.** Differences of agitation across the three different times (N = 26).

| Agitation | Before Music* | With Music** | After Music*** | Z | *p* |
|---|---|---|---|---|---|
| | Q (MR) | Q (MR) | Q (MR) | | |
| Hypothesis 1 | 1 (9.0) | 0 (10.5) | | −3.070 | .002 |
| Hypothesis 2 | | 0 (10.5) | 1 (10.5) | −0.878 | .380 |
| Hypothesis 3 | 1 (9.0) | | 1 (10.5) | −2.139 | .032 |

*Agitation for 30 minutes prior to music intervention. **Agitation for 30 minutes with music intervention. ***Agitation for 30 minutes after music intervention.

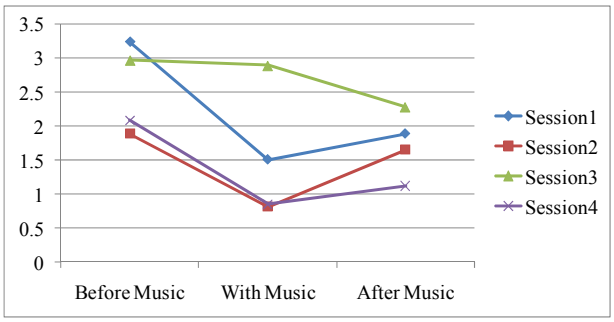


**Figure 1.** The change of agitation scores by the sessions across the three different times (N = 26).

## 4. DISCUSSION

The current study showed that individualized music reduced agitation in patients with dementia living at home even after the music removed and the finding was consistent with other music intervention studies conducted at nursing care facilities, group basis, and meal time or nursing time in terms of agitation reduced while the presence of music [21,28,29]. Jennings and Vance (2002) provided music therapy using singing familiar songs and playing rudimentary instrument for 30 minutes to 16 persons with dementia using an adult day care center to control agitation and showed decreased agitation level with music compared to baseline. Richeson and Neill (2004) offered therapeutic recreation music intervention

 

using quiet music to control agitation at meal time to 27 persons with dementia staying at nursing homes and reported significantly decreased agitation while playing music. Hicks-Moore (2005) played relaxing music to control agitation for 33 persons with dementia using a special care unit at meal time and the total number of agitation in this study decreased during music condition. Even though the types of music and the settings the subjects stayed were different in the previous studies, the findings of the studies were similar in that agitation reduced with music in patients with dementia.

The reduced agitation with the presence of music in this study was also consistent with other music intervention studies performed prior to peak agitation time with individual basis but nursing care facilities [18,20]. Gerdner (2000) provided individualized music to compare the effect of individualized music on agitation to classic music to 39 persons with dementia using long term care facilities for 30 minutes prior to peak agitation time and significantly reduced agitation was observed with individualized music compared to classic music in her study. Ragneskog *et al*. (2001) played an individualized music to control agitation for 45 minutes prior to peak agitation time for 4 persons staying at nursing homes and presented two persons of them became calmer during the individualized music sessions.

The findings of this current study was similar with Park and Specht (2009)'s pilot study in terms of that agitation was controlled by music provided for 30 minutes, prior to peak agitation time, individual basis, and at home setting and the reduced agitation was remained even after the withdrawal of the music even though the total period of participation to the music intervention was different in both studies [23]. The current study offered music interventions for a total of 4 sessions and the result of this study showed the continuous effect of music on agitation as time goes by. Even four sessions of music interventions controlled agitation, but if more regular and continuous music interventions could be provided and tested for home-dwelling patients with dementia, it would be more helpful to develop an individualized music intervention protocol for home-dwelling patients with dementia.

The current study was offered for home-dwelling persons with dementia and the home dwelling persons include the persons living at their own homes but also staying at assisted living facilities. In this study, comparing the effect of music intervention on agitation between home and assisted living facility was not tested, but the different effect of music on agitation could be anticipated when considered subjects' living environments at home are not similar with assisted living facility. Thus, for the further studies, measuring the effect of music intervention on agitation depending on the different settings might be meaningful to develop the music intervention protocol to meet client's music needs.

Music was basically offered two times a week (Tuesday/Friday), but if subjects want to listen to the music while non-music intervention days, it was allowed. During the days, the primary caregivers of the subjects at home were inclined to play the caregivers' preferred music not subjects' one according to the caregivers' music tastes. Even though the subjects want to listen to their preferred music, it is not easy for them to express the needs. Assessing the music preferences for home-dwelling patients with dementia and playing their preferred music need to be considered to control agitation and increase quality of life.

The current study showed that listening to 30 minutes of patients' preferred music reduced agitation but the study has a couple of limitations. The study was conducted at 2 states so that it was difficult to generalize to other places. In addition, the subjects of this study were home-dwelling patients with dementia and the patients have limited information on their general and disease characteristics compared to the hospital patients so that it was difficult to collect the patients' information and also the patients and families were not familiar to their health information. For the further studies with home-dwelling patients with dementia, there is a need to utilize the patients' hospital data to aware of patients' characteristics related to disease and to meet the patients' needs in depth if available. Also, the study was conducted to test the effect of individualized music on agitation without the comparison group. Actually, in this study it was difficult to recruit the home-dwelling patients for the control group because they want the researchers to visit and offer something for them. For the further studies with home-dwelling patients with dementia, providing any kind of intervention to compare with the effect of music for the control group is suggested. Even though the current study has some limitations, the study is meaningful in terms of that it is the first study to provide individualized music to control agitation for home-dwelling patients with dementia with the reasonable sample size.

## 5. CONCLUSION

The current study showed that individualized music intervention controlled agitation for home-dwelling patients with dementia and the findings were consistent with the results of previous studies. It provides meaning information in terms of that an individualized music intervention was provided for home-dwelling patients with dementia to control agitation with the reasonable sample size. It would also suggest meaningful data to develop a music intervention protocol for home-dwelling patients with dementia and families. Based on the findings of this

 

study, developing an individualized music intervention protocol to control agitation for home-dwelling patients with dementia and testing the effect of music with the comparison group needs to be conducted. Also, testing the effect of the individualized music to control agitation in different settings is suggested for the further studies.

## 6. ACKNOWLEDGEMENTS

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