How Sweet the Sound
Research Evidence for the Use of Music in Alzheimer’s Dementia

ABSTRACT
The purpose of this article is to provide an evidence-based synthesis of the research literature on music intervention for agitated behavior in Alzheimer’s dementia. A qualitative review of the literature supported music as a low-cost, simple alternative to traditional methods of management, with minimal risk to the client. A rating system assigning levels of evidence to support these interventions was used, and implications for nursing practice innovations and further research are discussed.

Jan Witzke, RN, BSN; Rebecca A. Rhone, RN, BSN, CWS, FACCWS; Diane Backhaus, RN, BSN; and Nanette A. Shaver, RN, BSN
A quick glance at the face of a young nursing student trying to bathe an agitated client was the only assessment required for the instructor to know a rapid intervention was needed. The client, an elderly man with dementia, had been crying out repetitively all morning but was now making threatening gestures as well. The instructor began to sing old familiar tunes while encouraging both the client and the student to join her. Soon the student took the lead and began singing one of the most familiar songs of our time: “Amazing grace! How sweet the sound…” (Bradley, 1989). Remarkably, the client’s body relaxed, and his expression softened as he sang along.

Challenging client behaviors such as these are becoming more common. A recent Alzheimer’s Association (2007) report indicates that someone develops this devastating disease every 72 seconds, with more than 5 million people in the United States currently affected. Because this disease manifests late in life, the number of people living with its ravaging effects is increasing as the population ages. Symptoms are progressive and include forgetfulness, confusion, disorientation, and agitation. Agitated behaviors often interfere with even the simplest activities of daily living and may escalate from restlessness, pacing, and disrobing to hitting, kicking, and yelling. Cohen-Mansfield and Billig (1986) defined agitation as inappropriate verbal or motor activity unrelated to needs or confusion.

Real-life situations such as the nursing student’s experience described above prompt scientific inquiry. What effect, if any, did music have in this situation? What best practice evidence is available to support decreasing agitated behaviors? Unfortunately, traditional management often results in chemical or physical restraint (Cohen-Mansfield, Marx, & Rosenthal, 1989), and because these measures may result in numerous detrimental side effects, there has been a great deal of interest in finding nonpharmacological interventions to alleviate these symptoms. Recent research has examined a number of alternative interventions, including:

- Aromatherapy (Ballard, O’Brien, Reichtel, & Perry, 2002; Holmes et al., 2002; Lin, Chan, Ng, & Lam, 2007; Smallwood, Brown, Coulter, Irvine, & Copland, 2001).
- Therapeutic touch and massage (Rowe & Alfred, 1999; Wang & Hermann, 2006; Woods & Dimond, 2002).
- Animal-assisted therapy (Churchill, Safaoui, McCabe, & Baun, 1999; McCabe, Baun, Speich, & Agrawal, 2002; Richeson, 2003).
- Light therapy (Ancoli-Israel et al., 2003; Lovell, Ancoli-Israel, & Gevirtz, 1995; Lyketsos, Lindell Veiel, Baker, & Steele, 1999; Skjerve, Bjorvatn, & Holsten, 2004).

The purpose of this review was to provide an evidence-based synthesis from the findings of previously published literature regarding the use of music in managing agitated behaviors in Alzheimer’s dementia.

### METHODS OF REVIEW

A literature search was conducted using the computerized databases of CINAHL, ProQuest, and Cochrane to identify relevant studies published between 1994 and 2007. Keywords used in the search included music, music therapy, dementia, Alzheimer’s disease, and agitation. In addition, hand searches were conducted from the reference lists of retrieved studies. The criteria for study selection included presentation of recorded music as an intervention for agitated behavior, published in English from 1994 to 2007, involved older adults with dementia or Alzheimer’s disease, and published in peer-reviewed journals.

Several studies were excluded from our review that did not specifically measure agitation as an outcome. Nevertheless, these studies may represent important evidence supporting music as a therapeutic intervention for the symptoms of dementia. Kumar et al. (1999) found melatonin levels increased significantly and continued to increase even after music therapy had been discontinued for 6 weeks. Suzuki et al. (2004) found a significant decrease in salivary CgA levels (which increase with stress) after 16 sessions of music. Irish et al. (2006) found significant improvement in autobiographical memory recall for individuals with Alzheimer’s disease, as well as significant reduction in state anxiety compared with healthy older adults also listening to background music.

In addition, four studies reviewed were conducted by professional music therapists (Brotons & Pickett-Cooper, 1996; Clair & Bernstein, 1994; Kumar et al., 1999) or by a combination of music therapists and nursing professionals (Suzuki et al., 2004). The term music therapy can be defined as “the use of music and/or its musical elements (sound, rhythm, melody and harmony) by a qualified music therapist” (Vink, Birks, Brunsma, & Scholten, 2003, p. 2).

This specialized field of applying active or receptive music therapy involves setting specific musical goals for the participants. Although these studies may provide significant findings for our topic, we chose to exclude three of them (Brotons & Pickett-Cooper, 1996; Kumar et al., 1999; Suzuki et al., 2004) to broaden the applicability of our findings. We chose to include Clair and Bernstein’s (1994) study because of the presentation of recorded music as an unstructured intervention.

In this review, we will join Sherratt, Thornton, and Hatton (2004) and reserve the term music therapy for those structured musical activities carried out by a professional music therapist and use the terms music or music intervention to include the presentation of recorded music by a variety of caregivers. It is our hope that music...
interventions may be implemented at relatively low cost in a variety of settings by nurses, nursing assistants, activity staff, volunteers, and family members (Gerdner, 2007).

**PREVIOUS LITERATURE REVIEWS**

The findings of seven previous reviews of music interventions in dementia were examined during our search. Goodall and Etters (2005) noted that studies conducted after 2000 appear more rigorous than those conducted prior and discussed the realistic barriers of sufficient sample size and randomization of participants in the chosen population of interest. Koger, Chapin, and Brotton (1999) provided a meta-analysis of music/music therapy interventions to update and statistically cumulate the findings on this topic; they concluded the overall results did not provide sufficient data to determine the effectiveness of specific music interventions. Lou (2001) assessed study designs and emphasized the confounding factors of medication use and the Alzheimer’s disease process itself.

In her review, Madan (2005) discussed her previously unpublished randomized controlled trial testing a preferred music intervention for disruptive behaviors in dementia. Although she reported a significant change in scores on the Disruptive Behavior Scale, she noted that a power analysis using a sample size of 141 was needed to determine if these results were truly statistically significant. Sherratt et al. (2004) focused their qualitative review of the literature on the outcome behaviors of engagement and participation, not only on problem behaviors. Notably, they discussed the Theory of Personhood to support the idea that well-being, as well as ill-being (as in measuring agitated behaviors), may provide a better measure of interventional effect. In 2005, Sung and Chang centered their review on evaluating preferred music interventions or comparisons of preferred music interventions with other kinds of music to determine effects on agitated behaviors.

Most recently, the Cochrane Dementia and Cognitive Improvement Group examined the effect of music therapy and concluded “the methodological quality and reporting of the included studies were too poor to draw any useful conclusions” (Vink et al., 2003, p. 1). It is our suggestion, however, that the results of this rigorous review of music therapy interventions may be supplemented with a broader base of evidence from the literature. As one nursing research expert noted, in determining the best evidence related to care models for patients with Alzheimer’s disease, experimental and non-experimental studies may be the best evidence available (Goode, 2003). Therefore, the aim of our review is to synthesize not only the findings of primary experimental studies as in the Cochrane review, but also to gather a wider range of previously published data and examine these findings to propose levels of evidence that may or may not support music as an intervention to decrease agitated behaviors in Alzheimer’s dementia.

A music intervention is easy to incorporate into daily care, is inexpensive, and is noninvasive.
### Table

#### SUMMARY OF PRIMARY RESEARCH STUDIES REVIEWED ON MUSIC INTERVENTION FOR AGITATED BEHAVIOR IN ALZHEIMER’S DEMENTIA

<table>
<thead>
<tr>
<th>Author (Year), Location</th>
<th>Design, Sample</th>
<th>LOE</th>
<th>Intervention/Independent Variable</th>
<th>Definition of Agitated Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clair &amp; Bernstein (1994), midwestern United States</td>
<td>Quasi-experimental, time series, within-participants design; N = 28</td>
<td>III</td>
<td>A no music condition and two background music conditions (stimulative or sedative), randomly</td>
<td>Pacing or wandering, screaming or loud persistent vocalizations, outbursts of physical combativeness, and furniture moving</td>
</tr>
<tr>
<td>Denney (1997), midwestern United States</td>
<td>Quasi-experimental, time series; N = 9</td>
<td>III</td>
<td>Classical music selections played just above background noise level in dining room during lunchtime. No music was played on weeks 1 and 3. Music was played on weeks 2 and 4.</td>
<td>Inappropriate verbal, vocal, or motor activities that cannot be attributed directly to manifest needs or confusion</td>
</tr>
<tr>
<td>Gerdner (1997), location not identified</td>
<td>Case study; N = 1</td>
<td>VI</td>
<td>Preferred music was played on an audiocassette for 30 minutes 2 days per week for a total of 15 sessions.</td>
<td>Flat affect, pacing, repetitious verbalizations regarding desire to leave, and incoherent speech</td>
</tr>
<tr>
<td>Gerdner (2000), midwestern United States</td>
<td>Experimental, repeated measures crossover design; N = 39</td>
<td>III</td>
<td>Individualized or classical “relaxation” music was played for 30 minutes two times per week for 6 weeks, with a 2-week washout period in between.</td>
<td>Inappropriate verbal or motor activity that is not explained by needs or confusion</td>
</tr>
<tr>
<td>Gerdner (2005), southern United States</td>
<td>Pilot study using repeated measures and mixed methodology; N = 8</td>
<td>III</td>
<td>Individualized music played on a portable CD player at a time preceding peak level of agitation and on an as-needed basis</td>
<td>Inappropriate verbal or motor activity that is not explained by needs or confusion</td>
</tr>
<tr>
<td>Goddaer &amp; Abraham (1994), Belgium</td>
<td>Quasi-experimental, repeated measures, ABAB (A = no music, B = music); N = 29</td>
<td>III</td>
<td>Relaxing music defined as neutral with unrecognizable tunes, played during mealtime at a decibel level just above the average noise level on weeks 2 and 4</td>
<td>Inappropriate verbal, vocal, or motor activities that cannot be attributed directly to manifest needs or confusion</td>
</tr>
<tr>
<td>Hicks-Moore (2005), Canada</td>
<td>Quasi-experimental; N = 30</td>
<td>III</td>
<td>Relaxing music played during the evening meal on weeks 2 and 4</td>
<td>Inappropriate verbal or motor activities that cannot be explained by needs or confusion</td>
</tr>
<tr>
<td>Olsen et al. (2000), eastern United States</td>
<td>Quasi-experimental, within-participants, longitudinal design; N = 15</td>
<td>III</td>
<td>Musical Memory Lane and Video Memory Lane interventions that present nostalgic music and videos in easy-to-use format</td>
<td>Agitation as one target behavior (examples of target behaviors include smiling, laughing, agitation, wandering, sleeping, fidgeting)</td>
</tr>
<tr>
<td>Ragneskog et al. (2001), Sweden</td>
<td>Quasi-experimental, within-participants, time series design; N = 4</td>
<td>III</td>
<td>Intervention compared individualized music and classical music with a no music control; music was played for 30 minutes in each session</td>
<td>Signs of agitation included screaming, restlessness, aggressiveness, or fighting; facial expressions</td>
</tr>
<tr>
<td>Sung, Chang, &amp; Abbey (2006), Taiwan</td>
<td>Quasi-experimental; N = 32</td>
<td>III</td>
<td>Preferred music provided in mid-afternoon for 30 minutes twice per week for 6 weeks</td>
<td>Inappropriate verbal or motor activity that is not explained by needs or confusion</td>
</tr>
<tr>
<td>Tabloski et al. (1995), eastern United States</td>
<td>Quasi-experimental, repeated measures; N = 20</td>
<td>III</td>
<td>Calming music selection, played for each participant either in own room or a familiar lounge on two separate occasions for 15 minutes each</td>
<td>Fourteen agitated behaviors on the Agitated Behavior Scale (ABS)</td>
</tr>
</tbody>
</table>

**Note.** CMAI = Cohen-Mansfield Agitation Inventory.  
LOE = levels of evidence. Level I: a systematic review or meta-analysis of randomized controlled trials or clinical practice guidelines based on randomized controlled trials; Level II: a well-designed randomized controlled trial; Level III: well-designed nonrandomized controlled trials; Level IV: well-designed case control or cohort studies; Level V: systematic reviews of descriptive or qualitative studies; Level VI: a single descriptive or qualitative study; Level VII: the opinion of expert authority (Melnky & Fineout-Overholt, 2005).
### Measure of Outcomes

<table>
<thead>
<tr>
<th>Measure of Outcomes</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observers counted the number of participants exhibiting agitated behaviors at 1-minute intervals over 30-minute time periods (the placheck method).</td>
<td>No significant change in amount of agitated behavior was displayed over the course of the study.</td>
</tr>
<tr>
<td>CMAI as modified by Goddaer &amp; Abraham (1994) was used to record behaviors on the last day of each week.</td>
<td>Incidence of all agitated behaviors was reduced. Specific syndromes of verbally agitated behaviors and physically nonaggressive behaviors decreased most with the music intervention.</td>
</tr>
<tr>
<td>Observed behavior was recorded in a qualitative fashion.</td>
<td>Participant smiled and then danced; stated, “This is fun”; made no statements indicating a desire to leave.</td>
</tr>
<tr>
<td>Behaviors observed using a modified version of the CMAI</td>
<td>Significantly greater decrease in frequency of agitated behaviors with the individualized music intervention compared with the classical music</td>
</tr>
<tr>
<td>A modified version of the CMAI; the Agitation Visual Analog Scale (VAS); open-ended interviews</td>
<td>Agitation was significantly reduced on day shift throughout the 8 weeks. Agitation was significantly reduced on evening shift on weeks 5 through 8.</td>
</tr>
<tr>
<td>CMAI as modified by the authors to measure behaviors as absent or present during mealtimes</td>
<td>Significant differences were found in the cumulative incidence of agitated behaviors for the dimensions of physically nonaggressive behaviors and verbally agitated behaviors.</td>
</tr>
<tr>
<td>CMAI as modified by Goddaer &amp; Abraham (1994)</td>
<td>Decreased incidence of agitated behaviors observed in the weeks music was played in comparison to the weeks music was not played</td>
</tr>
<tr>
<td>Data were collected by direct observation using hand-held computers.</td>
<td>“Favorable impact” on engagement, stimulated positive affect, and activity-related talking, while also reducing fidgeting. Clients chose a Memory Lane activity significantly more often than other activities and remained engaged for longer periods.</td>
</tr>
<tr>
<td>Observers analyzed randomly selected samples of videorecorded sessions. Segment samples were analyzed using a Facial Action Coding System.</td>
<td>Effect of classical music was not as evident as effect of individualized music. Two patients became calmer with interventions. Effect of music was minimal for 2 patients with the most severe dementia.</td>
</tr>
<tr>
<td>Behaviors observed using the CMAI</td>
<td>Significant reduction in overall agitation and physically nonaggressive behaviors</td>
</tr>
<tr>
<td>ABS measured preintervention, intervention, and postintervention behaviors</td>
<td>Significant difference was found in agitation scores, both during and after the calming music intervention.</td>
</tr>
</tbody>
</table>

### STRENGTH OF EVIDENCE

In the 1970s, the disciplines of nursing and medicine began viewing their respective practices with a critical eye on the scientific rationale for interventions (Goode, 2003; White, 2004). During this time period, problem-oriented, research-based interventions were developed by the Western Interstate Commission for Higher Education research utilization project, which teamed a nurse clinician and nurse educator. In 1972, due to concern about effectiveness and efficiency, Cochrane, a British epidemiologist, challenged the medical community to base practice decisions on rigorous research evidence versus tradition and expert opinion alone. This challenge eventually led to the evidence-based medicine (EBM) movement and the establishment of both the Cochrane Collaboration in 1993 and the Evidence-Based Medicine Working Group (Goode, 2003).

Levels of evidence, which categorize the statistical strengths and weaknesses of individual research or meta-analyses, vary in complexity between EBM and evidence-based nursing (EBN). The scope of evidence to support nursing practice is generally more inclusive than is EBM (Goode, 2003; Stetler, 2003). Ciliska (2006) defined EBN as “the incorporation of the best research evidence along with patient preferences, the clinical setting and circumstances, and healthcare resources into decisions about patient care” (p. 38). Therefore, EBM focuses on randomized controlled trials to make recommendations for clinical practice, while the range of EBN can include evidence from randomized controlled trials or quasi-experimental, descriptive, or qualitative studies in developing practice standards (Melnyk & Fineout-Overholt, 2005). Both medicine and nursing scientific inquiry evaluate authoritative opinion and expert consensus but ascribe guarded status to this evidence when making recommendations for practice.
Melnyk and Fineout-Overholt’s (2005) level of evidence rating system seems well suited for nursing practice recommendations relating to music interventions. Their evidence rating system categorizes levels of evidence as follows:

- **Level I:** a systematic review or meta-analysis of randomized controlled trials or clinical practice guidelines based on randomized controlled trials.
- **Level II:** a well-designed randomized controlled trial.
- **Level III:** well-designed non-randomized controlled trials.
- **Level IV:** well-designed case control or cohort studies.
- **Level V:** systematic reviews of descriptive or qualitative studies.
- **Level VI:** a single descriptive or qualitative study.
- **Level VII:** the opinion of expert authority.

**FINDINGS OF THIS REVIEW**

Eleven of 17 studies reviewed met our inclusion criteria and are presented in the Table. Nine of the included studies reported reductions in agitation after the music intervention (Denney, 1997; Gerdner, 2000, 2005; Goddaer & Abraham, 1994; Hicks-Moore, 2005; Olsen, Hutchings, & Ehrenkranz, 2000; Ragneskog, Asplund, Kihlgren, & Norberg, 2001; Sung, Chang, & Abbey (2006); Tabloski, Mckinnon-Howe, & Remington, 1995). Eight studies were quasi-experimental (Clair & Bernstein, 1994; Denney, 1997; Goddaer & Abraham, 1994; Hicks-Moore, 2005; Olsen et al., 2000; Ragneskog et al., 2001; Sung et al. (2006); Tabloski et al., 1995), 1 was experimental (Gerdner, 2000), 1 was a case study (Gerdner, 1997), and 1 was a pilot study that used a mixed methodology (Gerdner, 2005). Regarding the 6 studies excluded from our findings, 5 did not specifically measure agitation as an outcome (Casby & Holm, 1994, Clark, Lipe, & Bilbrey, 1998; Irish et al., 2006; Kumar et al., 1999; Suzuki et al., 2004), and 1 used structured musical activities as the intervention (Brotons & Pickett-Cooper, 1996).

In the studies reviewed, we found both strengths and weaknesses regarding measurement tools, sample sizes, and study designs. Internal validity was strengthened in all experimental and quasi-experimental studies by the selection of a homogeneous sample and the use of reliable diagnostic tools for level of dementia. Likewise, the reliability of data collection instruments used was well documented; for example, the Cohen-Mansfield Agitation Inventory was used to measure the outcome of agitation (Gerdner, 2000, 2005; Hicks-Moore, 2005; Sung et al., 2006). Methods were used to verify observer training and inter-rater agreement (Clair & Bernstein, 1994; Gerdner, 2000, 2005; Olsen et al., 2000; Sung et al., 2006). Importantly, 5 studies reported standardization of the music intervention, such as preferred, “individualized” musical selections (Hicks-Moore, 2005; Sung et al., 2006) or the use of an interventional protocol (Gerdner, 1997, 2000, 2005). In addition, Gerdner’s 2000 and 2005 investigations demonstrated convergent validity with triangulation of data by adding qualitative evidence in the form of anecdotal notes.

Similarly, there were threats to internal and external validity. Four studies had samples of less than 10 (Denney, 1997; Gerdner, 1997, 2005; Ragneskog et al., 2001), and 7 had samples between 15 and 39 (Clair & Bernstein, 1994; Gerdner, 2000, 2005; Goddaer & Abraham, 1994; Hicks-Moore, 2005; Olsen et al., 2000; Sung et al., 2006). Methods were used to verify observer training and inter-rater agreement (Clair & Bernstein, 1994; Gerdner, 2000, 2005; Sung et al., 2006). The use of nonprobability, convenience samples contributed to selection bias and weakened generalizability. Other factors, such as the presence of observers, staff expectations, and the novelty of the intervention, may have exerted an effect as well.

Generally, the statistical methods used in the studies seemed to be appropriate in relation to the tools used to measure behavior. Two of the studies used inferential statistics in their analysis (Clair & Bernstein, 1994; Gerdner, 2005), whereas the rest used nonparametric statistics to describe their findings.
IMPLICATIONS FOR NURSING

Several implications for nursing practice can be derived from the studies reviewed:

- Music interventions may decrease the need for physical and chemical restraints (Hicks-Moore, 2005).
- When using music or any intervention, continued assessment is important. Not only should the client’s response be evaluated, but other clients in the environment should also be monitored as they may find the music unpleasant (Gerdner, 2005). Headphones may be an important tool for the music intervention to protect others in the environment (Madan, 2005).
- A music intervention is easy to incorporate into daily care, is inexpensive, and is noninvasive (Hicks-Moore, 2005).
- The volume of music should be adjusted to match the hearing function of the individual resident (Clair & Bernstein, 1994) and to provide the optimal level of auditory stimuli (Irish et al., 2006).

Overall, our review suggests supportive evidence to recommend the use of music as an intervention in nursing practice. In fact, a national guideline was recently established outlining the use of an individualized music intervention in dementia (Gerdner, 2007). Also, the University of Iowa (2007) offers a quick reference guide and consumer information sheet describing an individualized music intervention strategy in dementia.

Opportunities for interdisciplinary or collaborative practice are available to nurses and activity therapists using music as an intervention. During interviews with both a long-term care recreational coordinator and a regional hospice nursing administrator, the intentional use of group and individual music interventions for prevention and treatment of agitated behaviors was discussed (A. Craddock, personal communication, November 15, 2006; S. Spillman, personal communication, November 15, 2006). Formalized plans of care used in these settings involved nurses, a music therapist, and an activity therapist and included assessment of triggering factors for agitated behaviors and a prescribed music intervention, lasting 15 to 30 minutes, based on client preferences.

RECOMMENDATIONS AND CONCLUSION

Although the literature has contributed a great deal to the body of knowledge regarding music interventions, there is still much to be learned. For example:

- Is there an anxiety reduction mechanism underlying the observed effect of music (Irish et al., 2006)?
- Would the examination of well-being in addition to ill-being (as in measuring agitated behaviors) provide a better measure of interventional effect (Sherratt et al., 2004)?
- Are there direct and indirect effects of music on the caregiver?
- What, if any, are the long-term effects of music on clients’ behaviors?
- What is the most effective “dosage” of music in regard to the frequency and duration of the intervention?

Current study findings point toward the efficacy of individualized music as a simple, low-cost alternative to physical and chemical restraints. The evidence supports music as a therapeutic nursing intervention that may serve to enhance the quality of life for many clients with Alzheimer’s dementia.

REFERENCES


Gerdner, L.A. (2000). Effects of individualized versus classical “relaxation” music on...


ABOUT THE AUTHORS

Ms. Witzke is Instructor, William Jewell College, Department of Nursing, Liberty, Missouri; Ms. Rhone is Staff Nurse, Wilson Medical Center, Neodesha, Kansas; Ms. Backhaus is Staff Nurse, Liberty Hospital, Liberty, Missouri; and Ms. Shaver is Assistant Professor, Johnson County Community College, Department of Nursing, Overland Park, Kansas. All authors are also graduate nursing students, University of Kansas School of Nursing, Kansas City, Kansas. The authors thank Geri B. Neuberger, RN, MN, EdD, ARNP, Professor, University of Kansas School of Nursing, for her guidance in the development and preparation of the manuscript.

Address correspondence to Rebecca A. Rhone, RN, BSN, CWS, FACNCS, 2693 Quail, Fall River, KS 67047; e-mail: rrhone@kumc.edu.