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Use of preferred music to decrease agitated behaviours in older people with dementia:

A review of the literature

Abstract

Background. Music has been suggested as a feasible and less costly intervention to manage agitated behaviours in older people with dementia. However, no review of the literature focusing on study findings of preferred music on agitated behaviours in older people with dementia had been reported.

Aims and objectives. This paper was to review study findings of preferred music on agitated behaviours for older people with dementia and to provide implications for future research and practice.

Methods. A review was undertaken using electronic databases with specified search terms for the period of 1993-2005. The references listed in the publications selected were also searched for additional studies.

Results. Eight research-based articles met the inclusion criteria and were included in the review. The preferred music intervention demonstrated positive outcomes in reducing the occurrence of some types of agitated behaviours in older people with dementia. The findings from these studies were relatively consistent in finding improvement in agitated behaviour although the findings in one study did not reach statistical significance. The small sample sizes and some variations in the application of the preferred music intervention mean that caution is needed in drawing conclusions from these studies.

Conclusions. This review highlights that preferred music has positive effects on decreasing agitated behaviours in older people with dementia; however, the methodological limitations indicate the need for further research.

Relevance to clinical practice. Findings from the review highlight the beneficial outcomes of preferred music in reducing agitated behaviours for older people with dementia. The incorporation of preferred music has the potential to provide a therapeutic approach to the care of older people with dementia.

Key words: preferred music, dementia, agitated behaviours, nurses, nursing
BACKGROUND

Caregivers have identified agitated behaviours as one of the most challenging in caring for those with dementia (Wagner et al. 1997) and may put older people at risk of harm to themselves, other residents and caregivers. Agitated behaviours have traditionally been managed with the use of psychotropic medications or physical restraints. These treatments may cause negative effects (Bradley et al. 1995). These concerns have led to research seeking alternative approaches to reduce the need for chemical or physical restraints in the care of older people with dementia. One such approach is use of music. Music has been suggested as a feasible and less costly intervention to manage behavioural problems in older people with dementia. Music can be used to modify environmental stimuli (Hall & Buckwalter 1987, Gerdner & Buckwalter 1999) and some types of music may create a neutral environment to mask noises and prevent over-stimulation. Therefore, use of music can be a viable intervention to manage agitated behaviours in older people with dementia.

Therapeutic use of music

According to Munro and Mount (1978, p.1029), music therapy is defined as ‘controlled use of music and its influence on the human being to aid in physiologic, psychologic, and emotional integration of individual during treatment of an illness or disability.’ Music intervention has been used as a valuable nonpharmacologic intervention for patients of all ages in a variety of clinical practice settings. Several literature reviews have documented the positive outcomes of music interventions for various clinical populations (Kneafsey 1997, Snyder & Chlan 1999, Biley 2000, Evans 2002, Savarimuthu & Bunnell 2002). Some reviews have focused on the use of music for people with dementia and finding beneficial effects on their behaviours and social interaction (Brotons et al. 1997, Koger et al. 1999, Lou, 2001, Vink et al. 2003, Sherratt et al. 2004). There is a wide range of music interventions used for older people with dementia including listening to different types of music, instrument playing or group exercise while listening to music. Music as an intervention can be implemented by using individualised music to match the past preferences of older people or listening to tapes of classical or calming music privately or in a group setting. Music listening with personal
preferences in particular has been suggested to effectively manage behavioural problems of older people with dementia (Gerdner & Swanson 1993, Gerdner, 2000, Ragneskog et al. 2001).

Familiarity in older people with dementia

Older people with dementia are especially susceptible to the incongruence created by an environment that is unfamiliar and may result in negative psychosocial outcomes, such as anxiety and agitation (Mirotznik & Ruskin 1985). Although older people with dementia have impaired explicit memory, they have preserved implicit memory and habits (Randolph et al. 1995, Fleischman et al. 1998, Knight, 1998). One form of implicit memory is associated with the sense of familiarity. Older people with dementia may invoke memories encoded with familiar environmental cues which the elders may perceive as less intimidating and stressful (Son et al. 2002). Since older people with dementia are typically unable to learn or interpret a new environment (Camberg et al. 1999), introducing the sense of familiarity into a new environment or maximising familiarity in an existing environment can enhance their functional abilities (Son et al. 2002). Using aspects of prior familiar environments (such as music, objects and pictures) can be a viable strategy to stimulate remote memories associated with positive feelings in older people with dementia.

Familiar music from the past can assist in memory recall and elicit memories associated with positive feelings. Researchers indicate that the areas of the brain that respond to music are the last to deteriorate in dementia and suggested that music may be one form of communication that remains preserved in people with dementia who respond to music (Crystal et al. 1989). Cuddy and Duffin (2005) found that memory for familiar music was spared in people with dementia and concluded the presence of music may prompt motor activity or memory recall in people with dementia. Music is often used as a stimulus and a catalyst for reminiscence for older people and may be used to communicate forgotten memories in those with dementia (Clair 1996). When Music is viewed as an important aspect in the person’s life and is based on personal preferences, memories associated with positive feelings can be elicited. Older people are usually fond of music that was popular during their youth (Gibbons 1977). Music from religious services, patriotic ceremonies or cultural events would
have specific meaning to the person’s life. The level of significance of music in the person’s life prior to the onset of dementia is proposed to be associated with the effectiveness of music intervention (Clark et al. 1998, Gerdner 2000). Music that elicits positive memories from the past can have a soothing effect, and these positive feelings, in turn, will prevent or reduce agitation in older people with dementia (Gerdner 2000). Listening to one’s favourite music can also decrease cortisol which increases in the presence of stress (Fukui 1996), which may in turn reduce state anxiety and promote relaxation (Chlan 1998). Thus, music, which can elicit memories and positive feelings in older people with dementia, has the potential to decrease the occurrence of behavioural problems, such as agitation.

According to current literature, music appears to have beneficial effects on people with dementia, but the effect size of these benefits was not consistent across all studies. In addition, variation in musical selections, different types of music activities and multiple types of measurements for the outcomes also limited the ability to compare and contrast the effects across the studies. Previous reviews on music and dementia research included different types of music activities and various outcomes (Brotons et al. 1997, Koger et al. 1999, Lou 2001, Vink et al. 2003, Sherratt et al. 2004); however, these broader based reviews limited the generalisability of findings as they failed to differentiate which type of music activities worked for which outcomes in older people with dementia.

AIMS OF THE REVIEW

This review differs from previous reviews of music interventions in dementia care in that it focuses on studies using preferred music interventions or comparisons of preferred music with other types of interventions to manage agitated behaviours in older people with dementia. The aim of this review was to provide a summary of the current state of knowledge about the effects of preferred music on agitated behaviours for older people with dementia and to discuss the implications for future research and practice.

METHODS

The following computerised databases were searched from 1993 to 2005: CINAHL, MEDLINE, PsychINFO, PsycARTICLES and the Cochrane Database of Systematic Reviews.
Keywords used in the literature search included ‘preferred music’, ‘individualised music’, ‘music’, ‘agitated behaviours’, ‘dementia’, ‘Alzheimer’s disease’, ‘music and dementia’ and ‘music and Alzheimer’s disease’. The literature search resulted in 29 research studies that identified use of music on people with dementia. The references listed in the publications selected were also searched for additional studies. Initial review of the abstract of each article found from data base search were undertaken to determine those meeting the inclusion criteria. The inclusion criteria for study selection were published in English and appeared in refereed journals. Criteria specific for the topic were: (i) intervention studies of preferred or individualised music, (ii) agitated behaviours, and (iii) people with dementia or Alzheimer’s disease. Studies of music that did not involve patient participating in preferred music interventions were excluded from the review. A total of eight research-based articles met the criteria and were included in the review. An appraisal of the quality of the included studies was conducted and each study was appraised critically in relation to their sample, designs, treatments, measures and findings (Table 1). The methodological weaknesses of these reviewed studies were discussed. The result of this review was also discussed and compared with those of previous reviews on music and dementia.

RESULTS

The studies reviewed were predominantly from North America and only one study was conducted in Europe. Four studies were conducted by nursing professionals, one study was by mental health professionals (Cohen-Mansfield & Werner 1997), one was by music therapists (Clark et al. 1998), one was by a group of recreational professionals (Thomas et al. 1997), and one was by occupational therapists (Casby & Holm 1994). Prior to reporting the main findings about preferred music for those with dementia, methodological issues for the included studies are outlined. They are examined according to the sample, design, treatments, measures and main findings of the reviewed studies.

Sample
The participants involved in the studies were older people diagnosed with dementia or dementia of Alzheimer’s type and were residents in long-term care facilities. Two studies did not mention anything about the screening measures for estimating disease severity or reporting levels of cognitive function for their participants (Casby & Holm 1994, Snyder & Olson 1996). Of those that did refer to screening measures, three studies assessed their participants’ cognitive function by the Mini-Mental State Examination (MMSE) (Gerdner & Swanson 1993, Clark et al. 1998, Ragneskog et al. 2001), two studies used the Global Deterioration Scale (GDS) for determining disease severity (Thomas et al. 1997, Gerdner 2000), and one study used the Brief Cognitive Rating Scale (BCRS) to assess cognitive deterioration (Cohen-Mansfield & Werner 1997). One study reported their participants had a moderate level of dementia (Thomas et al. 1997), three studies classified their participants as having severe level (Cohen-Mansfield & Werner 1997, Clark et al. 1998, Ragneskog et al. 2001), and two studies included participants with both moderate and severe levels of dementia (Gerdner & Swanson 1993, Gerdner 2000). There were four studies in which the sample size was less than six participants (Gerdner & Swanson 1993, Casby & Holm 1994, Snyder & Olson 1996, Ragneskog et al. 2001).

Design

The studies reviewed used various research designs. One study used a case study design (Gerdner & Swanson 1993), one was a case control (Ragneskog et al. 2001), and another employed a quasi-experimental design (Thomas et al. 1997). The remaining five studies used a crossover design with each participant serving as their own control and with repeated measures (Casby & Holm 1994, Snyder & Olson 1996, Cohen-Mansfield & Werner 1997, Clark et al. 1998, Gerdner 2000). Only two studies used random assignment of participants into treatment groups (Clark et al. 1998, Gerdner 2000). Some of the crossover design studies had one group of participants receiving preferred music and the other group receiving other types of treatment conditions, such as classical music (Gerdner 2000) or use of family video or social interaction (Cohen-Mansfield & Werner 1997) or hand massage (Snyder & Olson 1996), then the order of the conditions was reversed so that each group of
participants received all treatment conditions but in different time periods. There were only three crossover studies that provided a washout period of 1-2 weeks between sequences of different treatment conditions (Cohen-Mansfield & Werner 1997, Clark et al. 1998, Gerdner 2000), thereby preventing carry-over effects and nullifying possible cumulative effects of the music interventions. One study (Ragneskog et al. 2001) had each participant receiving the same order of treatment conditions (no music period then classical music period and followed by two periods of preferred music) and compared their behavioural responses before, during, and after each period of treatment conditions. Earlier studies reviewed appear to use smaller sample size while more recent studies appeared to use more rigorous research designs with larger sample to test the effects of preferred music intervention.

Treatments

The majority of the studies evaluated the effects of preferred music interventions in comparison with either no music or with other types of treatment conditions, such as classical music, taped music, family-generated video, social interaction or hand massage. In addition, music interventions were conducted at different time periods, such as at a fixed time of day (Gerdner & Swanson 1993, Snyder & Olson 1996), at peak time for agitation (Cohen-Mansfield & Werner 1997, Gerdner 2000, Ragneskog et al. 2001), or during bathing time (Thomas et al. 1997, Clark et al. 1998). One study did not mention the time of day when they implemented the music sessions (Casby & Holm 1994). Gerdner’s study (2000) was the only one which implemented music sessions 30 minutes prior to the peak level of each participant’s agitation. Furthermore, the numbers of preferred music sessions conducted in the studies also varied. There were as little as three sessions of music intervention once a day in a 3-day period (Thomas et al. 1997) and as many as twelve sessions of preferred music in a six-week period (Gerdner 2000).

Measures

The assessment instruments used in the studies mainly included informant ratings, self-developed behavioural checklists, and video-taped recording. The most frequently used instrument
was Cohen-Mansfield Agitation Inventory (CMAI), which is a type of informant rating scale (e.g. Gerdner & Swanson 1993, Cohen-Mansfield & Werner 1997, Thomas et al. 1997, Gerdner 2000). The CMAI demonstrated high reliability and was used to record the occurrence of 29 observable agitated behaviours. Gerdner (2000) modified the CMAI for the time classification to provide more detailed assessment of each specific agitated behaviour during a ten-minute period and this was the only study which assessed the peak level of participants’ agitation using a valid assessment tool. Ragneskog and colleagues (2001) used video-taped recording for agitated behaviours in one-minute segments and suggested that video-recordings are a more reliable method to code behaviours compared to observational rating scales. Cohen-Mansfield and Werner (1997) used taped-recording accompanied by the CMAI and the SBMI (Screaming Behavioural Mapping Instrument) to measure verbal disruptive behaviours accurately. Other researchers used self-developed behavioural checklists to measure the outcomes, but the validity and reliability of the checklists were not reported (Casby & Holm 1994, Clark et al. 1998). One study did not name the assessment tool used for measuring aggressive behaviours nor its validity and reliability (Snyder & Olson 1996).

Main findings of the reviewed studies

While there are some methodological limitations in the included studies, the preferred music intervention used in these studies consistently demonstrated positive outcomes in reducing occurrence of some types of agitated behaviours in older people with dementia although in one study (Snyder & Olson 1996) the positive outcome was not statistically significant. These studies found that music listening with personal preferences generally has a soothing effect on older people with dementia. Seven of the eight studies reported preferred music to be effective in decreasing occurrence of some types of agitated behaviours in older people with dementia. However, one study (Snyder & Olson 1996) found that preferred music intervention did not significantly decrease the occurrence of aggressive behaviours, but it significantly improved relaxation.

Among the seven studies reporting significant improvement in agitation, there were only two studies which found significant changes in agitated behaviours both during and following the music
interventions. A significant decrease of agitated behaviours during and one hour after the music intervention was found for four of the five participants in Gerdner & Swanson’s study (1993). Similar results were found in another crossover design of 39 participants (Gerdner 2000), in which the occurrence of agitated behaviours were significantly reduced during and 30 minutes following preferred music by comparing to classical music listening. The other 5 studies reporting significant improvement measured the effect of preferred music on agitation during the intervention. Given that preferred music reduced the occurrence of some types of agitated behaviours in people with dementia from the seven reviewed study findings; however, family-generated videotape playing and social interaction with other staff also produced similar effects while comparing to individualised music listening in one study (Cohen-Mansfield & Werner 1997).

DISCUSSION

From reviewing the existing literature, it is evident that music listening intervention matched with personal preferences has positive effects in reducing occurrence of some forms of agitated behaviours in older people with dementia. Nevertheless, a number of methodological limitations were apparent in the studies reviewed.

Study design

The majority of studies employed purposive sample with the size of samples ranging from three to 39. Small and purposive samples reduced the external validity of these studies, and findings should be interpreted cautiously as they may not be representative of wider populations of older people with dementia. In addition, there was a lack of adequate descriptions of methods for determining sample size and randomisation procedures in most of the reviewed studies. Moreover, all studies focused on older people with dementia in long-term care facilities; however, differences in the settings and environments may contribute to variability in the way the music intervention is administered and in participant’s responses to the interventions. The variation of settings for implementing music intervention may affect the outcomes achieved. Further, recent studies appear to use more rigorous research design to test the effects of preferred music on behavioural outcomes in
people with dementia. However, more studies with larger sample sizes and use of experimental
designs (such as randomised controlled trials) are needed and can provide more empirical evidence of
the effectiveness of preferred music intervention in reducing agitated behaviours in older people with
dementia.

Treatments

All studies asked participants to listen to music of their preferences, but there was wide
variation in duration and frequency of the music sessions. Limited information about the ideal number
and length of music sessions that should be conducted provides minimal guidance for the use of music
sessions in clinical practice. In addition, although mid-afternoon is suggested as the time for increased
anxiety and agitated behaviours according to Progressive Lowered Stress Threshold model (Hall &
Buckwalter 1987) and would be a suitable time period for implementing music interventions, not all
older people with dementia display agitated behaviours in the mid afternoon. Therefore, the pattern of
agitated behaviours for each person should be assessed to determine the peak level of agitated
behaviours and the best time for implementing music intervention. It is also important to examine
whether preferred music intervention has a carry-over effect and the duration of the effects on
behavioural changes among older people with dementia.

Measures

The use of assessment measures is important for accurately and practically measuring
behavioural outcomes. Two of the studies used self-designed behavioural checklists to assess
participant’s behaviours, but they did not report the validity and reliability of the tools. Further testing
is needed to establish validity and reliability of these behavioural checklists. While video recording
was suggested as a more accurate and reliable method for measuring and coding behavioural
outcomes, it is more costly and requires technical assistance on data coding and analysis. More studies
concluded that the behavioural outcomes can be assessed reasonably by using a reliable and valid
observational rating scale, such as the CMAI. Moreover, only one study assessed participant’s
personal preferences of music with a valid music preference assessment tool (Gerdner 2000). Personal
preferences of music should be assessed by a assessment tool developed according to the cultural differences of older people. The information gathered from the music preference assessment tool can become a database for other caregivers to implement preferred music intervention for older people in long-term care facilities.

Findings

This review suggested that preferred music intervention demonstrated positive outcomes in reducing the occurrence of some types of agitated behaviours in older people with dementia. The findings from the reviewed studies were relatively consistent in finding improvement in agitated behaviour except for the findings in one study (Snyder & Olson 1996) that did not reach statistical significance. The finding of this review is similar to those of previous reviews (Brotons et al. 1997, Koger et al. 1999, Lou, 2001, Sherratt et al. 2004) in which music interventions in general have the potential to reduce problem behaviours in older people with dementia, but the process by which this effect occurs remains unclear and several methodological limitations of the studies indicate the need for further research. A meta-analysis of 21 empirical studies by Koger et al. (1999) also revealed that the overall effect of music was highly significant for managing symptoms of dementia, but the effect size was not consistent across all studies. However, a Cochrane systematic review of five randomised controlled trials by Vink et al. (2003) concluded that the quality of the studies was generally too poor to draw useful conclusions about effectiveness of different types of music therapy in the treatment of symptoms of older people with dementia.

This review focused on the effect of one specific music modality, preferred music, on agitated behaviours of older people with dementia, unlike previous reviews in which different types of music interventions were included. Two of the previous reviews recommended that music preference is a key element to ensure success of music interventions for managing problem behaviours in people with dementia and needs to be considered for future research (Brotons et al. 1997, Lou 2001). In addition, previous reviews found music effective for a range of outcomes, such as emotional, social and behavioural outcomes; however, the current review only focused on agitated behaviours since social
interaction is not considered as a valid outcome for preferred music intervention in older people with dementia. Further, this review, similar to some of the previous reviews, also recommended further study with more stringent methodology in terms of validity and reliability of measures (Koger et al. 1999, Lou 2001, Vink et al. 2003, Sherratt et al. 2004), experimental design with a larger sample size (Vink et al. 2003), consistency of music modality (Lou 2001), interaction effects of other confounding variables (Lou 2001), impact of disease severity (Brotons et al. 1997, Koger et al. 1999) and potential long-term effects (Koger et al. 1999, Vink et al. 2003).

CONCLUSION AND RECOMMENDATIONS

This paper reviewed study findings on preferred music in decreasing agitated behaviours in older people with dementia and highlights the use of preferred music as a less costly alternative intervention to chemical and physical restraints in dementia care. However, the methodological limitations of past studies needs to be considered. More rigorous research designs with larger sample sizes are needed to determine the effects of preferred music on agitation in older people with dementia. There is also a need for investigations into the interaction effects with possible confounding variables, such as use of medications and physical restraints. Since psychotropic medications are often used to manage behavioural problems in older people with dementia, the outcome measures could be affected by use of the medications. Correlations between the level of severity of dementia and the effects of preferred music should also be further examined. A qualitative research study could be conducted to interview nursing staff to assess their attitudes and perceptions about implementation of preferred music intervention for older people with dementia in long-term care facilities. Future research can also examine the effect of preferred music on older people with dementia in different settings, such as day care centres and communities.

In conclusion, given that methodological limitations are evident in the reviewed studies, preferred music is considered to have the potential to reduce agitated behaviours and can be a viable alternative to chemical and physical restraints for managing behavioural symptoms of dementia. The
incorporation of preferred music has the potential to provide a therapeutic approach to the care of older people with dementia and improve the quality of their life.

CONTRIBUTIONS

Literature review and study design: HS; data analysis: HS, AC; manuscript preparation: HS, AC.
REFERENCES


Table 1 Summary of the studies of preferred Music on agitated behaviours in older people with dementia

<table>
<thead>
<tr>
<th>Authors</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention</th>
<th>Instrument</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gerdner &amp; Swanson</td>
<td>Case study</td>
<td>N=5</td>
<td>Preferred music played 30 min for 5 days (3:30-4 pm)</td>
<td>CMAI</td>
<td>The mean percentage of agitated behaviours decreased 46.6% during intervention and 80% 1 hour after intervention for 4 subjects.</td>
</tr>
<tr>
<td>(1993)</td>
<td></td>
<td>Age87-97 MMSE&lt;21</td>
<td></td>
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<tr>
<td>Casby &amp; Holm</td>
<td>3-single subject</td>
<td>N=3</td>
<td>Sub1: ABCA Sub2: ACA Sub3: ABA 20 min of music for 4 days A-baseline B-classical music, C-individualised music</td>
<td>Self-designed behavioural checklist</td>
<td>Both classical and favourite music significantly decreased repetitive vocalisations in 2 subjects.</td>
</tr>
<tr>
<td>(1994)</td>
<td>withdrawal design</td>
<td>(No screening tool)</td>
<td></td>
<td></td>
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<tr>
<td>Snyder &amp; Olson</td>
<td>Experimental</td>
<td>N=5</td>
<td>Preferred music vs. hand message (3-9 pm)</td>
<td>Not mentioned measures for aggressive behaviours</td>
<td>Significantly improved levels of relaxation, but did not significantly reduce frequency of aggressive behaviours.</td>
</tr>
<tr>
<td>(1996)</td>
<td>crossover design</td>
<td>Mean age 92</td>
<td></td>
<td></td>
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<tr>
<td>Thomas et al.</td>
<td>Quasi-experimental</td>
<td>N=14</td>
<td>Preferred music played before and during bathing</td>
<td>CMAI</td>
<td>Significant decreased aggressive behaviours during intervention, but no significant change for hiding, hoarding, physically nonaggressive behaviours and verbally agitated behaviours</td>
</tr>
<tr>
<td>(1997)</td>
<td>design</td>
<td>Age 69-86 GDS(moderate)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen-Mansfield &amp; Werner (1997)</td>
<td>Repeated measures pre-posttest crossover design</td>
<td>N=32 mean age 86.8 BCRS(mean score 5.5)</td>
<td>4 grps Each grp: family video(2 wks) +wash-out (1 wk) +social interaction (2 wks) +wash-out (1 wk) +preferred music(2 wks)</td>
<td>1. Tape-recording 2. SBMI 3. CMAI</td>
<td>Verbal disruptive behaviours decreased by 56% during social interaction, 46% during videotape, 31% during music, 16% during no</td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention Details</td>
<td>Outcome</td>
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<tr>
<td>Clark et al. (1998)</td>
<td>One group experimental crossover design</td>
<td>N=18, mean age 82, MMSE (mean score 10)</td>
<td>no music for 2 wks and preferred music for 2 wks in bathing time (4 wks: 10 episodes with no music + 10 episodes with music)</td>
<td>Observational checklist for aggressive behaviours. Decrease occurred in 12 of 15 aggressive behaviours during music, significant decrease for hitting behaviours.</td>
<td></td>
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<tr>
<td>Gerdner (2000)</td>
<td>Experimental repeated measures pre-posttest crossover design</td>
<td>N=39, mean age 82.6, GDS (3-7)</td>
<td>Grp A: 30-min preferred music (6 wks) + wash-out (2 wks) + 30-min classical (6 wks) Grp B: reverse (30’x2 days/wk)</td>
<td>Modified CMAI. Significantly reduction in agitation during and following preferred music compared to classical music.</td>
<td></td>
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<tr>
<td>Ragnesko et al. (2001)</td>
<td>Case control</td>
<td>N=4, mean age 81.25, MMSE (0-7)</td>
<td>period 1 (no music) period 2 (class music) period 3 (preferred) period 4 (preferred) (45 min/session x 4-5 sessions/subject)</td>
<td>1. Video recording 2. FACS. Reduced agitation and shouting for 2 subjects.</td>
<td></td>
</tr>
</tbody>
</table>

MMSE: Mini-Mental State Examination
GDS: Global Deterioration Scale
BCRS: Brief Cognitive Rating Scale
CMAI: Cohen-Mansfield Agitation Inventory
SBMI: Screaming Behavioural Mapping Instrument
FACS: facial action coding system