**Critical Review: Does music therapy have a positive impact on language functioning in adults with dementia?**

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This critical review examined the effects of music therapy (MT) on language functioning in adults with dementia. Study designs reviewed included one within-subjects repeated measures design, one mixed repeated measures design and one mixed case-control study. Results provided suggestive evidence that MT can have a positive impact on speech content, speech fluency and category fluency in adults with vascular dementia (VD) and dementia of the Alzheimer's type (DAT). Improvements were also noted on the language subscale of the Mini-Mental State Examination (MMSE). Recommendations for further research and clinical implications are provided.

## Introduction

Many degenerative central nervous system diseases, especially those that commonly affect older adults, may cause dementia (Brookshire, 2007). Diffuse impairment of memory, intellect and cognition are recognized as indicators of dementia. Behavior and personality changes, as well as movement disorders or sensory disturbances are also commonly observed in dementia (Brookshire, 2007). Many pharmacological treatments for individuals with dementia exist, however, they have been found to be relatively ineffective for treating various symptoms of the disease (Vink, Bruinsma, & Scholten, 2003). MT is one example of a non-pharmacological treatment that has been used to treat individuals with dementia (Brotons & Koger, 2000). The World Federation of Music Therapy (2011) describes MT as the use of music and/or its musical elements (sound, rhythm, melody and harmony) by a qualified music therapist, on an individual or group basis, through a formally defined process. This process is designed to facilitate and promote communication, relationships, learning, mobilization, expression, organization and other relevant therapeutic goals that are intended to meet physical, emotional, mental, social and cognitive needs. Vink et al. (2003) distinguish between two types of MT that may be effective for individuals with dementia. The first is referred to as receptive MT, in which the music therapist provides music while individuals simply listen. The second is referred to as active MT, in which individuals are expected to participate in the production of the music by playing instruments, singing, and/or dancing.

The use of MT allows a unique method of communication for individuals who have difficulties with expressive and receptive language (Vink et al., 2003). MT has been used in treating dementia for a number of years, as it appears that the musical abilities of individuals with dementia remain intact for an extended period of time, despite cognitive deterioration (Baird & Samson, 2009). However, as stated by Vink et al. (2003), the reason for this is not well understood or easily explained. The majority of research conducted in the area of MT intervention for individuals with dementia has focused on behavioral and affective outcomes (Thompson, Moulin, Hayre, & Jones, 2005). Researchers have found positive effects of the use of MT on aggressive behavior (Clark, Lipe, & Bilbrey, 1998), mood (Kumar et al., 1999), and sleep patterns (Lindenmuth, 1992) in individuals with dementia. More recently, researchers have become interested in evaluating the potential benefits of MT on the language functioning of individuals with dementia (Brotons & Koger, 2000).

## Objectives

The primary objective of this critical analysis is to outline and critically evaluate existing literature on the impact of MT on the language functioning of adults with dementia. A second objective of this paper is to provide clinicians with evidence-based recommendations to guide their clinical decision making for individuals with dementia.

## Methods

Search Strategy
Computerized databases, including PubMed, PsycINFO, CINAHL, ComDisDOME, Medline – OVID and Scopus were searched using the following search strategy: (Dementia) AND (Music Therapy), (Dementia) AND (Music Therapy) AND (Communication), (Dementia) AND (Music Therapy) AND (Language). The reference lists of articles retrieved from this search were manually reviewed for additional studies relevant to the purpose of this critical review.

Selection Criteria
Studies included in this critical review were required to investigate the effects of MT on language functioning in adults with dementia. It was necessary for studies to specifically state that an MT intervention had taken place, as opposed to stating that music was simply played during the experimental condition. No limitations were set on the demographic variables (e.g., age, culture, race, gender, or socioeconomic status) of research participants, the research design or the outcome measures.

Data Collection
Results of the literature search yielded three articles that were consistent with the selection criteria: one within-subjects repeated measures design, one mixed repeated measures design and one mixed case-control study.

## Results

Within-Subjects Repeated Measures Design Study
MT has been found to improve speech content and fluency in individuals with dementia. Brotons and Koger (2000) conducted a within-subjects, counterbalanced, repeated measures design study, which yielded Level 2b evidence. This study compared the effects of MT and conversational sessions on language functioning in individuals with DAT. Twenty-six participants were chosen based on specific criteria and were organized into small groups. Each group participated in eight MT sessions over a four week period. MT sessions included a 'hello song' for participant and therapist introductions, four songs related to pre-determined topics (e.g., animals) and a 'goodbye song.' Following each song, a discussion relating to the song took place. The same procedure was followed for conversational sessions, without music. Four subscales of the Western Aphasia Battery (WAB) (spontaneous speech, auditory verbal comprehension, repetition and naming) were administered one week before intervention and again upon completion of each condition block.

A total of 20 participants completed the spontaneous speech subtest of the WAB, which gives a measure of speech content and fluency. Based on the results of a two-way repeated measures ANOVA, performance in the music condition was superior to performance in the conversational condition ($p=0.01$). Participants also scored significantly higher on fluency than on speech content in each condition ($p=0.004$). Overall, performance was better during the MT condition for both speech content and fluency ($p=0.09$). A one-way ANOVA was carried out on data from 19 participants who completed the first section of the auditory verbal comprehension subtest (yes/no questions) of the WAB.

No significant difference was found between the MT and conversational groups on this subtest. Based on results obtained from these language performance subtests, Brotons and Koger (2000) concluded that implementing MT for individuals with DAT may have a positive impact on their speech content and fluency.

Mixed Repeated Measures Design Study
Studies have also demonstrated the effectiveness of MT on improving category fluency in individuals with dementia. Thompson et al. (2005) conducted a mixed, counterbalanced, repeated measures design study, which yielded Level 2b evidence. The purpose of this study was to investigate whether MT had a facilitating effect on category fluency in healthy older adult controls (OAC) and patients with Alzheimer's disease (AD). Four groups were created by counterbalancing the presentation order of condition (music, no music) and two groups of fluency categories (fruits and vehicles, furniture and colors). Four OACs and four participants with AD were randomly assigned to each group and participants were given one minute to name as many category-specific items as possible. Participants were assessed on the MMSE between the two groups of fluency categories (fruits and vehicles, furniture and colors).

Results of a repeated measures ANOVA revealed that both OACs and participants with AD performed significantly better in the music condition as compared to the no music condition ($p<0.05$). Based on these results, Thompson et al. (2005) concluded that MT contributes to enhanced category fluency in both individuals with AD and healthy older adults.

Mixed Case-Control Study
There is further evidence to suggest that MT can improve language functioning in patients with dementia. Suzuki et al. (2004) conducted a mixed, nonrandomized, case-control study, which yielded Level 2b evidence. The purpose of this study was to determine the effectiveness of MT, as measured by behavioural and endocrinological evaluation tools, for individuals with dementia. The experimental group consisted of six participants with DAT and four participants with VD. All participants received 16 MT sessions. MT sessions began and ended with a song that incorporated the names of all participants, while the remainder of the session was devoted to singing familiar songs and playing percussion instruments. The control group consisted of six participants with DAT and seven participants with VD who participated in therapeutic physical activities. A clinical psychologist evaluated the MT and control groups using the MMSE before intervention and one week following completion of the program.

A paired *t*-test was used to compare pre- and post-intervention scores obtained from the MMSE for both the MT and control groups. Suzuki et al. (2004) found a significant improvement on the language subscale of the MMSE in the MT group ($p=0.012$), with no such improvement noted in the control group. Significant improvements were not seen specifically in participants with DAT, however, Suzuki et al. (2004) proposed that this may have been a result of the limited sample size.

Case studies for two participants with VD were also included for consideration in Suzuki et al. (2004), yielding Level 4 evidence. The first participant was an 86-year old man who would not initiate conversation or spontaneously give verbal contributions prior to receiving MT. During MT sessions however, he participated in all music activities and spoke with nurses as well (e.g., "What will we sing next?"). The second participant was a 90-year old woman who did not speak voluntarily prior to receiving MT. After each session, nurses asked this woman how she felt about the session. Following the seventh session of MT, she gave a verbal response ("I enjoyed singing very much and I was happy"). It was noted that this participant's overall expressiveness and participation increased over the course of the MT intervention. Based on the results of these case studies, as well as the statistical analysis of the mixed case-control study, Suzuki et al. (2004) suggested that MT stimulates and reinforces language abilities.

### Discussion

The studies included in this critical review provided suggestive evidence that MT may have a positive impact on speech content, speech fluency and category fluency in adults with VD and DAT. Following MT, participants also showed improvements on the language subscale of the MMSE. The evidence provided should be interpreted with caution, however, due to several limitations and methodological flaws. These factors may have negatively impacted the reliability and validity of the studies and caused the results to appear more compelling than they are. One important limitation is the small sample size that was included in these studies, which affects the generalizability of the results. In addition, the MT interventions described in each study took place over a short period of time and no long-term effects were reported.

As discussed by Raglio and Gianelli (2009), another limitation of current MT research is the loose clinical definition of MT. As a result of this, there is very little consistency in experimental methodologies, making it difficult to compare results across studies. MT may be carried out on an individual or group basis, and the size of the groups often varies from one study to another. With respect to the studies included in this critical review, Brotons and Koger (2000) divided participants into groups of two to four people for MT, while Suzuki et al. (2004) organized participants into groups of ten and Thompson et al. (2005) presented results based on individual therapy. In addition, the definition of MT does not distinguish between active and receptive forms of the therapy. This is another issue that may lead to inconsistencies in methodologies and make it difficult to compare results across studies. For instance, Brotons and Koger (2000) and Suzuki et al. (2004) reported findings that were based on active MT, while Thompson et al. (2005) discussed results obtained through receptive MT. Inconsistencies were also noted in the frequency, amount and duration of MT that was provided across studies. For example, Brotons and Koger (2000) had participants attend eight 30-minute MT sessions over a four week span, Suzuki et al. (2004) provided 16 one-hour sessions over eight weeks and Thompson et al. (2005) had participants attend only one session to complete two one-minute tasks.

A further limitation of the research included in this critical review is that participants had varying types of dementia (i.e., VD or DAT). As well, no information regarding the severity of the dementia was provided. These factors also make it difficult to compare results across studies and generalize them to other individuals with dementia. In addition, all participants were selected from either a specialized facility (Brotons & Koger, 2000; Suzuki et al., 2004) or a memory clinic (Thompson et al., 2005). This affects the representativeness of the sample, as there may be commonalities among individuals from the same setting beyond the diagnosis of dementia. A more random sampling to obtain participants would be necessary in order to increase the generalizability of the results.

Another limitation of the current research is that different areas of language were measured in each study and comprehensive assessments of language were typically not conducted. The exception to this was Suzuki et al. (2004) who reported on the language subtest of the MMSE, however, it was not clear which aspects of language were measured using this subtest. Given that the results are specific to certain language domains in most cases, one cannot assume that they generalize to other areas of language functioning. In order to determine whether MT improves language functioning overall, a more comprehensive assessment of language abilities should be conducted pre- and post-MT intervention.

A final limitation of the studies included in this critical review is that there were no language goals specified for

the MT interventions. While Suzuki et al. (2004) did outline the goals for their sessions, they were related to physical and mental functioning, as well as social interaction. In order to determine whether MT is a successful therapeutic technique that can be used with adults with dementia, measurable language goals need to be set. This will allow progress to be measured and comparisons to be made across studies.

### *Recommendations*

Based on the limitations of the current research, it is recommended that further studies be conducted to determine the degree to which MT may improve language functioning in adults with dementia. Future studies should include the following in order to improve the strength of evidence in this area of clinical research:

- Larger sample sizes in order to improve the generalizability of results.
- Increased length of MT interventions and more longitudinal studies to determine whether the proposed effects of MT are long-term.
- More information on the type and severity of dementia of the participants. Researchers may want to include a variety of types and severity levels to determine whether the results can be generalized.
- A more comprehensive assessment of language functioning pre- and post-MT interventions to determine which areas may or may not be impacted by MT.
- More rigorous methodological designs for MT studies, as well as specific goals for MT intervention. This will allow researchers to make comparisons across studies, attempt to replicate results, and obtain more compelling evidence either for or against the use of MT in adults with dementia.

### *Clinical Implications*

Further research should be conducted to determine the effects on language functioning in adults with dementia. However, current research provides suggestive evidence that MT does have a positive impact on speech content, speech fluency and category fluency in adults with VD and DAT. Improvements have also been noted on the language subtest of the MMSE. Clinicians should consider the following when deciding whether to recommend and/or implement MT for adults with dementia:

- MT is suggested to be a non-invasive method for improving language functioning in adults

with dementia and it has not been shown to have any harmful side effects (Vink et al., 2003).
- Specific training is required in order to become a registered music therapist (RMT). Clinicians should consider the amount of time required and financial resources before committing to providing this type of therapy.
- If clinicians do not wish to conduct MT sessions themselves, they need to seek out the services of an RMT. In this case, they must consider the financial burden that may be placed on themselves and/or the individuals receiving the therapy.
- Consider conducting research while doing MT to contribute to the scientific community since this a relatively small area of clinical research. While doing so, clinicians should develop specific language goals for the MT sessions and attempt to make MT interventions more systematic.

### *Conclusion*

There is suggestive evidence that MT has a positive impact on speech content, speech fluency and category fluency in adults with VD and DAT. Following MT, improvements have also been noted on the language subscale of the MMSE. However, the use of MT in clinical practice needs to become more systematic. There is also a need for additional evidence-based studies, with more rigorous methodological designs (e.g., randomized controlled studies). These improvements will allow for replication of studies and will also increase the strength of evidence obtained in this area of clinical research.

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