

Meeting the Complex Needs of Individuals With Dementia Through Music Therapy

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Abstract

Since its founding in 1995, the Institute for Music and Neurologic Function (IMNF) has been committed to the study of music therapy for people with neurologic impairments, especially for those with Alzheimer disease and other dementias. Our more than 30 years of research has reaped some unique findings. This article will describe the research projects and their implications in a narrative review with the focus on method, music intervention, and outcomes. It is hoped that the work of researchers and clinical practice communities will benefit from the synthesis of our findings and that the investigations and practices for our aging population will continue to expand.

Keywords

music therapy, Alzheimer disease and dementia, memory, cognition, quality of life

The Institute for Music and Neurologic Function (IMNF), located in New York city, was created in 1995 to interface neuroscience research with clinical music therapy research in order to design the most efficacious music-based approaches to treat people with neurologic impairments. These developed from clinical observations that regular engagement in music therapy not only provided momentary benefits of improved mood and increased attention, but that these improvements were maintained outside of the music therapy session if the patient was regularly engaged (2-3 times per week) in these programs. There has been critical interest in neurologic function and in particular how music of a strong personal nature can be of essential importance to persons with dementia. Research by Petr Janata¹ has shown that the medial prefrontal cortex has been indicated in autobiographical narrative and sense of self. Our qualitative and quantitative inquiries have shown explicit situations where music affected the response in people with dementia, most specifically in terms of attention and recognition memory within the music therapy process. In particular, the researchers sought to observe how responses to music by individuals with dementia could be indicative of preserved memory function.

The first critical study undertaken at the IMNF was *The Influence of Music on Memory in Persons With Dementia*² funded by the New York State Department of Health (DOH) Dementia Grants Program in 1993. The purpose of this study was to answer the question of whether or not music therapy can positively affect the neurologic and cognitive function of persons with dementia. Participants were randomly selected for inclusion in either 5-person or 6-person verbal reminiscence or music therapy intervention groups. Sessions of 30 minutes were conducted 3 times per week for 10 months. Toward the end of the study,

participants were measured against their own baseline scores on a battery of cognitive tests and standard mental status examinations. Electroencephalograms (EEGs) were also administered and evaluated against recorded baselines.

The specific variables measured were attention, recognition, verbalization, EEG changes, functional status, behavior, depression, and cognitive status. To test these variables, the investigators used the following: EEG, Mini-Mental Status Examination, Cornell Scale for Depression in Dementia, Cohen-Mansfield Agitation Scale, Global Deterioration Scale, severe impairment battery, Brief Cognitive Rating Scale, and video analysis.

The EEG testing was done at baseline and at the end of the intervention period. During EEG testing, 3 types of recorded music were provided as stimuli: a song that was familiar to all the participants, an unfamiliar song with same dynamics and rhythm as that of the familiar song, and a contemporary rock song with a strong rhythmic beat. Although investigators were unable to isolate a specific central nervous system localizing pattern, it was the unfamiliar music with the strong rhythmic beat that had the greatest effect on altering patients' EEG states, especially in increased background rhythms. This may be indicative of an increased level of arousal stimulated by the strong auditory rhythms. This finding could have implications for the use of novel but rhythmically strong music to engage

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attention in those with dementia, even though this is contrary to the established use of personally preferred music in this population.

Also of note, the music group as a whole improved from nodding responses to verbalizing recognition and had more context-relevant spoken words than those in the verbal reminiscence groups. Overall, more than half of the participants in the verbal and music groups showed an improvement in their scores on the Mini-Mental Status Examination over the course of 10 months, implying that there is the potential for improvement in patients with dementia.

Following the 1993 funded study, the NY DOH awarded a second grant in 1996 to the IMNF to investigate *The Effects of a Music Therapy Intervention on the Levels of Depression, Anxiety/Agitation, and Quality of Life Experienced by Individuals Diagnosed With Early and Middle Stage Dementias*.³ This was a straightforward, randomized experimental/control group using a pre-/mid-/posttest evaluation. The research design was a 2 (control/experimental) \times 3 (pre-/mid-/posttest) \times 3 (depression/anxiety/agitation) statistical analysis. The project participants consisted of 121 individuals with Alzheimer disease or other dementia plus depression. Of these individuals, 61 were assigned to immediate participation in the music therapy (experimental group) and 60 were "wait-listed" to participate in the intervention for 4 months (control group). Of the 121 original participants, final data were based on 111 individuals who completed all aspects of the study. Music therapy groups of 5 members participated in 45-minute sessions 3 times a week for 4 months. Individuals were used as their own controls. The participants in each of the intervention groups varied in their interest in the music and/or their ability to actively participate. In all cases, the music therapist conducted the session in such a way as to integrate each participant as much as possible. Participants were also compared with individuals who were not participating in music therapy interventions. Data were collected to measure agitation/anxiety, quality of life, adaptive daily living skills, and cognitive functioning. Initial data analysis of the pretest measures comparing the experimental to the control group did not show significant differences in any variable.

The basic content of each session consisted of (1) greeting song, (2) singing/listening to music familiar to the participants, (3) music listening with guided imagery, (4) rhythmic and/or melodic improvisation, (5) songwriting, and (6) closing song. The style of guided imagery and improvisation was flexible and not based on any established music therapy method. During the course of the 4-month project, each individual and his or her primary caregiver provided data on a variety of measures including depressions, agitation/anxiety, quality of life, adaptive daily living skills, and cognitive function as well as a variety of measures collected as part of the regular good clinical practices.

The sessions were led by a professional music therapist. The overall focus of the sessions was to provide a music therapy intervention that would positively influence mood, decrease anxiety/agitation, and enhance quality of life. Each session

began with a "hello" song identifying each individual in the group. The session included songs familiar to the individual participants, songs representing the feelings of the group members, rhythmic improvisations, verbal discussions, and a "closing" song. Given the varying functional, cognitive, and emotional characteristics of each individual in each intervention group, the music therapist utilized music in such a way as to maximize the responses of each of the participants. Participants in the music therapy intervention group were first assessed individually by the music therapist using the adapted Glynn⁴ music therapy assessment tool (MTAT) to determine the responsiveness to music. Each individual was assessed again based on their responses during the first intervention session. The first, midpoint, and last sessions were videotaped. Each individual was reassessed based on the responses during the last intervention. After each session, the music therapist evaluated each participant on participation in group activities, participation in individual activities, level of anxiety, exhibited behavioral problems, and alertness. Descriptive logs were maintained for each session.

Within each session, a variety of musical equipment was used. The therapists used a variety of instruments to play music. These included guitar, piano accordion, piano, or keyboard. Pretaped music was played on the stereo system. A variety of percussion instruments was used by the therapists and the participants. These included hand drums, large crash cymbal, chimes, maracas, claves, djembe, conga drum, sleigh bells, and shaker eggs. Each site had a variety of these instruments to offer participants during the intervention.

The music therapists leading the interventions were responsible for assessing each individual participant; videotaping the initial assessment plus the first, middle, and last sessions; designing each intervention within the content outline based on the individuals assigned to the group; arranging schedules for the session with unit staff; transporting participants to and from sessions; completing rating scale/attendance forms after each session; maintaining a descriptive log of each session; doing a qualitative analysis of each video tape and session logs; meeting with music therapy team on a weekly basis; and assisting in the composition of the qualitative research findings for the final report.

The music therapy staff met before the start of the intervention phase to discuss the method of assessment and the format of the intervention. This team also met on a weekly basis to discuss any issues relating to the intervention or documentation. During the qualitative analysis of the videotapes, each music therapist presented tapes of their sessions to the other music therapists. This peer debriefing allowed for the emergence of several findings consistent with each of the therapist's groups, despite the variety of participants and the different therapists.

In terms of main effects for the control group (wait-list), there were statistically significant increases in the number of medications ($t = 2.25, P < .028$), number of diagnosis of psychiatric or depressive disorders ($t = 2.1, P < .045$), and number of negative affective ratings such as tearfulness and sadness ($t = 2.58, P < .12$), from pretest to posttest. The

experimental group (music therapy) showed a statistically significant decrease in the levels of depression from pretest to posttest ($t = 2.9, P < .006$). The MTAT was used to assess changes in behavior during the course of the intervention. Conversation, smiling, sad affect, flat affect, elation, anxiety, singing/humming, and verbal and nonverbal behaviors were assessed at pretest and posttest. All behavioral aspects were found to change significantly ($P < .01$) in the appropriate directions (ie, smiling: increased, anxiety: decreased, etc).

An unexpected result from this study was a complex interaction effect that had not been predicted originally. While the main effect of agitation/anxiety was not significantly different from the pretest to posttest, it did significantly interact with depression, whether or not the individual was in the music therapy sessions. Some individuals in both groups showed decreased levels of agitation/anxiety. However, those in the intervention group showed significant changes in their depression level, even though depression and agitation/anxiety are highly correlated ($P < .0001$). Further, the same people increased their activities of daily living ($F = 4.11, P < .045$). This implies that the music therapy allows individuals who showed decreased levels of agitation/anxiety to decrease their depression as well, which in turn affects how they navigate their daily lives.

This study found that a music therapy intervention could decrease depression and anxiety in individuals with early- and middle-stage dementias who reside in long-term care nursing facilities. Specifically, the music therapy intervention showed statistically significant changes in behavior and affect of even the most challenging individuals studied (individuals diagnosed with depression along with dementia). Behavior markers included conversation, smiling, sad affect, elation, flat affect, anxiety, singing/humming, and verbal and nonverbal variables as defined by the MTAT. All markers moved significantly in the appropriate directions, indicating improvement over time. Another significant finding of this study was that although the music therapy groups and the nonmusic therapy groups showed decreases in the observed levels of agitation, only the music therapy group showed decreases in the observed levels of agitation and depression, with increased activities of daily living to a statistically significant extent.

The promising results of the study led to additional funding to support the development of a quality-of-life scale for late-stage dementia.⁵ Quality of life is considered to be of the utmost importance when living in long-term care facilities. It is particularly important for those with Alzheimer disease and other dementias who may not have the ability to let their wishes be known. Based on previous studies conducted at this facility, it seemed that existing measures to assess quality of life focused primarily on negative behaviors, reflective of the disease process. Late-stage Alzheimer disease and dementia demand a greater sensitivity of measure to ascertain a legitimate assessment of quality of life. With this project, *Quality of Life Measures for Individuals With Late-Stage Alzheimer's and Dementia*, the researchers sought to develop a way of measuring how people view the quality of life within a long-term facility. Two interventions were designed. The first

intervention was an observational measure based upon the analysis of approximately 36 hours of verbal and music therapy session video filmed as part of an earlier DOH-funded study. The observational measure was then used with long-term skilled nursing residents to address the personal, individual behaviors reflective of quality of life.

The second intervention involved the development and implementation of an environmental survey that was then administered to residents at 3 different facilities. A concept mapping procedure involving family members of residents with mid- to late-stage dementias, staff, and residents without dementia was used to develop the 63-item environmental survey.

This study has 2 major findings. First, quality of life is measured based on positive behaviors rather than negative ones. Negative behaviors will be part of the life of a person with a degenerative disease such as Alzheimer or dementia. However, it should also be noted that these individuals do exhibit positive behaviors that indicate the quality of life that they are experiencing.

Second, quality of life of individuals living in facilities cannot be measured without assessing the environment itself. The environment plays a crucial role in whether the individuals are experiencing a good quality of life.

A third critical study from our literature base, which served as the foundation for the author's dissertation, was titled *Music on Their Minds: A Qualitative Study of the Effects of Using Familiar Music to Stimulate Preserved Memory Function in Persons With Dementia*.⁶

In choosing a detailed in-depth format, the author was able to delve deeply into the experience of 4 residents with late-stage dementia who received individual music therapy in 20-minute sessions twice a week. Participants were involved in a total of at least 16 sessions. Music for the sessions was primarily selected from that named by the resident's significant other (spouse or adult child) to ensure that music of personal/autobiographical importance was played. To compare the participant's response to similar but nonpersonalized music, songs of the same era, mostly from a time period when the participant was in the late teens to 30 years of age, and style were included in the sessions as well.

All sessions were videotaped and exact transcripts were made available for each session, including raw data on the therapist's direct observations and participants' nonverbal responses. These were then analyzed and coded to yield specific categories regarding memory function. This included the areas of self-identity, melodic memory, remembrance, word finding, familiarity, and spontaneous physical responses. Throughout the sessions, reoccurring expressions of personal needs emerged as themes. Most importantly, the aggregate themes included love, family, and loneliness.

The analysis also compared the responses with autobiographical versus age-similar music to determine whether the responses were connected to the personal nature of the music. There were many notable outcomes of this study in the above-mentioned areas. Participants were able to improve their melodic

memories and recall lyrics over time. In addition, an increased word-finding ability was documented. A specific familiarity was established between the residents and the therapist, by establishing a foundation in trust. Spontaneous physical responses (exclamations, crying, singing, clapping, smiling, eye contact, and gestures) were found to be more prominent while listening to songs that were personally important to the participant. Speech improvements included the use of context-appropriate words and, eventually, conversational interaction with the therapist.

Another important observation of this study was that the aggregate of fragmented and seemingly unrelated statements made by the participants over the course of the many sessions did convey coherent personal information. This finding was made apparent only through the extensive analysis of video, spanning a long period of time. The expressed personal information implies that an understanding of self and personal needs still exists for an individual even at the late stages of dementia.

In 2009, the IMNF researchers studied the *Effect of Active Music-Making Music Therapy on Depression and Apathy in Community-Based Day Health Care Patients With Neurologic Impairments*. This was a quasi-randomized, controlled clinical research study that investigated the effect of individualized active music-making music therapy on depression and apathy in 43 patients with neurologic impairments who attended day health care programs. The goal of the study was to determine whether individualized active music-making music therapy has a significant positive effect on mood in patients with depression and apathy having neurologic impairments and to compare the effects of music therapy combined with routine psychological treatment (ie, drug therapy and/or supportive verbal therapy), individually provided social visits with routine psychological treatment, or routine psychological treatment alone. The outcomes of these 3 intervention conditions (therapeutic interventions) were measured through Montgomery-Asberg Depression Rating Scale and the Apathy Evaluation Scale. The findings of the study suggest that individualized active music-making music therapy is an effective and low-risk intervention for patients with neurologic impairments having depression and lack of motivation, thus showing positive implication for its utilization in health care facilities for similar individuals.

The assignment of the participants was quasi-randomized by the order of recruitment as well as by stratification of demographic criteria in order to ensure an even distribution of participants into 3 groups. At the start of the study, the 3 groups showed about the same level of depression. When the study concluded, both the active music-making music therapy group and the social visitation group showed significant decreases in depression compared with the control group. These differences were accepted as statistically significant based on an α level of .05 as well as clinically significant. These findings are shown in Table 1.

Although the active music-making music therapy group did achieve lower depression scores than the social visitation group, the significance of this finding could not be statistically

Table 1. Descriptive Statistics.

	Treatment		
	Music Therapy Mean	Social Visitation Mean	Control Mean
MADRS depression score (pretest)	16.27	15.60	15.62
MADRS depression score (posttest)	8.62	11.29	16.25

Abbreviation: MADRS, Montgomery-Asberg Depression Rating Scale.

established because of the small sample size; however, the trend was in a positive direction.

In 2009, funding was received to study the impact of a 4-tiered music therapy program conducted at 14 community-based sites located throughout the New York city on frail elderly people receiving comprehensive managed care but residing at home. The following programs were implemented and studied in regard to caregiver burden and quality-of-life measures of the participants.

Group Music Therapy Program: Group music therapy program focused on physical wellness and memory function in about 1200 older adults in small targeted groups (eg, Alzheimer, stroke, Parkinson) within most sites' social day program. The IMNF music therapists applied techniques suitable for enhancing functional independence in these targeted groups.

Homebound Music Therapy Program: Homebound patients with complex medical conditions and receiving home care services received 2 at-home music therapy sessions per week, for a period of 12 weeks.

Caregiver Training Program: Experienced music therapists provided training in therapeutic music techniques to about 150 professional caregivers employed in the social day centers as well as to the 50 family caregivers caring for their loved ones at home.

Individualized Therapeutic Music Listening Program: To reinforce the benefit of music therapy, the IMNF provided prerecorded music and therapeutic music-based video programs to the social day programs, home care patients, and/or at-home caregivers with instructions and training on its usage. The patients and caregivers were taught to use the player on a daily basis.

Through outcome-based measurements utilizing standardized psychological and physical evaluation tools, the project aimed to show various effects of music therapy, such as pain management and improving emotional coping skills and quality of life. In addition, through cost-utilization analysis, the research aimed to determine whether there is a correlation between treatment outcomes and the total costs of care for the patients participating in the program before and after the music therapy service.

Our goals were not only to extend the scope of therapeutic music programs to benefit a broad range of individuals with complex medical problems but to sustain such programs by training direct caregivers in these techniques. The project presented many challenges that mirror the complexity of providing health services in a multicultural and widely dispersed urban environment. Every care was taken to exact our program and evaluations to the specific cultural background of the individuals served, including the translation of all assessment tools into 6 languages as well as ensuring that music programs were culturally appropriate. Our results show many positive trends, with 3 findings being statistically significant: (1) the Neuropsychiatric Inventory distress rating scale that measured the caregiver evaluation of the severity of patient's problems; (2) the cost-effectiveness of the community-based music therapy groups; and (3) self-awareness in the participants of the music therapy group.

In analyzing the various studies presented here, along with an in-depth review of effective music therapy techniques for persons with dementia undertaken with a grant from the US Administration on Aging, the following are the summaries of best practices for music therapy to benefit people with Alzheimer disease and other dementias.

Music Therapy to Address Psychosocial and Emotional Issues

Many individuals with dementia exhibit problems in the areas of interpersonal relations, self-awareness, and emotional regulation. These include issues such as decreased self-awareness, confusion, anger, frustration, despair, isolation, withdrawal, depression, and/or agitation. Four major music therapy techniques were found to be crucial in eliciting desired therapeutic outcomes: use of familiar songs, musically cued relaxation, a therapist's presence, and consistency of sessions.

Use of familiar songs: The use of familiar songs, especially those of personal importance to the individual, is extremely effective in helping patients decrease agitation, aggression, and depression, while increasing sense of self and initiating self-expression. This was demonstrated by reduction in disruptive and repetitive vocalizations or complaints, more relaxed facial and bodily expressions, and more spontaneous engagement in music with increased self-expression along with verbal and nonverbal interpersonal interactions. The familiar songs provided a sense of safety and security to the patients, thus increasing vocalizations. As awareness and vocalizations increased, the music therapist was able to incorporate other musical techniques such as songwriting, instrumental playing, or musically guided imagery to further the psychological process. However, the premature shift to another musical activity without allowing the patient to be fully engaged in familiar songs often diminished the positive effect of the engagement on reduced emotional stress. This also affected the interpersonal relationship,

as it was observed that changing the song lyrics or style of the song resulted in decreased engagement of the patient. Positive responses to familiar songs were immediate changes in behavior, but these were often subtle. For example, changes in affect, slight tapping of a foot or finger to the song's rhythm, spontaneous though very soft singing of lyrics, and an immediate request to repeat a song were observable behaviors even in those who had seemed minimally responsive to the music. The music therapist's ability to manipulate the music in real time further enhanced these types of engagements.

Musically cued relaxation: Relaxation techniques using either familiar or improvised tunes were found to be effective for alleviating physical and emotional distress as well as facilitating recall of images, personal associations, and positive memories. This required the therapist to be sharply attentive and insightful of the patient's physical and emotional states and to be able to guide them carefully through the gradual relaxation process. Soft and steady drumbeats often set patients' physical and emotional states into a relaxed mode. Use of voice to match patient's mood was strongly effective in facilitating a sense of safety and assurance. However, it was generally noticed that the use of words that geared toward in-depth introspection beyond the patient's cognitive and emotional readiness tended to interfere with the initial and prolonged establishment of relaxation.

Therapist's presence and consistency of sessions: It was crucial that the therapist maintained an attentive presence throughout the session, sitting close to the patient and making eye contact. This close proximity allowed for direct cueing and encouragement such as tapping on knees or exaggerated vocal, facial, and bodily mirroring. Face-to-face eye contact was extremely important for maintaining a strong connection with the patient and increasing their alertness and engagement. It was often observed that the therapist was most effective in helping with emotional regulation when music alone was used as the primary tool to cue the relaxed state, rather than using words. Keeping a consistent yet flexible session structure over the course of the music therapy sessions was important to preserve a sense of security over time.

Music Therapy to Address Cognitive Issues

Impairments of cognitive function are the hallmark of Alzheimer disease and dementia. Such impairments include decreased alertness and attention span, deficits in long-term and short-term memory, unintelligible use of language (both receptive and expressive), poor reasoning and decision making, and/or disturbances of thoughts, including impaired self-identity. Disturbances in consciousness, such as a distorted sense of orientation or severely decreased alertness (partial absence of consciousness), are also often observed. Because music provides memory cues or "priming" on so many neurologic

levels, it can and does affect cognitive issues presented by patients with dementia. Specifically, both familiar music and novel sounds can be used to arouse attention and increase engagement. In addition, manipulations of musical dynamics, vocal, and other sensory cues, along with musically induced associative recall of autobiographical memory and musically cued word retrieval, had a positive impact on cognitive function.

Both *familiar and novel sounds* stimulate responses in people with dementia. Presenting musical and nonmusical stimuli that were both familiar and novel helped to arouse attention and sustained engagement in many of the patients with dementia. The challenge is to understand when each is appropriate. The music therapist who is able to observe behaviors and manipulate the musical cues in real time is best equipped to do this. Musical tunes that were familiar with the patient on an implicit “sense of familiar” level—demonstrated by the patient’s nonverbal responses—often seemed to facilitate a cognitive process of recognition memory. This observation is supported by an experimental finding that showed heightened frontal activity of P3 brain potentials (an event-related brain potential sign of the brain’s evaluation of novelty) in the participants listening to culturally familiar music.⁷ This may indicate that listening to familiar styles of tunes increases the allocation of attention-based resources during the memory updating process, which is supposed to determine the P3 amplitude.

The purposeful manipulation of the timing of changes in energy and direction of musical dynamics was critical in helping the patients stay alert and attentive. The therapist achieved this by carefully working with the moment-to-moment relationship between the patients’ responses and musical components in order to facilitate a balance between familiar and novel music and sounds. For example, inserting a sudden pause or a delay in the start of a song increased the patients’ alertness.

Throughout the sessions, the therapist’s direct leading was crucial for keeping the patients focused, attentive, and engaged. This corresponds to the finding from other modalities of dementia treatment.⁸ When the patients showed difficulty in decision making due to impaired executive function, providing directive cues *both vocal and sensory* was successful in engaging the patient’s ability to make choices. Examples include preselected options (eg, certain songs, instruments, topics of discussion, etc), closed questions if necessary, or clear presentation of how to do a breathing exercise or play a certain instrument. The therapist’s use of dynamic vocal cues, both in singing and in speaking, resulted in the patients’ increased alertness and attention. Other sensory cues, such as the visual (eg, facial or hand cues) or tactile (eg, touch or tapping on limbs) also helped to enhance the patients’ attention. Redirecting the patient’s perceptual focus or utilizing what comes into his or her immediate perceptual field was another effective technique to generate instant attention and motivation. For example, a patient who was withdrawn and inattentive to the familiar tunes played for him became instantaneously attentive and enlivened when the therapist acknowledged and sang about the new blanket on his knee.

Musically induced associative recall of autobiographical memory was observed when songs of strong personal importance were used. It was frequently observed that patients with dementia were still able to retrieve memories, both long-term and short-term, through an implicit, associative cognitive processes. Often patients who could not recall their autobiographical history (eg, date of birth, mother’s maiden name, year of leaving hometown) on an explicit level when verbally asked were able to retrieve associative stories, images, and feelings through familiar songs or carefully guided improvisatory musical images. Despite the patients’ inability to explicitly name key events and times in their life, they could infer recognition of these times and events when the autobiographical music provided the associative cues. Those patients with impairments in short-term explicit recall exhibited the ability to recall it implicitly, that is, associative feelings or moods and/or similar genre of song. For example, the patient may incorrectly recall the name of the song, but did recall the name of a song from the same genre, demonstrating implicit short-term memory on some level. These clinical findings correspond to the previous notion of interconnectedness between emotion and implicit associative cognitive processing as well as music’s effect on it.⁹⁻¹⁹ The previous and current information together indicate that in older individuals with dementia, the associative neural network between subcortical and cortical areas may be relatively intact and that it can be effectively stimulated by familiar or personally meaningful music.

Because of short-term memory problems, many patients exhibited problems in word recall and meaning, similar to aphasia and apraxia. For these patients, both words and syntax could be cued through the use of song, melody, and rhythm, especially when the word was embedded in a song or musical phrase. Patients showed improved performance on word retrieval, particularly when the target word fell on the downbeats of the tune, specifically at the beginning or closing notes of phrases or refrains of the song. This indicates the therapeutic efficacy of coupling the semantic component of words with the musical syntax (form). This may be related to the previous notion of the common brain properties involved in processing musical and linguistic syntaxes.²⁰ It is noteworthy that word finding and retrieval were more successfully achieved when a patient was tapping and/or singing in synchrony with the rhythm of the song, indicating that the rhythmic structure of the music informed the structure and recall of the word. This effect was stronger for rhythmic structure rather than melodic structure. This observation is also supported by the notion of significance of temporal–rhythmic components over melodic–pitch components in melody’s aiding text recall.²¹

Patients showed improvements in their use of language when undergoing a personally meaningful musical experience. Patients who normally exhibited unintelligible use of language, such as mishearing, misunderstanding, or repetitive or tangential speaking, tended to improve as they personally related to and talked about personal associations attached to familiar songs. Verbalizations during musically engaged moments were more fluent and integrated and interpersonal communications

more relevant. It was also noted that thought disturbances such as obsessive negative thoughts tended to be reduced or absent during such musical moments. This may indicate that one cognitive mode may inhibit other cognitive processes, possibly at the subcortical level.

There was evidence of improved motor function and coordination. People with dementia often lose coordination and motor activity as the disease progresses and mobility decreases, resulting in decreased coordination, inertia, and lack of bodily awareness. The use of music was found to be helpful in intervening with these problems.

By providing steady beats and changes in dynamics, the music therapist was able to trigger the patient's internal impetus to move, thus allowing them to "feel" the beat. Patients who were initially reluctant to participate in instrumental playing became motivated and spontaneously engaged in rhythm-based actions (eg, expressive conducting, clapping, or playing the drum). It is important for the therapist to provide music with a steady beat and engage the patient long enough for them to "feel" the beat and respond physically. Patients tended to initiate their physical actions more readily when they securely perceived the basic beats of the music, and this was likely to develop into more complex, sophisticated rhythmic movement as they continued to play. A systematic increase in tempi has been noted as a key component in rhythmic-motor entrainment for patients with paresis.²²

Conclusion

Dementia is a disease that presents many clinical issues that can be addressed successfully through music therapy. Individuals with dementia have progressive neurologic degenerations that affect their emotional, social, cognitive, and physical well-being. Therefore, it is crucial that any professional involved in clinical practice or research with these patients understands the need to relate to each person as an individual who has had a full life of intact experiences and sense of self and others. These memories and abilities are not destroyed in dementia but the access to and the ability to retrieve them is. We have seen how the purposeful use of music as a cue to memory retrieval and renewed sense of self is possible in individuals with dementia. In conclusion, the analysis of this research demonstrates that music therapy can be used effectively for many aspects of treatment and improved quality of life for people with dementia. Additionally, it was determined that a music therapist can successfully train caregivers and other health professionals to use the therapeutic aspects of music to benefit those with dementia as a way to sustain the clinical benefit.

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References

1. Janata P. The neural architecture of music-evoked autobiographical memories. *Cereb Cortex*. 2009;19(11):2579-2594. doi:10.1093/cercor/bhp008.
2. Tomaino CM. The Influence of Music on Memory in Patients with Dementia. Paper presented at: Annual Meeting of the NY State Dementia Grant Program; June 1996; Albany, NY.
3. Tomaino C, Scheiby B, Asmussen S, Ramsey D, Shah V, Goldstein A. The effects of a music therapy intervention on the levels of depression, anxiety/agitation, and quality of life experienced by individuals diagnosed with Early and middle stage dementias: A controlled study. Paper presented at: Annual Meeting of the NY State Dementia Grant program; June 1999; Albany, NY.
4. Glynn NJ. The music therapy assessment tool in Alzheimer's patients. *J Gerontol Nurs*. 1992;18(1):3-9.
5. Asmussen SM. Development of a Quality of Life Measure for Individuals with late-Stage Alzheimer's Disease and Dementia. Final grant report to NY Department of Health Dementia Grants programs. 1999
6. Tomaino CM. Music on their minds: a qualitative study of the effects of using familiar music to stimulate preserved memory function in persons with dementia. UMI 9832773. <https://steinhardt.nyu.edu/music/therapy/people/students/thesis>. Accessed September 6, 2013.
7. Arikan MK, Devrim M, Oran O, Inan S, Elhih M, Demiralp T. Musical effects on event related potentials of humans on the basis of cultural environment. *Neurosci Lett*. 1999;268(1):21-24.
8. Mahendra M. Direct interventions for improving the performance of individuals with Alzheimer's disease. *Sem Speech Lang*. 2001;22(4):291-303.
9. Tomaino CM. Music and music therapy for the frail non-institutionalized elderly. *J Long Term Home Health Care*. 1993;13(2):24-27.
10. Tomaino CM. Music and limbic system. In: Bejjani FJ, ed. *Current Research in Arts and Medicine*. Chicago, IL: A Capella Books; 1993:393-398.
11. Tomaino CM. Music therapy for the elderly in long term skilled nursing care and short term rehabilitation. *Music Ther Int Rep*. 1996;10:69-71.
12. Tomaino C. Working with images and recollection with elderly patients. In: Aldridge D, ed. *Music Therapy in Dementia*. London, England: Jessica Kingsley; 2000:195-211.
13. Tomaino CM. Clinical application of music therapy in neurological rehabilitation. In: Haas R, Brandes V, eds. *Music That Works*. Wien, Austria: Springer; 2009:211-220.
14. Gaudreau LA, Peretz I. Implicit and explicit memory for music in old and young adults. *Brain Cogn*. 1999;40:126-129.
15. Halpern AR, Zatorre RJ. When that tune runs through your head: a PET investigation of auditory imagery for familiar melodies. *Cereb Cortex*. 1999;9(7):697-704.
16. Halpern AR, O'Connor MG. Implicit memory for music in Alzheimer's disease. *Neuropsychology*. 2000;14(3):391-397.
17. Itoh M. Mood effects on the impression formation of typical and atypical targets. *Jpn J Psychol*. 2002;73(5):419-424.

18. Schulkind MD, Hennis LK, Rubin DC. Music, emotion, and autobiographical memory: they're playing your song. *Mem Cognition*. 1999;27(6):948-955.
19. Sacks OW, Tomaino CM. Music and neurological disorder. *Int J Arts Med*. 1991;1(1):7,9.
20. Patel AD, Peretz I, Tramo M, Labrecque R. Processing prosodic and musical patterns: a neuropsychological investigation. *Brain Lang*. 1998;61(2):123-144.
21. Kilgour AR, Jackson LS, Cuddy LL. Music train and rate of presentation as mediators of text and song recall. *Mem Cognition*. 2000;28(5):700-710.
22. Thaut MH, McIntoch GC, Rice RR. Rhythmic facilitation of gait training in hemiparetic stroke rehabilitation. *J Neurol Sci*. 1997; 151(2):207-212.

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