



Music therapy for patients with alzheimer's disease: A focused critical review

Antigoni Fountouki¹, Stiliani Kotrotsiou², Theodosios Paralikas² and Dimitrios Theofanidis¹

¹Nursing Department, International Hellenic University, Greece

²University of Thessaly, Greece.

Correspondence

Dimitrios Theofanidis

Nursing Department, International Hellenic University, Greece

E-mail: dimitrisnoni@yahoo.gr

- Received Date: 16 Mar 2021
- Accepted Date: 05 Apr 2021
- Publication Date: 09 Apr 2021

Copyright

© 2020 Science Excel. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International license.

Abstract

Introduction: Dementia is one of the most pressing issues in old age, affecting not only the person who suffers it but also the caregivers and family.

Aim: The purpose of this systematic review is to explore the therapeutic value of music as a non-pharmacological intervention for people with AD. A secondary objective is to reveal evidence on the type of music that is most beneficial.

Methods: The systematic search included critical review of different databases: Google Scholar, Science Direct, PubMed, Scielo, Dialnet and Cochrane. The search dates ranged from 2006 to 2019 and individual and combinations of the following keywords were used: "Alzheimer's disease", "music", "music therapy" and "dementia" in English, Spanish and Greek. The selected papers were then read in their entirety and further exclusions were made based on 'fine-tuning' according to the inclusion and exclusion criteria.

Results: Results revealed publications from many different countries such as: Spain, Greece, USA, Netherlands, Brazil, Germany and China. Searching the databases led to the selection of 21 research studies and 7 systematic reviews including a Cochrane review.

Discussion: MT has elicited considerable interest amongst researchers and findings clearly illustrate that this innovative and non-invasive method is of great protective advantage to those suffering cognitive decline as found in AD and that responses to MT are evident within a short period of time [within 5 weeks] with as few as one to two half hour sessions per week.

Conclusions: MT stimulates cognitive function, improves mood, and reduces behaviour problems triggered by stressful conditions. It is an inexpensive and pleasant intervention with no adverse effects and has emerged as a promising additional therapeutic approach for patients with dementia. It seems that most benefit is achieved when familiar music is enjoyed amongst a group adding a social element to the whole experience.

Introduction

Dementia is one of the most pressing issues in old age, affecting not only the person who suffers it but also the caregivers and family. The most frequent form of dementia in developed countries is Alzheimer's disease (AD). This is a chronic degenerative disorder characterized by a gradual loss of mental capacity including diminished personal and social identity. Sarasa et al. [1], define AD as a "primary degenerative dementia of cortical predominance and insidious onset from the age of fifty, progressive and irreversible, characterized by loss of various intellectual and cognitive capacities, leading to altered behavior, with loss of personal care habits, deterioration of the relationship with people and the environment, and various neurological and physical disorders".

The disease is characterized by three distinct stages with each one having different symptoms and signs. Broadly speaking, there is deterioration in memory as the first sign (initially in the short, followed by medium term memory), proceeded by a relevant loss of autonomy, and ending with

incapacitation of daily activities. However, the evolution of the disease is not always the same. It can be fast or slow, and there may even be a mixture of signs and symptoms from different stages. In any case, finally there is a functional alteration at cognitive level (language, perception) motor (basic skills) and behavior i.e., depression, anxiety, sleep disorder, irritability [2].

To-date, pharmacological treatments are not curative of dementia, so non-pharmacological treatments provide an important alternative for improving the quality of life of these patients. Music Therapy (MT) is one type of non-pharmacological treatment which can be offered to such patients [3]. It was introduced in the 1970s and its usefulness in the field of dementia is now recognized by the scientific community since various studies have reported physical, cognitive, and psychological benefits [4].

MT has many various approaches and definitions. According to the American National Association for Music Therapy (NAMT): "Music therapy is the use of music to achieve therapeutic goals: the

Citation: Fountouki A, Kotrotsiou S, Paralikas T, Theofanidis D. Music therapy for patients with alzheimer's disease: A focused critical review. Case Rep Rev. 2021;2(1):1-7.

restoration, maintenance, and improvement of mental and physical health. It is the systematic application of music, directed by a music therapist in a therapeutic context in order to facilitate changes in behavior. These changes help the person in therapy to better understand himself and his own world, thus becoming better adapted to society" [5].

A further definition of MT is provided by the World Federation of Music Therapy (WFMT): "Music therapy is the use of music and/or its musical elements [sound, rhythm, melody, harmony] by a music therapist, with a patient or group, in a process designed to facilitate and promote communication, learning, mobilization, expression, organization, or other relevant therapeutic goals, in order to achieve change and meet physical, emotional, mental, social, and cognitive needs" [6]. Thus, MT seeks to unfold the patient's available functional potential and help restore the individual so that they reach improved interpersonal relationships and, consequently, a better quality of life for both the patient and those around them.

For this purpose, numerous MT techniques have been developed and put to practice. Broadly, these fall in two main categories, i.e., Active Techniques which are based on direct interaction with the patient, and Receptive Techniques which require a lower level of participation [7]. Furthermore, interventions may be tailored to a specific music content-subject and carried out with individuals or in groups.

Aim

The purpose of this systematic review is to explore the therapeutic value of music as a non-pharmacological intervention for people with AD. A secondary objective is to reveal evidence on the type of music that is most beneficial.

Method

The systematic search included critical review of different databases: Google Scholar, Science Direct, PubMed, Scielo, Dialnet and Cochrane. The search dates ranged from 2006 to 2019 and individual and combinations of the following keywords were used: "Alzheimer's disease", "music", "music therapy" and "dementia". The language was restricted to English, Spanish and Greek.

The search strategy that was used was as follows: dementia major OR dementia OR Alzheimer major OR Alzheimer AND music OR music therapy and randomized controlled trial OR controlled clinical trial OR clinical trial OR random* OR trial* OR outcome OR meta-analysis OR systematic review OR systematic overview. The first two authors screened the search results independently looking for studies that were considered eligible according to the abstracts which were scrutinized and sorted depending on whether they adhered to the study's aims. Disagreements were resolved by consulting with the third author. The selected papers were then read in their entirety and further exclusions were made based on 'fine-tuning' according to the inclusion and exclusion criteria.

The inclusion and exclusion criteria were as follows:

1. Randomised trials, observational studies, as well as systematic reviews were considered eligible.
2. Patients within the selected papers had been diagnosed with dementia using clinically diagnostic criteria.
3. The main outcome of the selected studies was the effect of music therapy on dementia.
4. Animal studies were excluded.

Although there is a recent Cochrane review available on this subject matter, this paper focuses on a critical discussion of the conclusions of each paper, while the method is also elaborated. .

Data extraction and quality assessment

Data extraction was performed by the first two authors. Specific study characteristics (i.e. method, relevance, outcomes, etc.) were entered into a database, based on the Scottish Intercollegiate Guidelines Network (SIGN) checklists [8]. The first author assessed quality criteria and the second checked for accuracy. Disagreements

were resolved by the third author. According to SIGN codes for study assessment, the papers identified were cross-checked for internal validity, overall assessment of the study and study description.

Results

Results revealed publications from many different countries such as: Spain, Greece, USA, Netherlands, Brazil, Germany and China. Searching the databases led to the selection of 21 research studies and 7 systematic reviews including a Cochrane review (Table 1).

Table 1. Initial hits per database..

Google Scholar	21500
Science Direct	5963
Medline	209
Scielo	7
Dialnet	5
Cochrane	1

Table 1 above shows the total returns per database based on the keyword search without the inclusion-exclusion criteria being applied. After close perusal, these were restricted as to the results presented in the following tables. Yet, the vast number of hits is an indication of how active the field of MT has become.

After the initial 'filtration' in terms of relevance to this review on MT, selected articles were separated as reviews and are shown in Table 2 and the selected trials are briefly summarized in Table 3.

Discussion

Music therapy has elicited considerable interest amongst researchers in the past decade as shown by the extensive literature reviews outlined in Table 2 and shown in more detail in Table 3. The findings clearly illustrate that this innovative and non-invasive method is of great protective advantage to those suffering cognitive decline as found in AD and that responses to MT are evident within a short period of time [within 5 weeks] with as few as one to two half hour sessions per week.

Yet Table 3 shows that MT uses variable methodologies, so individual research papers cannot always be compared to others in a systematic fashion. Certainly, some major findings of importance are displayed in both tables, the most notable being the importance of not simply playing music but rather playing familiar songs with familiar lyrics so that AD patients can join in the singing. In some cases, it is evident that this can be done in groups but where this is done great care would need to be taken that there are no cultural or ethnic differences in the group where MT is used.

Also, of advantage is getting the AD patients physically involved in some way with the music as well as singing such as playing or beating a musical instrument providing an addition element of fun. In this sense, music can also improve the relationships with the familial social group and in turn helps to reduce anxiety. An added bonus is that this therapy is also of benefit to the well-being of AD carers and improves their relationships with the patients especially when they get involved with the activities.

Yet, the enthusiasm these papers demonstrate for MT as a treatment option for AD also comes with emphasis that this therapy is not a substitute for medication but rather a complimentary treatment.

Conclusion

In summary, music therapy stimulates cognitive function, improves mood, and reduces behavior problems triggered by stressful conditions. Music therapy, an inexpensive and pleasant intervention with no adverse effects and has emerged as a promising additional therapeutic approach for patients with dementia.

It seems that most benefit is achieved when familiar music is enjoyed amongst a group adding a social element to the whole experience.

This means that the more familiar, interactive, and individualized it is, the better is for the patients.

Table 2. Systematic and narrative reviews on MT

Author, Year, Country	Method	Conclusion
Leggieri et al. [9], 2019, Canada	Studies published in the last 10 years (2008-2018), in English with pre- and post-intervention data collection in cognitive and/or behavioral domains concerning MT (active or music listening), and individualized or non-individualized	Results suggest that MT using individualized music playlists and focusing on relaxation techniques tend to yield greater benefits on AD patients. The study suggests that music interventions which use individualized music playlists and focused on relaxation techniques tend to yield greater benefits on AD persons.
Moreira et al., [10], 2018, Brazil	Systematic search in different data bases. The selected studies included patients diagnosed with mild or moderate AD who underwent MT for memory improvement. The review included RCTs in English, Portuguese, or Spanish.	Despite the positive outcome of this review, the available evidence remains inconsistent due to the small number of randomized controlled trials.
Van der Steen et al. [11], 2018, Netherlands	Cochrane Review of randomized controlled trials with music-based therapeutic interventions (at least five sessions) for people with dementia in institutional care, 22 trials-890 people	Providing people with dementia with at least five sessions of MT reduces depressive symptoms and improves overall behavioral problems. It may also improve emotional well-being, quality of life and reduce anxiety, but may have little or no effect on agitation, aggression or on cognition. It remains uncertain about effects on social behavior and about long-term effects.
García-Casares et al. [12],2017, Spain	Systematic review of 21 studies. Time frame January 2006 – December 2016	Music therapy constitutes an effective therapy to some extent for some cognitive, emotional and behavioral symptoms in patients with AD.
Fang et al. [13], 2017, USA	Systematic reviews, reports and RCTs in English and Spanish for past 5 years. Time frame from January 2006 to October 2016.	Studies revealed that that MT can protect cognition of AD especially autobiographical and episodic memories, psychomotor speed, executive function, and global cognition. Yet, MT is only an adjunct method for treating AD.
Millán-Calenti et al. [14], 2016, Spain	The sample size of the included studies ranged from 37 to 148 AD participants. All studies except one included institutionalized AD patients in care homes.	Music therapy is an effective non-pharmacological intervention for reducing agitation in institutionalized AD patients, particularly when the intervention implies individualized and interactive music. Higher, long-term reduction in behavioral symptoms in the interactive music [including clapping, singing, and dancing] group compared with the passive music [listening to music via a CD player] group and no-music control group
[15], 1993, Germany	Narrative review	Music therapy appears to offer a sensitive assessment tool. Certainly, the anecdotal evidence suggests that quality of life of Alzheimer patients is significantly improved with music therapy accompanied by the overall social benefits of acceptance -and sense of belonging gained by communicating with others.

Authors. Year. Country	Method - Sample	Main results-Conclusions
Rio [16], 2018, USA	Analysis of a Music Therapy group carried out from 2011 to 2018	Meaningful support through a community-based peer group helps meet the needs of the person with dementia and their caregiver from the first symptoms to the later stages of AD, through a carefully designed music therapy program tailored to preferences, culture, and ability. The MT support group was found to relieve some of the strain on caregivers by allowing for greater emotional support through relationships with peers and professionals, and through the increase of meaningful interactions with their loved one with dementia
Gioagnoli et al. [17], 2017, Italy	39 patients with mild to moderate AD divided in 3 groups a) cognitive therapy b) music therapy and c) neuro education given 2x25 min group sessions / week for 12 weeks	Active music therapy showed improvement in mood scores similar to cognitive therapy and neuro-education
Gómez Gallego et al. [18],2017, Spain	Forty-two patients with mild to moderate AD underwent music therapy for 6 weeks	Music therapy improved some cognitive, psychological, and behavioral alterations in patients with AD.
Thomas et al. [19], 2017, USA	98 nursing homes (NHs) trained in the Music & Memory program during 2013 Participants Long-stay residents with Alzheimer's disease and related dementias (ADRD) during 2012–2013. (M&M is a facility-level quality improvement program that provides residents with music specific to their personal histories)	The results offer the first evidence that the M&M individualized music program is associated with reductions in antipsychotic medication use, anxiolytic medication use, and BPSD symptoms among long-stay NH residents with ADRD [Alzheimer's disease and related dementia]
Kim et al. [20], 2016, Korea	Cognitive stimulation via art, music, recollection and horticultural therapy. MT involved playing melodies and/or accompanying chords for popular songs. 32 AD patients and 21 controls, 1 h × five times/week MT for 6 months	Significant improvement was observed in memory, orientation, depression and anxiety in all AD patients. Reduced anxiety, delirium, hallucinations, agitation, irritability, and language disorders in moderate AD patients. Training group showed improvement in the word-list recognition and recall test scores versus the control. No change in the overall CDR score, but the domain of community affairs improved in the cognitive intervention group. QOL-AD of caregivers was slightly improved in the intervention group.
Fukui et al. [21], 2012, Japan	They report that music therapy is effective in the treatment of AD. The study monitored testosterone and 17β-estradiol levels over time in patients with AD stimulated with music, to determine whether music therapy has the potential as an alternative treatment for hormone replacement therapy, focusing on the fact that the hormones bearing a causative relation to the onset of AD are also closely related to music.	During the sessions, patients with Alzheimer's disease were allowed to listen to music and songs with verbal contact from the therapist. It was found that problematic behaviors such as poriomania had decreased. It was found that the secretion of 17 -estradiol and testosterone, hormones that are supposed to have preventive effects on Alzheimer's disease, is significantly increased by music therapy.
Satoh et al. [22], 2015, Japan	Use of karaoke and the YUBA Method, passive listen and singing for 10 AD & 10 controls, 1/ week (>60 min) x 6 months	Time for Japanese Raven's Colored Progressive Matrices reduced. Also, NPI score decreased while sleep time prolonged.
Li et al. [23], 2015, Taiwan	A Mozart Sonata and Pachelbel's Canon for 20 mild AD patients and 21 in control group, for 30' daily x 6 months	MMSE in the MT group were less decreased than control group [not statistically significance]. Change of abstraction domain in the MT group was improved.
Palisson et al. [24], 2015, France	3 texts were used: a) Ode to Joy by Beethoven [melody sung], b) spoken/recorded by Modern Times by Charlie Chaplin, c) spoken alone; each text was visually presented for 12 mild AD and 15 controls	Sung texts were better remembered than spoken ones for both groups, that was both immediately and after a retention delay.

Authors. Year. Country	Method - Sample	Main results-Conclusions
Narme et al. [25], 2014, France	Different styles of music (e.g., classical instrumental, familiar songs) were used; Participants sang or used percussion instruments. All patients had moderate/severe AD, 18 in MT group, 19 in cooking group 1 h × twice a week × 1 month	Both music and cooking improved the patients' emotional state and decreased the severity of their behavioral disorders, as well as reduced caregiver distress. No benefit was shown on cognitive status.
Särkämö et al. [26], 2014, Finland	Singing or listening to familiar songs with vocal exercises; rhythmic movements (singing group) and reminiscence and discussions (listening group) for patients with mild/moderate dementia: 27 in singing group, 29 in listening group, 28 in control, 1.5 h/session, daily × 10 weeks	Singing and listening improved mood, orientation, and remote episodic memory and to a lesser extent attention, executive function and general cognition. Singing enhanced short-term and working memory. Caregivers were also affected positively, whereas music listening had a positive effect on QOL.
De la Rubia et al. [27], 2014, Spain	25 patients older than 65 institutionalized in the Association of Alzheimer of Valencia. Valoration scales used before and after the use of music therapy.	The benefits of a short music therapy protocol applied to patients with mild Alzheimer's type dementia are highly satisfactory, as it reduces stress-related depression and anxiety in most patients and increases their level of happiness (mood directly related to the feeling of well-being). This fact can be demonstrated in an effective, non-invasive and non-damaging way for this type of patients, with standardized questionnaires.
Dassa et al. [28], 2014, Israel	Six AD patients singing familiar songs,	Despite the small sample, the study showed elicitation of past memories and spontaneous verbal responses.
Arroyo-Anlló et al. [29], 2013, Spain	Twenty AD with familiar music, twenty AD with unfamiliar music; all were mild or moderate AD 2-4 min/ session × 3 sessions/ week × 3 months	Familiar songs increased self-consciousness in AD patients who received a music intervention. They also showed stabilization or improvement in aspect of SC. The AD group with unfamiliar music showed poorer scores in MMSE and FAS test, whereas the familiar music group did not vary in their cognitive performance.
Simmons-Stern et al. [30], 2012, USA	Twelve patients with a clinical diagnosis of probable AD and 17 healthy older adults participated in this experiment. ("second part" of the previous article)	Although our study found that under the present experimental conditions musical mnemonics were unable to enhance specific content information, these musical mnemonics were able to improve memory for more general content information in both healthy older adults and patients with AD. All subjects had better memory for general content of lyrics when sung versus spoken
Meilán García et al. [31], 2012, Spain	Four kinds of music, (happy, sad, cafeteria sound, unemotional, and absence of sound) for 25 AD patients (with 5 sessions for 30 min/session, and each session spaced by at least 1 week)	Sad music was found to be the most effective to autobiographic memory.
Simmons-Stern et al. [32], 2010, USA	Thirteen patients with a clinical diagnosis of probable AD and fourteen healthy older adults were recruited for this study.	Patients with AD performed better on a task of recognition memory for the lyrics of songs when those lyrics were accompanied at encoding by a sung recording than when they were accompanied by a spoken recording
Guetin et al. [33], 2009, France	Thirty mild/moderate AD patients, divided in 2 groups, MT or not, one 20' session per week × 16 weeks	There was a significant decrease in anxiety at 4 weeks and significant decrease in depression at 3 weeks
Ozdemir et al. [34], 2009, Turkey	Multisensory stimulation (including MT, painting pictures, and orientation interventions) for twenty seven mild AD patients for 4 sessions/week × 3 weeks	MMSE scores of increased, and the scores of Geriatric Depression Scale and Beck Anxiety Scale decreased. This effect continued for 3 weeks after completion.

Authors. Year. Country	Method - Sample	Main results-Conclusions
Bruer et al. [35], 2007, Canada	Listening & singing and playing musical instrument; Seventeen AD patients with cross-over design (1 h/week × 8 weeks)	MMSE scores improved immediately after and the next day of MT compared with control group.
Irish et al. [36], 2006, Ireland	Vivaldi's 'Spring' from 'The Four Seasons' played on a cassette recorder as a background during the test for ten mild AD and ten healthy elderly.	Autobiographical memory of AD in music condition improved; A significant reduction was on the State Trait Anxiety Inventory in the music condition.

References

- Sarasa M, Pesini P. Natural non-transgenic animal models for research in Curr Alzheimer's disease. *Alzheimer Res.* 2009; 6:171-178.
- Hickman R, Faustini A, Wisniewski T. Alzheimer disease and its growing epidemic: risk factors, biomarkers, and the urgent need for therapeutics. *Neurol Clin.* 2016; 34: 941-953.
- Herholz SC, Herholz RS, Herholz K. Non-pharmacological interventions and neuroplasticity in early stage Alzheimer's disease. *Expert Rev Neurother.* 2013; 13: 1235-1245.
- Samson S, Clément S, Narme P, et al. Efficacy of musical interventions in dementia: methodological requirements of nonpharmacological trials. *Ann N Y Acad Sci.* 2015; 1337: 249-255.
- D'Addario M. *The Quantum Side of Your Life* 2018: Babelcube Inc. New York.
- Grace D, Parambi T, Prabhakar V, et al. The rhythms of life: music therapy for the body, mind and soul. *Int J Pharmaceut Sci Res.* 2011; 2: 237-246.
- Sakamoto M, Ando H, Tsutou A. Comparing the effects of different individualized music interventions for elderly individuals with severe dementia. *Int Psychoger.* 2013; 25: 775-784.
- Scottish Intercollegiate Guidelines Network (SIGN): SIGN 50: A Guideline Developer's Handbook. Edinburgh, Scottish Intercollegiate Guidelines Network, revised edition, 2011.
- Leggieri M, Thaut M, Fornazzari L, et al. Music Intervention Approaches for Alzheimer's Disease: A Review of the Literature. *Front Neurosci.* 2019; 13: 132.
- Moreira V S, Ricardo dos Reis Justi F, Moreira M. Can musical intervention improve memory in Alzheimer's patients? *Dement Neuropsychol.* 2018; 12: 133-142.
- Van der Steen J, Smaling H, van der Wouden J, et al. Music-based therapeutic interventions for people with dementia. *Cochrane Database Systematic Reviews.* 2018; 7: CD003477.
- García-Casares N, Moreno-Leiva RM, García-Arnés JA. Efecto de la musicoterapia como terapia no farmacológica en la enfermedad de Alzheimer. *Revisión sistemática. Rev Neurol.* 2017; 65: 529-538.
- Fang R, Ye S, Huangfu J, et al. Music therapy is a potential intervention for cognition of Alzheimer's Disease: a mini-review. *Transl Neurodegener.* 2017; 6: 2-9.
- Millán-Calenti JC, Lorenzo-López L, Alonso-Búa B, et al. Optimal nonpharmacological management of agitation in Alzheimer's disease: challenges and solutions. *Clin Interv Aging.* 2016; 11: 175-184.
- Aldridge D. Music and Alzheimer's disease--assessment and therapy: discussion paper. *J R Soc Med.* 1993; 86: 93-95.
- Rio R. A Community-Based Music Therapy Support Group for People With Alzheimer's Disease and Their Caregivers: A Sustainable Partnership Model. *Front Med.* 2018; 5: 293-299.
- Giovagnoli A, Manfredi V, Parente A, et al. Cognitive training in Alzheimer's disease: a controlled randomized study. *Neurol Sci.* 2017; 38: 1485-1493.
- Gómez Gallego M, Gómez García J. Musicoterapia en la enfermedad de Alzheimer: efectos cognitivos, psicológicos y conductuales. *Neurología.* 2017; 32: 300-308.
- Thomas KS, Baier R, Kosar C, et al. Individualized Music Program is Associated with Improved Outcomes for U.S. Nursing Home Residents with Dementia. *Am J Geriatr Psychiatry.* 2017; 25: 931-938.
- Kim H, Yang Y, Oh J, et al. Effectiveness of a community-based multidomain cognitive intervention program in patients with Alzheimer's disease. *Geriatr Gerontol Int.* 2016; 16: 191-199.
- Fukui H, Arai A, Toyoshima K. Efficacy of music therapy in treatment for the patients with Alzheimer's disease. *Int J Alzheimers Dis.* 2012: 531646.
- Satoh M, Yuba T, Tabei K, et al. Music therapy using singing training improves psychomotor speed in patients with Alzheimer's disease: a neuropsychological and fMRI study. *Dement Geriatr Cogn Dis Extra.* 2015; 5: 296-308.
- Li C, Liu C, Yang Y, et al. Adjunct effect of music therapy on cognition in Alzheimer's disease in Taiwan: a pilot study. *Neuropsychiatr. Dis Treat.* 2015; 4: 291-296.
- Palisson J, Roussel-Baclet C, Maillat D, et al. Music enhances verbal episodic memory in Alzheimer's disease. *J Clin Exp Neuropsychol.* 2015; 37: 503-517.
- Narme P, Clément S, Ehrle N, et al. Efficacy of musical interventions in dementia: evidence from a randomized controlled trial. *J Alzheimer's Dis.* 2014; 38: 359-369.
- Särkämö T, Tervaniemi M, Laitinen S, et al. Music listening enhances cognitive recovery and mood after middle cerebral artery stroke. *Brain.* 2008; 131: 866-876.
- De la Rubia Ortí J, Sancho Espinós P, Cabañés Iranzo C. Physiological impact of music therapy on depression, anxiety and well-being of patients with dementia of Alzheimer's type. Assessment of the use of questionnaires to quantify it. *Eur J Investig Health Psychol Educa;* 2014; 4:131-140.
- Dassa A, Amir D. The role of singing familiar songs in encouraging conversation among people with middle to late stage Alzheimer's disease. *J Music Ther.* 2014; 51: 131-153.
- Arroyo-Anlló E, Díaz J, Gil R. Familiar music as an enhancer of self-consciousness in patients with Alzheimer's disease. *Biomed Res Int.* 2013; 2013: 752965.
- Simmons-Stern N, Deason R, Brandler B, et al. Music-based memory enhancement in Alzheimer's disease: Promise and limitations. *Neuropsychologia.* 2012; 50: 3295-3303.
- Meilán García J, Iodice R, Carro J, et al. Improvement of autobiographical memory recovery by means of sad music in Alzheimer's Disease type dementia. *Aging Clin Exp Res.* 2012; 24: 227-332.
- Simmons-Stern N, Budson A, Ally B. Music as a memory enhancer in patients with Alzheimer's disease. *Neuropsychologia.* 2010; 48: 3164-3167.
- Guétin S, Charras K, Berard A, et al. An overview of the use of music therapy in the context of Alzheimer's disease: a report of

- a French expert group. *Dementia (London)*. 2013; 12: 619-634.
34. Ozdemir L, Akdemir N. Effects of multisensory stimulation on cognition, depression and anxiety levels of mildly-affected Alzheimer's patients. *J Neurol Sci*. 2009; 283: 211-213.
35. Bruer R, Spitznagel E, Cloninger C. The temporal limits of cognitive change from music therapy in elderly persons with dementia or dementia-like cognitive impairment: a randomized controlled trial. *J Music Ther*. 2007; 44: 308-328.
36. Irish M, Cunningham CJ, Walsh J, et al. Investigating the enhancing effect of music on autobiographical memory in mild Alzheimer's disease. *Dement Geriatr Cogn Disord*. 2006; 22: 108-120.