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Effectiveness of Music Based Cognitive Exercises in Individuals with Dementia: A Randomized Clinical Trial

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Abstract

Purpose of the study: To determine the effectiveness of music-based cognitive exercises on cognition in individuals with dementia.

Methods: Twenty-four subjects (9 males and 15 female) above 60 years were screened for Dementia by Mini-Mental State Examination Scale and randomized into two groups. Group A received music-based cognitive exercises whereas Group B received only cognitive exercises. Treatment was given for 20 minutes, 5 days per week for 4 weeks. The outcome measure used in this study was Six- Item Cognitive Impairment Scale (6-CIT).

Result: Both the groups in this study showed normal distribution on the basis of demographic data. There was significant improvement noted on the scores of Six-Item Cognitive Impairment Test both within the group and between the groups. But the music based cognitive exercise group showed more improvement in the Six- Item Cognitive Impairment Scale score than the other group.

Conclusion: Music-based cognitive exercises were effective in improving cognition in individuals with mild to moderate dementia.

Keywords: Dementia; Cognition; Cognitive exercises; Music-based cognitive exercises; 6-item cognitive impairment test

Introduction

Dementia is a neurological disorder characterised by gradual decline in symptoms of multiple cognitive functions, emotional control and social behaviour [1]. As the age progresses age-related neurodegenerative changes occurs, which can causedamage to the brain cells and restricts the ability of the brain cells to communicate with each other, leading to disturbed thinking, behavioural control, problem solving abilities, emotional state of mind and declined intellectual functioning which interferes with normal day to day life [2]. Although most changes in the brain that cause dementia are permanent and worsen over time, at least two of the following core mental functions must be significantly impaired to be considered as dementia, is: Memory, communication and language, ability to focus and pay attention, reasoning and judgment, visual perception [3,4].

In 2010, there were 3.7 million Indians affected by dementia, which is expected to double by 2030. Despite the magnitude, there is gross ignorance and negligence of service available to people with dementia and their families [5]. Cognitive training such as discussion of past and present events and topics of interest, word games, puzzles, counting numbers in ascending and descending order, music and activities such as cooking or baking or indoor gardening could reduce health care costs by helping older individuals maintain healthy and active lifestyle [6]. If cognition becomes impaired, an individual may have difficulty performing everyday tasks.

It was stated that the Cognitive Stimulation (mental exercise) may be helpful in improving cognitive ability, slowing down the decline in memory, thinking and behavioral symptoms [7,8]. Literature recommend that cognitive exercises and music therapy have improved the cognitive levels in dementia, but there were no studies, where the combined effect of music and cognitive exercises were evaluated. Thus, the main aim of the present study was to determine the effect of music-based cognitive exercises in individuals with dementia.

Methods

Participants

Ethical clearance was obtained from the Research Ethics Committee of the Institute. A total of thirty-two participants from old age homes and tertiary care hospitals were screened for dementia by using Mini-Mental State Examination Scale (MMSE), out of which twenty-four participants with mild to moderate dementia were recruited [9]. Both males and females of age group 60 years and above diagnosed with dementia with Mini Mental State Examination Scale Score lower than 24 were included in this study. Hearing and visually impaired subjects were excluded.

Randomization and design

The present study was a Randomized Controlled Trial with convenience sampling technique, conducted in old age homes in Belagavi. Participants who met the inclusion criteria were randomized into 2 groups using the envelope method. The randomized groups were as follows: Group A received cognitive exercises along with rhythmic music in the background and Group B received only cognitive exercises.

Intervention

Participants from the Group A performed cognitive exercises which consist of puzzles, maze games, finding missing numbers and counting numbers in ascending and descending order with the rhythmic music of gamma-frequency (40 Hz) beats in the background and Participants

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from the Group B performed only cognitive exercises [10]. Both the groups received intervention for twenty minutes per session, for five days a week, for four weeks. Intervention was performed in a secluded room where there was no disturbance. Subjects and physiotherapist were seated facing each other with elbows resting on a table.

The Six-Item Cognitive Impairment Test (6-CIT) consists of total six questions, scored to produce a total out of 28. 0-7 is considered normal and 8 or more is considered significant with inverse scoring. The test Re-Test Reliability of this scale is 0.82 to 0.87. This test has high sensitivity (78%) in mild dementia.

Consort flow diagram (Figure 1)

Figure 1

Data analysis

Statistical analysis was performed using SPSS Version 21.0. The demographic data were analysed using mean and standard deviation (Table 1). Paired *t*-test and Two-way analysis of variance were used to assess within the group and between-group differences, respectively.

P value less than 0.05 was considered statistically significant.

Results

Results are shown in Table 1 and Table 2.

Table 1 showed the demographic data of the participants and signifies a homogeneous distribution.

Table 2 demonstrates pre-intervention and post-intervention scores on Six-Item Cognitive Impairment Scale. There was significant

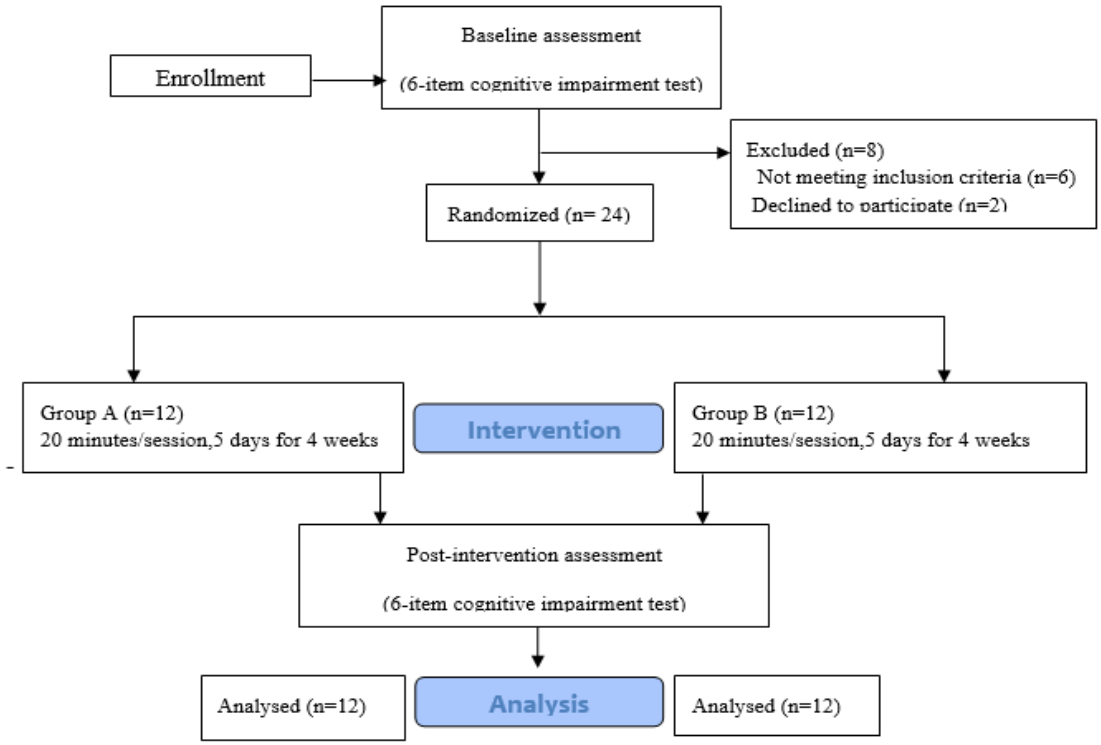

Figure 1: Consort flow diagram.

Participants (n=24)	Mean (SD)
Age	74.7 (8)
Gender	
Male	1.77 (1.2)
Female	1.46 (1.1)
Height	165.5 (4.7)
Weight	60.6 (5.8)
BMI	22.1 (1.7)

Table 1: Demographic characteristics of the participants.

Outcome measure	Group A				Group B				p-value
	Pre	Post	Mean diff	p*	Pre	Post	Mean diff	p*	
Six-Item Cognitive Impairment Scale	13 (2)	10.67 (1.7)	2.33	0.0001*	10.25 (2)	9.41 (1.9)	0.84	0.0001*	*0.000094
	*p<0.05; values are Mean(SD)								

Table 2: Comparison of 6-Item Cognitive Impairment Test scores between the groups, Pre intervention and Post intervention.

improvement in cognitive levels in both the groups but Group A showed better improvement on cognition levels than Group B with the mean difference of 2.33 in Group A and 0.84 in Group B.

Discussion

The results of the present study suggest a beneficial effect of music-based cognitive exercises compared to cognitive exercises alone, four weeks following the intervention.

The probable mechanism of cognitive exercises could be neural plasticity or transfer of learning which brings changes in brain development and enhances cognitive skills such as attention, psychomotor speed, orientation, and executive function by stimulating neural activity patterns in right angular gyrus and left lingual gyrus [11]. The repetition of these patterns through clinical tasks and authorized games can help improve connectivity in the brain, create new synapses, and myelinate neural circuits, able to recover and reorganize main cognitive function [12]. Literature established that the combined cognitive exercises including art, music, exercise, recollection and horticultural therapy can improve and maintain the cognition and physical performance in mild cognitive impairment in elderly individuals [7,13].

In addition, musical based activities recommend that the gamma brain waves induce mindfulness, increased awareness, and increased alertness. The rhythm of the music given was 40 Hz gamma frequency. These waves originate in the thalamus and moves back and front 40 times per second. The low amount of gamma brainwave activity has been linked to learning difficulties, poor memory and impaired mental processing. The musical training yields a unique advantage of transferrable skills which may provide a beneficial effect on the auditory, cognitive system and working memory mechanism.

Music with movement intervention improves cognitive functioning and depressive symptoms in people with dementia as music enhances the recall effects of autobiographical memory and reduces anxiety, stress, and emotional upliftment [14]. Listening to music requires certain perceptual abilities, including pitch discrimination, auditory memory, and selective attention in order to perceive the temporal and harmonic structure of the music as well as its affective components, engaging a distributed network of brain structures [15,16].

Studies have concluded that perhaps music served as a distracting factor for participants performing cognitive tasks and this could be due to undue attention to the lyrics, emotions and memories which music can evoke [17,18].

In present study, both the interventions seem to be beneficial in improving cognition but when compared for the better outcome, the group receiving music-based cognitive exercises showed clinically meaningful improvement in cognition in individuals with mild to moderate dementia.

Limitation

There exist few limitations in this study viz. 1) The result of the present study could not be generalized to the overall population with dementia as calculated sample size was relatively small. 2) Long term follow-up of level of cognition could not be assessed.

Conclusion

Present study concluded that the music-based cognitive exercises improved cognitive levels in individuals with mild to moderate dementia.

Future Scope

Long term follows up with the study group is highly recommended.

Conflict of Interest

The author declares no conflict of interest.

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References

1. Kramer AF, Erickson KI, Colcombe SJ (2006) Exercise, cognition, and the aging brain. J Appl Physiol 101: 1237-1242.
2. Hachinski V, Iadecola C, Petersen RC, Breteler MM, Nyenhuis DL, et al. (2006) National Institute of Neurological Disorders and Stroke–Canadian stroke network vascular cognitive impairment harmonization standards. Stroke 37: 2220-2241.
3. Alzheimer's Association (2011) 2011 Alzheimer's disease facts and figures. Alzheimers Dement 7: 208.
4. Rebok GW, Ball K, Guey LT, Jones RN, Kim HY, et al. (2014) Ten□year effects of the advanced cognitive training for independent and vital elderly cognitive training trial on cognition and everyday functioning in older adults. J Am Geriatr Soc 62: 16-24.
5. Wimo A, Jönsson L, Bond J, Prince M, Winblad B, et al. (2013) The worldwide economic impact of dementia 2010. Alzheimers Dement 9: 1-11.
6. Schlaug G, Norton A, Overy K, Winner E (2005) Effects of music training on the child's brain and cognitive development. Ann N Y Acad Sci 1060: 219-230.
7. Aguirre E, Woods RT, Spector A, Orrell M (2013) Cognitive stimulation for dementia: a systematic review of the evidence of effectiveness from randomized controlled trials. Ageing Res Rev 12: 253-262.
8. Simmons-Stern NR, Budson AE, Ally BA (2010) Music as a memory enhancer in patients with Alzheimer's disease. Neuropsychologia 48: 3164-3167.
9. Bianca Brijnath (2011) Screening for dementia: Fluidity and the Mini Mental State Examination in India. Transcult Psychiatry 48: 604–623.
10. Hommel B, Sellaro R, Fischer R, Borg S, Colzato LS (2016) High-Frequency Binaural Beats Increase Cognitive Flexibility: Evidence from Dual-Task Crosstalk. Front Psychol 7: 1287.
11. Irish M, Cunningham CJ, Walsh JB, Coakley D, Lawlor BA, et al. (2006) Investigating the enhancing effect of music on autobiographical memory in mild Alzheimer's disease. Dement Geriatr Cogn Disord 22: 108–120.
12. Satoh M, Yuba T, Tabei K, Okubo Y, Kida H, et al. (2015) Music Therapy Using Singing Training Improves Psychomotor Speed in Patients with Alzheimer's Disease: A Neuropsychological and fMRI Study. Dement Geriatr Cogn Dis Extra 5: 296-308.
13. Kim HJ, Yang Y, Oh JG, Oh S, Choi H, et al. (2016) Effectiveness of a community-based multidomain cognitive intervention program in patients with Alzheimer's disease. Geriatr Gerontol Int 16: 191–199.
14. Hars M, Herrmann FR, Gold G, Rizzoli R, Trombetti A (2014) Effect of music-based multitask training on cognition and mood in older adults. Age Ageing 43: 196–200.
15. Cheung DSK, Lai CKY, Wong FKY, Leung MCP (2018) The effects of the music-with-movement intervention on the cognitive functions of people with moderate dementia: a randomized controlled trial. Aging Ment Health 22: 306-315.
16. Johnson JK, Cotman CW, Tasaki CS, Shaw GL (1998) Enhancement of spatial-temporal reasoning after a Mozart listening condition in Alzheimer's disease: a case study. Neurol Res 20: 666-672.
17. https://seniorcarecorner.com/alzheimers-dementia-and-diabetes-connection-tips-for-caregivers
18. Dolegui AS (2013) The Impact of Listening to Music on Cognitive Performance." Inquiries Journal/Student Pulse 5: 1.