
Keeping the beat: Use of rhythmic music during exercise activities for the elderly with dementia

R. Mark Mathews, PhD
Alicia A. Clair, PhD, MT-BC
Karl Kosloski, PhD

Abstract

Involving people with dementia in group exercise activities often presents a challenge. The effects of a recorded instrumental musical accompaniment was evaluated on participation in a series of 14 exercise activities with a group of nursing home residents with dementia. All exercise sessions, specifically designed by physical therapists for older adults, were lead by an activity aide and consisted of a series of seated exercises. Direct observations of resident behavior were conducted over a 25-week period in a reversal experimental design. Results showed increased levels of participation during the experimental condition observations where rhythmic music accompanied the exercise activities. The music intervention was most successful on those generally most willing to participate in social activities.

Key words: dementia, exercise therapy, music therapy, physical therapy, recreation, therapeutic activities

Introduction

Inactivity and a lack of physical exercise can seriously compromise the health and well-being of older adults, including those with dementia.^{1,2} Overall functional performance improves with exercise in older persons, and physical exercise interventions may minimize functional decline.³ Engagement in physical exercise activities can be a problem, and desirable outcomes are dependent on adherence.

R. Mark Mathews, PhD, Professor of Human Development, University of Kansas, Lawrence, Kansas.

Alicia A. Clair, PhD, MT-BC, Board Certified Music Therapist, Professor of Music Education and Music Therapy, University of Kansas, Lawrence, Kansas.

Karl Kosloski, PhD, Professor of Gerontology, University of Nebraska, Omaha, Nebraska.

Involvement in physical exercise for persons with middle to late stage dementia is especially challenging. They may leave the room during an exercise program, or may simply discontinue their participation. The context for the exercise must motivate and encourage participation, and music is often used as a facilitator. However, music in exercise should have perceivable rhythm at the appropriate speed or tempo of the movement to ensure adequate repetitions and proper range of motion.

The literature on entrainment of physical movements with rhythmic auditory stimulation suggests that rhythm has significant influences on motor control and function, and auditory rhythm, with its recurring patterns, provides predictable cues.⁴⁻⁹ Therefore, the application of rhythm in exercise can function to increase participation adherence and endurance, and may decrease distractions due to discomfort and exertion associated with the exercise regimen. This rhythm, imbedded in the musical context, may enhance exercise engagement in persons with dementia in special-care units. This study evaluated the effects of rhythmic music on the engagement of persons with dementia in an exercise regimen designed to maintain strength and flexibility.

Method

Setting

The study was conducted at a 20-bed special-care unit (SCU) designed for persons with dementia residing in a county-owned residential care facility. During the day, one licensed nurse, three certified nursing aides (CNAs), one activity aide, and one housekeeper staffed the SCU. The facility was located in a rural community of 5,500 in northeastern Michigan. The SCU consisted of one locked wing within the 93-bed nursing home. In addition to 10 patient rooms (ranging in size from single to triple occupancy), the SCU included several common areas.

At one end of a hallway that ran the length of the SCU was a 700-square-foot day room used as a dining area (with a piano, compact disk player, six tables each seating four residents, and storage cabinets). All observations were conducted in the day room at a time when the room was not being used for any other activities.

Participants

Twenty-one SCU residents participated in at least one observation session over the course of the 25 weeks of data collection. Three residents participated in fewer than 10 percent of the observation sessions; those residents were not included in the subsequent data analysis. Seventeen residents (94 percent) were females and all 18 were Caucasians. They ranged from 74 to 97 years of age (mean = 85). All participating residents had been diagnosed with dementia. Residents scored between 0 and 23 (mean = 11) of 30 possible points on the Mini-Mental State Exam (MMSE). Ferris and Kluger¹² suggest that an MMSE score of 23 or lower provides indication of sufficient cognitive decline for a diagnosis of dementia.

Exercise activity

Group exercise activities were conducted weekday mornings. All residents of the SCU were invited to participate. The exercise session was led by an activity aide and consisted of a series of seated exercises. The physical exercise program was designed by physical therapists specifically for older adults. The array of exercises moved every major joint in the body to promote physical strength and flexibility, and was tested carefully in a population of frail, older adults to determine the appropriate pace and number of repetitions for the older adult age group. The series of 14 exercises had a participation duration of 14.4 minutes, while the entire exercise program required 22 minutes from beginning to end, allowing for musical introductions and brief transitional breaks between the musical tracks. The sequence of exercises included: (1) shoulder roll; (2) hand flex and hand pronate/supinate; (3) knees together/apart; (4) arms across chest; (5) knee extensions; (6) bicep curls; (7) toe taps and heel lifts; (8) bucket lifts; (9) rowing; (10) marching; (11) arm adduction/abduction and internal/external rotation; (12) head rotation and ear to shoulder; (13) ankle circles; and (14) arm extensions.

Observation procedure

The activity director of the facility conducted direct observations of participant performance in the exercise activities. She conducted observation sessions approximately once each week between June 23 and December

13, 2000. At the beginning of an observation session, the observer would write the name of each resident in attendance on a data collection checklist. A plus (+) indicated that a resident was participating in the exercise activity (e.g., rolling his or her head from one side to the other) and a minus (-) indicated that a resident was not engaged in the exercise activity (e.g., sitting passively without moving the identified part of his or her body). The observer used a 30-second partial interval recording system to score individual resident engagement. At the beginning of each 30-second interval, the observer would: (a) identify the name of the first resident listed on the checklist; (b) look up from the checklist at that person; (c) observe that person for 30 seconds to determine whether he or she was participating in the exercise activity or not engaged; (d) mark the observation interval for that person with a plus or minus; (e) identify the name of the next resident listed on the checklist; and (f) continue the observation procedure until each person listed had been observed. Two rounds of observations were conducted during each session. Percentage of participation in exercises was computed by dividing the number of intervals that residents were scored as participating, by the total number of intervals that residents were observed during that session.

Participation in other activities

Before this study began, the SCU program director independently rated each resident on his or her participation in all forms of social activities (e.g., games, music, parties, group crafts, etc.). Ratings were based on a five-point scale (1 = never; 2 = less than once a week; 3 = once a week; 4 = two to six times per week; 5 = daily or more often).

Materials

Data sheets, clipboards, a stopwatch, and pens were used to collect data. To provide interest and motivation, decrease distraction, and promote physical movements, these exercises were set to original, improvised, instrumental music. This music was digitally recorded as it was played on an electronic keyboard. The digital recording was used to make an audio file that was burned onto a CD to ensure the highest sound quality possible.¹⁰

Each exercise had its own particular music that reflected the movements required and conformed to the appropriate duration of the exercise. The music changed in style from one exercise to the next, which indicated the start and end points and the particular movements of the exercise. The typical styles included country and western, polka, folk, jazz, and blues. In addition, all the musical pieces had a strong, audible pulse (or beat)

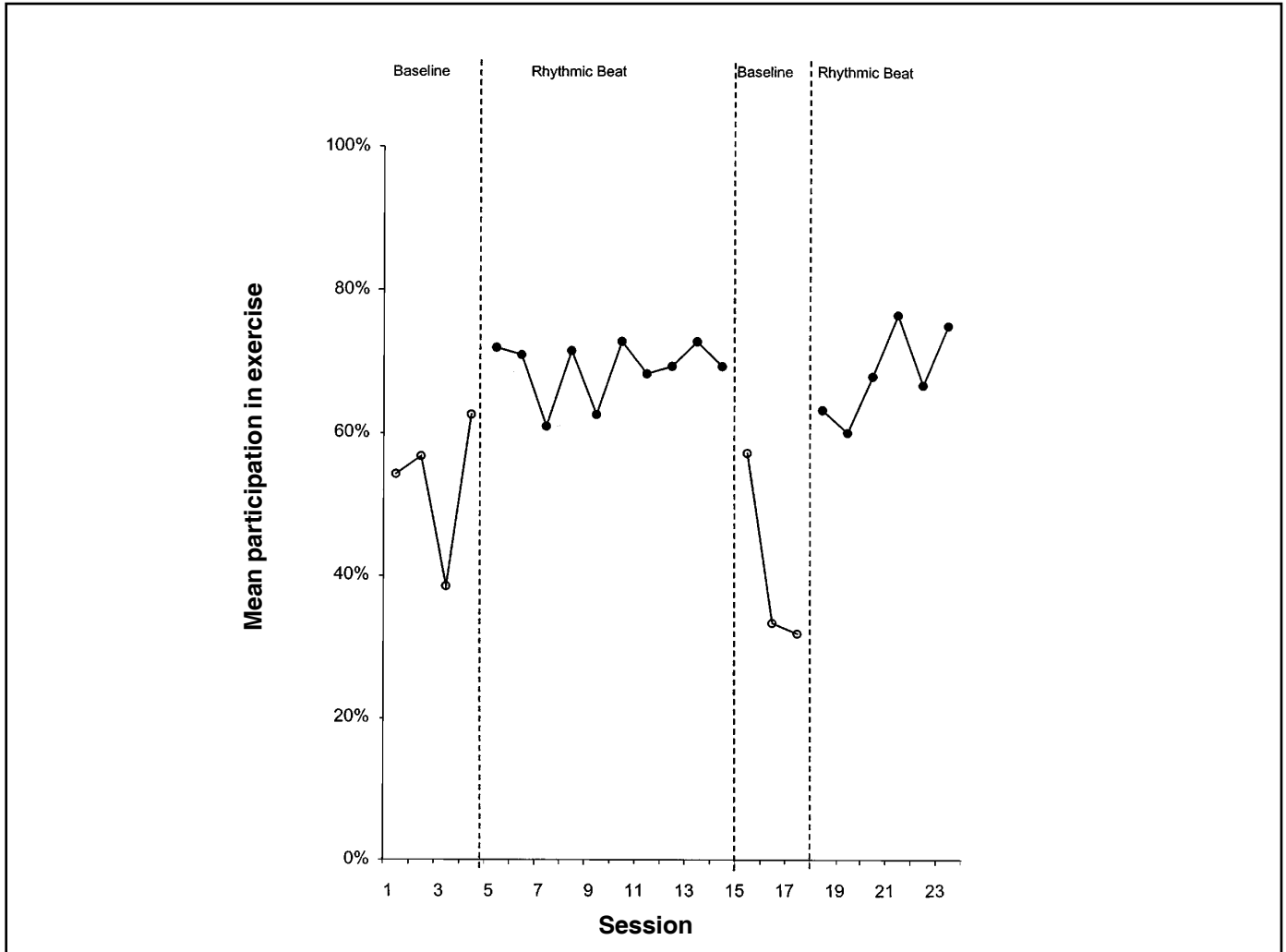


Figure 1. Observation of resident engagement in exercise activities.

Notes: Open circles indicate a baseline observation in which the music CD was not used. Filled circles indicate an experimental condition observation in which the rhythmic beat CD was used in conjunction with the exercise activity.

matched to the tempo (or speed) of the particular musical piece. This pulse was superimposed in the recording to provide clear, auditory cues for speed and range of the physical movements.

Experimental design

Effects of the rhythmic music CD on exercise participation in a group of nursing home residents with dementia was evaluated by using a reversal design. During the first four exercise sessions (baseline), an activity aide led the group in a series of 14 exercises with no musical accompaniment. During the next 10 exercise sessions (rhythmic beat), the same activity aide led the group in an identical series of exercises accompanied by the rhythmic beat CD. In the reversal-to-baseline condition, the activity aide conducted three exercise sessions with

no musical accompaniment. During the final six exercise sessions, the activities aide reinstated the rhythmic beat CD.

Results

Figure 1 shows the mean percentage of resident participation in exercise per session. Residents were observed to be engaged in the exercise activities during 53 percent of the initial baseline condition observations. Mean group participation increased to 69 percent during the initial (rhythmic beat) intervention when the music CD was played during the exercise activity. In the return to baseline condition, exercise activities were conducted without the use of the music CD and group participation decreased to 41 percent. When the rhythmic beat intervention was reintroduced participation increased to 68 percent.

A mean of 12.1 residents (ranging from nine to 16) attended the exercise activities. Attendance remained relatively constant across experimental conditions (initial baseline, mean = 12.5; initial intervention, mean = 12.2; return to baseline, mean = 12.8; return to intervention, mean = 11.8). Individual residents attended a mean of 15 exercise sessions (ranging from seven to 23 sessions). All 18 residents included in this analysis attended more than one session in each experimental condition.

Although Figure 1 suggests a substantial overall effect for the music intervention, detailed observations of individual participants suggest that this effect varies according to individual subjects' willingness to participate in social activities. To test this hypothesis, participants were classified into two groups according to their pre-study rating of participation in social activities. Those who never participated, participated less than once a week, or once a week were compared to those who participated two to six times per week or daily. A two-factor repeated measures ANOVA was conducted. The within-subject factor compared average scores for baseline-versus-treatment participation levels, and the between-subjects factor compared general activity levels. As expected, the treatment by group interaction was significant ($F [1, 16] = 6.6; p = .02$). These findings indicate that the music intervention is most successful on those generally most willing to participate in social activities.

Discussion

These results show that rhythmic music increases overall engagement by older adults with dementia in a group exercise activity. However, the effects of the intervention were most pronounced with those residents judged most willing to participate in social activities.

This simple intervention did not require specialized training or expertise to implement. While the music CD and exercise regimen used in the study were specifically designed by a team of music therapists and physical therapists for older adults with dementia, all of the exercise

activity sessions were conducted by an activity aide employed by the nursing facility. Thus, the procedures could be easily replicated in other nursing facilities by staff members.

Acknowledgment

The Grandvue Medical Care Facility in cooperation with the Dementia Program of the Michigan Department of Community Health funded this research.

References

1. Corcoran PJ: Use it or lose it—The hazards of bed rest and inactivity. *Western J Med.* 1991; 154: 536-538.
2. Harper CM, Lyles YM: Physiology and complications of bed rest. *J American Geriatric Society.* 1988; 36: 1047-1054.
3. Harada N, Chiu V, Fowler E, *et al.*: Physical therapy to improve functioning of older people in residential care facilities. *Physical Therapy.* 1995; 75a: 830-838.
4. McIntosh GC, Brown SH, Rice RR, Thaut MH: Rhythmic auditory motor facilitation of gait patterns in patients with Parkinson's disease. *J Neurology, Neurosurgery, & Psychiatry.* 1997; 62: 22-26.
5. Thaut MH, Kenyon GP, Schaur ML, McIntosh GC: Rhythmicity and brain function: Implications for therapy of movement disorders. *IEEE Engineering in Medicine & Biology.* 1999; 18: 101-108.
6. Thaut MH, McIntosh GC, Rice RR: Rhythmic facilitation of gait training in hemiparetic stroke rehabilitation. *J Neurological Sciences.* 1997; 151: 207-215.
7. Thaut MH, McIntosh GC, Rice RR, Miller RA: Rhythmic auditory-motor training in gait rehabilitation of stroke patients. *J Stroke & Cerebrovascular Disease.* 1995; 5: 100-101.
8. Thaut MH, McIntosh GC, Rice RR, *et al.*: Rhythmic auditory stimulation in gait training with Parkinson's disease patients. *Movement Disorders.* 1996; 11: 193-200.
9. Thaut M, Schleiffers S, Davis W: Analysis of EMG activity in biceps and triceps muscle in a upper extremity gross motor task under the influence of auditory rhythm. *J Music Therapy.* 1991; 28: 64-88.
10. Johnson G, Otto D, Clair AA: *Music Enhanced Exercises for Strength and Flexibility.* Topeka, KS: Veterans Administration Hospital, 2000.
11. Kazdin AE: *Research Design in Clinical Psychology.* (3rd Ed.) Needham Heights, MA: Allyn & Bacon, 1998.
12. Ferris SH, Kluger A: Assessing cognition in Alzheimer disease research. *Alzheimer Disease & Associated Disorders.* 1997; 11(Suppl 6): 45-49.