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Learning to Improve Mobility and Quality of Life in a Well Elderly Population: The Benefits of Awareness Through Movement

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Abstract

Objectives: This study tested the hypothesis that an alternative movement learning method, Awareness Through Movement, would produce improvements in coordination, mobility, economy of movement and quality of life in older adults.

Methods: A group of 31 older adults was studied using a prospective, repeated measures control group design. The SF-36 was used to assess health status - quality of life. Video motion analysis was used to collect data on walking and on a floor to stand transfer movement.

Results: Coordination of the transfer movement improved significantly in the experimental group. Vitality and mental health scores also improved significantly in this group. Interesting differences between young-old and old-old changes were observed.

Conclusions: Awareness Through Movement may be an additional effective method for pursuing the objectives of Healthy People 2010.

Introduction

As people age there is increased risk of a variety of problems such as falling, injury, loss of mobility, social isolation and depression. The Healthy People 2010 report has placed a new emphasis on quality of life and overall well being as opposed to longevity.[1,2] A variety of programs involving physical activity are being developed to address these risks and problems with the goal of improving quality of life.[3] In 1949, Moshe Feldenkrais suggested that some of these problems may be the result of learning less than optimal habits and postural responses and could be corrected by a process of exploratory relearning of basic movement skills.[4] He developed a method of teaching called Awareness Through Movement for this purpose.[5] This teaching process can be used with large groups of people and even made available thru broadcast media.[6] Several studies in recent years have documented that use of Awareness Through Movement can produce improvements in mobility[7] and balance [8] in well elderly populations. The objective of this study was to assess the hypothesis that an Awareness Through Movement training program would produce improvements in coordination, mobility, economy of movement and quality of life.

Methods

We studied the question of whether an Awareness Through Movement training program would improve the coordination and economy of movement and health status/quality of life in a well elderly population, using a prospective, pretest – posttest control group design. Active, healthy adult volunteers between the ages of 60 and 90 who were residents of a retirement community were recruited to participate in the study. A letter was placed in residents' mailboxes and a column was written in a community

newspaper inviting residents to an open community dialog during which there was a presentation and discussion of the project.

Individuals were screened for inclusion criteria including age, ability to walk independently without an assistive device for 10 minutes, ability to walk on a treadmill at 2-3 miles per hour, and ability to get up from the floor without assistance. Individuals were excluded from participation if they presented with musculoskeletal or neurological problems preventing independent mobility, had uncontrolled hypertension, a history of falling related to cardiac problems, orthopedic surgery within the past year or previous training in the Feldenkrais method of Awareness Through Movement. All participants meeting the selection criteria were ordered by age and gender and then alternately assigned to experimental (EXP) or control (CON) groups. These 2 groups were further stratified by dividing each equally into a younger and an older age group. All individuals received medical clearance to participate in the study from a physician. Prior to screening, all individuals signed a consent form. The study was approved by the Widener University Committee for the Protection of Human Subjects and by the Research Review Committee at the Kendall-Crosslands Retirement Community in Kennett Square, PA.

The study was conducted over a period of 8 days. On day 1, baseline data was collected from individuals in both groups. On days 4 and 5, all members of the EXP group participated in a total of 10 hours of Awareness Through Movement lessons while the CON group went about their normal daily activities and meetings. On day 8, post intervention data was collected from both groups.

The Awareness Through Movement Intervention

The ATM classes were conducted in a large carpeted room with lighting and temperature to comfort so that all individuals in the group could participate simultaneously. Individuals were seated in straight back chairs, standing, or lying on the floor on mats depending on the content of the lesson. Lessons lasted about 45 minutes and were presented by 6 different instructors over the 2-day period. A lesson consists of a period of movement exploration during which an instructor guides participants through a process of movement exploration by suggesting a variety of possible movement alternatives and directing attention to a range of possible sensory and perceptual experiences. The lesson may be structured around a simple movement (e.g. rolling to the side) which is not identified as a goal of the lesson. The movement serves as a structure for the participant to explore and appreciate a range of sensory experience and to work with a variety of strategies for organizing the suggested actions. Ten lessons in all were presented: 1) leg movements sitting in a chair, 2) body image and pelvic movements sitting in a chair, 3) lengthening of the body in supine, 4) flexion movements in supine, 5) rotational movements in sidelying, 6) rotational movements transferring from a chair to standing, 7) sliding the leg to the side in supine, 8) rolling from supine to sit, 9) rolling from supine to prone, and 10) standing and walking. There was no lesson in this sequence that dealt with the problem of coming to standing from supine, a dependent variable in the study. These lessons were based on a set of lessons titled "Innovations in Therapeutic Movement for Older Adults".[9]

Outcome Variables and Data Collection Procedures

Outcome data were collected in 4 areas: 1) responses on the SF-36 health status measure, 2) coordination in performance of a supine to stand movement, 3) energy consumption in treadmill walking, and 4) subjective feedback.

1) The SF-36 (ver.2) was administered by interview to all participants in both pre and post intervention data collection sessions and scored using the criteria provided by the Medical Outcomes Trust.[10,11]
2) Assessment of coordination of the supine to stand movement was done using video data. Participants were asked to perform 4 repetitions of the movement from a supine position to standing at their normal pace. The last 3 movements were recorded on video and the path of movement of the head was analyzed with the PEAK Motion Analysis system (Peak Performance, Englewood, CO).[12,13] Time to complete the movement and the number of acceleration units which the movement was composed of were selected as variables describing coordination or skill in the movement.[14]
3) Participants were videotaped during the last minute of a 4-minute treadmill walk at their preferred speed that was determined during screening. A 10-second video clip was randomly selected from the last 30 seconds of video for data analysis. Average vertical displacement of the sacrum during walking was determined using the PEAK-5 Motion Analysis system. The vertical displacement data were used to calculate a relative measure of energy expenditure.[15]
4) Subjective feedback about awareness of changes in performance of selected daily activities was collected from the experimental group during the post intervention data collection using a written questionnaire.

Data Analysis

A clearer picture of the outcomes emerged by considering the possible impact of age as a separate variable. The 2x2x2 design used three (intervention groups, age groups and time) factors with a repeated measure on the factor of time pre and post intervention.[16] A general linear ANOVA model was used with 2 between subject variables for parametric data from treadmill and supine to stand performance. To analyze the SF-36 data, which is non-parametric, the data was collapsed across the age variable and analyzed using Friedman's 2-way ANOVA. All statistical analyses were conducted using SPSS v10.1.[17] Internal consistency of the SF-36 scores was high as determined by Cronbach's alpha coefficients.[18] PEAK 5 video data were analyzed for average sacral vertical deviation and movement units using software written in Labview by Michael Coleman.

Results

Forty-four residents expressed interest and agreed to participate in the screening process. Thirty-two subjects met the selection criteria. After group assignment, one subject was moved from experimental to control group due to scheduling problems. Another dropped out of the experimental group for personal reasons. The final experimental group included 14 individuals: mean age 79 years, mean activity level[19] of 2.7 , mean resting heart rate 69 bpm, mean weight 67 kg, mean walking speed 165 ft/minute. The final control group included 17 individuals: mean age 77, mean activity level of 2.6, mean resting heart rate 72 bpm, mean weight 68 kg, mean walking speed 187 ft/minute. Differences between group means for all these characteristics were statistically insignificant except for walking speed. Ninety-seven percent of participants were white.

Participants were between the ages of 68 and 89. There were 12 men and 19 women. All were well educated, in good health and living independently, a robust group.[20]

Table 1 A and B show the outcomes for SF-36 assessment. Two of the 8 SF-36 subscales showed significant change across the 8-day period of the study. There was a 3-4% background of improvement in these subscales in the control group. However in the experimental group the range of change was greater than 8% for the mental health variable and 12% for the vitality variable.

Table 1C shows the outcome for the assessment of economy of walking on a treadmill. This variable assesses the up and down movement of the center of mass which is highly correlated with energy consumption ($r = 0.9$).[15] A decrease in the up and down movement, a smaller average deviation, reflects less work and therefore greater economy of movement. We observed a decrease in sacral deviation of about the same magnitude across time in both experimental and control groups. This suggests that there is a learning effect occurring with people who do not spend a lot of time walking on the treadmill. This was in spite of allowing people to practice a prescribed amount after screening and before the first data collection. A learning effect may account for some of the change seen in the control group in the supine to stand task as well.

Table 1 D and E show the outcomes for assessment of the supine to stand task. Decreasing time of performance is considered an aspect of skill acquisition.[21] A higher level of skill in this task has been documented in a normal adult as compared to an age matched population with multiple sclerosis.[12] A decrease in the number of movement units that make up a complex movement is also considered to indicate an increase in coordination in performance of that task [14] as we have observed previously with a

population with multiple sclerosis.[12] Here we observed significant changes as an interaction of group x age x time in both variables. In both measures there is a decrease in the younger group and an increase in the older group.

The specific categories of subjective feedback (Table 2) were asked about because they are areas in which people might experience change in behavior as a result of participating in Awareness Through Movement lessons.[13] It is interesting to note that there was no report of performance becoming worse or more difficult. Of greatest interest is the fact that 93% of people who participated in Awareness Through Movement reported that the supine to stand transfer was easier. This was in spite of the fact that the change observed was equally divided between those who decreased time and movement units and those who increased time and movement units. The last two categories, breathing and sleeping, lend reliability to the subjective data because both of these were areas in which we expected significant changes based on previous clinical experience and no changes were reported.

Discussion

It has been shown that perceived control is positively related to health status in the old/old.[22] A primary finding of this study is improvement of the SF-36 vitality and mental health subscale scores in the experimental group. We take this to reflect an increased sense of well being resulting from participation in Awareness Through Movement. This has been observed previously in work with people with multiple sclerosis [13] and with a well elderly group.[23] In a previous study with people with multiple sclerosis,[24] we observed significant improvements in balance performance and balance confidence. In a related, unpublished qualitative study, (Personal

communication, Dominique duShuttle, May 2000, Research meeting) themes from a focus group suggested that improved sense of well being is related to two issues: 1) improved physical function and confidence, and 2) an expanded sense of the choices available in problem solving engendered by the Awareness Through Movement process.

The supine to stand performance outcomes of the under 78 or "young/old" experimental group support our hypothesis that use of Awareness Through Movement can improve coordination. This was also supported by the subjective feedback that the floor transfer was easier for almost everyone in the experimental group. However the bifurcation of response seen with the "old/old" (78 and over) group is puzzling. Possibly people realized an option to move more slowly and carefully in an activity that would be complex, unfamiliar and difficult for most 80 year olds. Possibly the learning process was different in the "old/old" group. It has been suggested that there are differences in implicit learning between young and old that could account for differences in performance.[25,26,27] The changes observed may be transient due to the newness of the learning.[28] Possibly there were changes in sensory function, biomechanics or the postural control process requiring a different solution to a similar problem.[13,29,30,31]

The beneficial effects of exercise on various physiological and psychological parameters related to maintaining mobility and independence have been well established.[3,32,33,34] This study suggests that an approach such as Awareness Through Movement, which improves coordination, vitality, balance and well being may be a useful adjunct to enable older people to optimize the benefits of exercise and therefore might be widely used as a preventative as well as a restorative intervention in pursuit of the objectives of Healthy People 2010.

The population that was studied was not only socioeconomically advantaged but also generally robust. The available rehabilitation literature suggests it's effectiveness with other groups;[9,24] however, it remains to be determined if the Awareness Through Movement approach could contribute as much for other populations which might be less advantaged in a variety of ways.

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Table 1 - Changes in Dependent Variables by Group, Age and Time

A - SF36 Vitality

Variables						
Group	Age	Time	Mean	S.E.	% Change	n
Con		Pre	64.1	4.3	+4.3	17
		Post	66.9	5.5		17
Exp		Pre	64.0	2.9	+12.0	14
		Post	71.7	3.7		14

Significant change in Group*Time: p=.04

Significant change in Group*Time: p=.02

B - SF36 Mental Health

Variables						
Group	Age	Time	Mean	S.E.	% Change	n
Con		Pre	82.8	2.9	+3.2	17
		Post	85.5	2.9		17
Exp		Pre	83.3	2.3	+8.3	14
		Post	90.2	1.7		14

Significant change in Group*Time: p=.01

C - Sacral Deviation (inches)

Variables						
Group	Age	Time	Mean	S.E.	% Change	n
Con		Pre	1.35	.10	-7.6	17
		Post	1.25	.08		17
Exp		Pre	1.05	.11	-5.8	14
		Post	.985	.09		14

D - Supine to Stand Time (sec)

Variables						
Group	Age	Time	Mean	S.E.	% Change	n
Con	78 and up	Pre	9.34	1.60	-5.2	8
		Post	8.85	1.39		8
	Under 78	Pre	5.08	1.51	-5.1	9
		Post	4.82	1.31		9
Exp	78 and up	Pre	8.29	1.60	+15.7	8
		Post	9.60	1.39		8
	Under 78	Pre	8.61	1.85	-10.1	6
		Post	7.75	1.60		6

Significant change in Group*Age*Time: p=.05

E - Supine to Stand Time (movement units)						
Variables						
Group	Age	Time	Mean	S.E.	% Change	n
Con	78 and up	Pre	11.87	2.38	-14.7	8
		Post	10.12	1.81		8
	Under 78	Pre	5.55	2.24	+4.0	9
		Post	5.77	1.71		9
Exp	78 and up	Pre	10.25	2.38	+20.6	8
		Post	12.37	1.81		8
	Under 78	Pre	10.66	2.75	-12.5	6
		Post	9.33	2.09		6
Significant change in Group*Age*Time: p=.06						

Table 2 - Subjective Feedback from Experimental Group		
Category with - % yes responses		
1. Feel taller 29%	Same height 71%	Feel shorter 0%
2. Walking easier 43%	Walking same 57%	Walking harder 0%
3. Floor transfer easier 93%	Transfer same 7%	Transfer harder 0%
4. Breathing fuller 7%	Breathing same 93%	Breathing shallower 0%
5. Sleeping better 0%	Sleeping same 100%	Sleeping worse 0%