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Effect of a Combined Walking and Conversation Intervention on Functional Mobility of Nursing Home Residents With Alzheimer Disease

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Summary: Assisted walking and walking combined with conversation were compared to a conversation-only intervention in nursing home residents with Alzheimer disease. Sixty-five subjects randomly assigned to treatment group were tested at baseline and end of treatment. Subjects' mean Mini-Mental State Examination score was 10.83; mean age was 87. Treatment was given for 30 minutes three times a week for 16 weeks. Subjects in the assisted walking group declined 20.9% in functional mobility; the conversation group declined 18.8%. The combined walking and conversation treatment group declined only 2.5%. These differences in outcome were significant and appear to have been affected by differences in treatment fidelity. Subjects in the conversation treatment group completed 90% of intended treatment compared with 75% in the combined group and only 57% in the assisted walking group. Failure to treat was due to subject refusal and physical illness. The conversation component of the combined walking and conversation treatment intervention appears to have improved compliance with the intervention, thereby improving treatment outcome. Results indicate that assisted walking with conversation can contribute to maintenance of functional mobility in institutionalized populations with Alzheimer disease. Staff assigned to this task should be prepared to use effective communication strategies to gain acceptance of the intervention. **Key Words:** Exercise—Walking—Conversation—Alzheimer disease—Functional mobility—Compliance.

Three-quarters of the population with Alzheimer disease (AD) and related dementias are eventually institutionalized (Welch et al., 1992). The median nursing home stay for individuals with a clinical diagnosis of AD has been reported to be 2.75 years (mean 2.95), 10 times longer than the national median for all nursing home stays combined (Welch et al., 1992). Unfortunately, the nursing home environment frequently encourages physical inactivity, which leads to deconditioning (Schnelle et al., 1994) and ultimately to functional decline (Shephard, 1987; Stamford, 1988). Individuals with AD are not only vulnerable to deconditioning (van Dijik et al., 1993) but also less likely to be remobilized and reconditioned (Diamond and Holroyd, 1991; Streim et al., 1994).

Motor loss becomes evident primarily in the later stages of AD. At Reisberg's stage 7C, the individual takes progressively smaller and slower steps, begins to tilt forward, backward or laterally and may develop a twisted gait. At stage 7D, he or she cannot sit up independently; at 7F, he or she cannot hold the head up (Sclan and Reisberg, 1994). This decline and resultant increased need for assistance presents a considerable challenge to those responsible for providing care. There is evidence, however, that sufficiently targeted physical activity may slow the rate of decline (Svanborg, 1993).

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Interest in the effects of exercise on the physical function of frail older adults has increased rapidly in the past few years. Several investigations have shown that older adults have the capacity to improve their physical function given appropriately targeted exercise (Cress et al., 1999; Buchner and de Lateur, 1992; Verbrugge, 1991; Pitetti, 1993). For example, MacRae et al. (1993) found that physically restrained residents improved their work output substantially over 9 weeks and achieved significant improvement in walking endurance and speed, although not in handgrip strength, ankle range of motion, or tapping speed. The intervention included walking, wheelchair propulsion, and arm rowing. In one of the FICSIT studies, Fiatarone et al. (1994) found that high intensity resistance training resulted in increased gait velocity, stair climbing power, spontaneous activity level, and cross-sectional thigh area in nursing home residents (Fiatarone et al., 1994). Stamford (1988) noted that the lower the fitness level, the greater the cardiorespiratory training effect achieved in an institutionalized geriatric population.

Several studies have used exercise interventions to produce improvement in physical function in populations with dementia (McDonald and Butler, 1974; Jirovec, 1991). Frail, deconditioned, cognitively impaired nursing home residents in one study dramatically improved their walking and standing endurance, but not speed, in only 8 weeks of the FIT routine, which consisted of brief walks and repeated chair stands four times a day (Schnelle et al., 1994). A mixed (with and without dementia) group of nursing home residents increased their walk endurance time and distance but not speed, physical activity, or mobility after 12 weeks. No further significant improvement occurred when treatment was extended to 22 weeks (McRae et al., 1996).

Frail older adults with AD have been systematically excluded from the majority of studies on exercise (Schnelle et al., 1994). Difficulties with measurement (Tappen et al., 1997) and treatment compliance and assumptions regarding the inevitability of the decline have all contributed to their exclusion.

The purpose of this study was to examine the effect of a combination of exercise and conversation with walking-only exercise and conversation-only treatments on the functional mobility of frail nursing home residents with AD. We hypothesized that the conversation-only group, which received no exercise, would decline more than either of the groups receiving the walking exercise. This study was done as part of a larger study of the effects of exercise versus conversation on the performance of nursing home residents with AD.

METHODS

Subjects

The sample was drawn from the inpatient units of two long-term care facilities, both of which had a superior rating from the State of Florida's Agency for Health Care Administration. Subjects were included in the study if they had a clinical diagnosis of probable AD, as defined by the National Institute of Neurological and Communicative Disorders and Stroke–Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA) criteria (McKhann et al., 1984) and a Mini-Mental State Examination score < 23 (Folstein et al., 1975). To be eligible for inclusion, subjects had to be able to stand and walk with the assistance of one individual and/or an assistive device and have physician clearance to participate in the walking exercise. Subjects were excluded if they had evidence of vascular dementia, stroke, Parkinson disease, or history of major depression, schizophrenia, or mental retardation.

Consent for participation was obtained from the resident's proxy health care surrogate under the guidelines of the university's Committee for the Protection of Human Subjects and State of Florida law. Subjects themselves assented to participate in the activities of the study.

Measures

Modified 6-Minute Walk

A modified version of the 6-Minute Walk was used as a measure of functional mobility (Tappen et al., 1997). The test was modified to allow the use of an assistive device and/or physical assistance from the examiner. The test was further modified to allow the examiner to provide both physical and verbal cues to continue walking during the testing period. Many institutionalized individuals have very low endurance and are unable to ambulate the full 6 minutes. We therefore allowed subjects to rest as often and as long as needed during the 6-minute test period. The 6-minute time interval included any rest time that was taken by the subject. The test was scored as the distance in feet walked in the 6-minute time interval (Cole et al., 1994), with distance measured with a calibrated surveyor's wheel (Tyron, 1991). Interrater reliability and stability of the Modified 6-Minute Walk were examined in a previous study (Tappen et al., 1997). Intraclass correlation coefficients for intra- (using model 3, 1) and inter-rater (model 2, 1) reliabilities ranged from 0.80 to 0.99 for this measure. Stability over 1 week yielded intraclass correlation coefficients of 0.99 for the morning and 0.97 for the afternoon.

Fidelity of Treatment

Records were kept of the actual amount of treatment received by each subject. Primary reasons for failure to treat were subject refusal and physical illness. Fidelity of treatment is reported as the proportion of actual treatment to intended treatment (Pocock, 1983).

Intervention

Subjects in the assisted walking group received 30 minutes of self-paced assisted walking interspersed with rest as needed to delay fatigue (Miller and Marley, 1987) three times a week for 16 weeks. This is similar to the intervention described by Jirovec (1991) for a cognitively impaired nursing home population. The intervenor ambulated with the patient, using an assistive device and/or moderate physical assistance as required. The patient was encouraged to ambulate as far as possible during the session, but allowed to rest as desired or indicated by subject response. The intervenor did not initiate conversation during the session but did respond to subject communication.

Subjects in the conversation treatment group received 30 minutes of conversation treatment based upon Holland's (1993, Holland et al., 1984) approach to treatment of newly aphasic individuals with the addition of facilitative techniques designed for individuals with AD (Bayles and Kaszniak, 1987). These strategies were used in natural conversation as opposed to classroom-style practice or drill. During treatment sessions, the interviewers engaged the subject in conversation about objects and events within their environment and about topics that were of personal interest to the subject (Holland, 1993). The interviewers were instructed to respond to any attempts to communicate.

The third treatment group received both the walking exercise and the conversation treatment simultaneously within the 30-minute session. Interviewers encouraged the individual to walk for as much of the session as possible and engaged the individual in conversation for as much of the time as the subject tolerated. Both the walking and conversation were conducted under the same treatment guidelines as the separate walking and conversation interventions. All treatments were provided three times a week for 16 weeks.

Procedure

A repeated measures three-group design with random assignment to treatment group was used. Raters were blinded to treatment group assignment. Once consent was obtained, subjects were randomly assigned to one of three treatment conditions: (1) walking, (2) conversation, or (3) combined walking and conversation. Subjects' functional mobility was measured at baseline and after 16 weeks (4 months) of intervention.

Analysis

Descriptive statistics, Student *t* test, ANOVA, and chi-square were used to describe and compare the three treatment groups at baseline and to compare subjects who completed the intervention period with those who did not. Repeated ANOVA and ANCOVA with planned comparisons were used to examine the change over time across the three treatment groups on log-transformed data.

RESULTS

Sample Characteristics

Of the 71 subjects who began the intervention period, post-test follow-up measurements could be made on 65. Three subjects were lost from the walking group, two from the conversation group, and one from the combined treatment group. The loss to follow-up was not significantly different across groups ($p = 0.708$). Subjects lost to follow-up were significantly older and had more comorbidities than did the subjects who completed the study (Table 1).

The majority of the sample were women (84%). The mean age of subjects was 87 with a range of 70 to 105. The mean Mini-Mental State Examination score (Folstein et al., 1975) was 10.83, range 0 to 23 (the distribution of scores in this sample is presented in Table 2).

At baseline, there was a significant difference ($p = 0.03$) in age between subjects in the conversation group and those in the combined group (Table 3). There were no significant differences among the groups at baseline on the Mini-Mental Status scores, length of stay, modified 6-minute walk, or number of comorbidities.

Treatment Effects

Fidelity of treatment varied considerably across the 3 treatment groups. Subjects in the conversation group re-

TABLE 1. *Comparison of the subjects who completed and failed to complete the 16-week intervention*

Characteristic	Subjects completing study ($n = 65$)	Subjects not completing study ($n = 6$)	p value
Age	86.7	93.3	0.0211
MMSE score	11.1	9.8	0.6150
Number of comorbidities	5.3	9.3	0.0079
Modified 6-minute walk	328.6	273.8	0.5697

MMSE, Mini-Mental State Examination.

TABLE 2. *Sample distribution of Mini-Mental State Examination scores*

MMSE score	MMSE category	Frequency	Percent	Cumulative frequency	Cumulative percent
0	Very severe	5	8	5	8
1–10	Severe	26	40	31	48
11–17	Moderate	25	38	56	86
18–23	Mild	9	14	65	100
24+	None/minimal	0	0	65	0

MMSE, Mini-Mental State Examination.

TABLE 4. *Pretest and posttest change in 6-minute walk*

Group	Pretest, mean	Post-test, mean	% Decline
Walking (n = 23)	391.7 (233.3)	310.6 (219.3)	20.7
Conversation (n = 22)	261.1 (175.0)	212.1 (168.8)	18.8
Combined treatment (n = 20)	330.2 (250.0)	321.9 (223.2)	2.5

Numbers in parentheses indicate standard deviation.

ceived an average 90% of intended treatments, while those in the walking group received an average of only 57% of the intended treatments. Subjects in the combined group received an average of 75% of the intended treatments. The difference in fidelity of treatment across the 3 groups was significant F (2,62) = 11.95, p = 0.0001. A post hoc Tukey test with alpha set to the 0.05 level indicated that the conversation group differed from both the walking and combined treatment groups. The difference between the combined treatment and walking groups was not significant.

Comparison of means and standard deviations for the distance walked in 6 minutes indicated that the subjects in the combined treatment group declined a minimal 2.5% over the 16 weeks compared to an 20.9% decline for the walking group and an 18.8% decline for the conversation treatment group (Table 3).

Initial descriptive analysis of the 6-minute walk measure revealed that the magnitude of the variance of the three groups was proportional to the magnitude of the means of the groups (Table 4). This is not uncommon with this type of data. This type of instability of variance adversely affects the statistical power of repeated measures ANOVA. To address this, a variance stabilizing transformation was made [log(6-minute walk score +1)]; the constant was added to account for values near zero.

Our hypothesis that the change in 6-minute walk scores following intervention would differ among the three groups was tested by examining the interaction of time and group in the repeated measures analysis of variance (ANOVA) of the log transformed data. This analysis indicated no significant group or time effect but a significant time* group interaction indicating that at least one of the groups differed from the rest in its change in 6-minute walk score at post-test. In order to understand the nature of this time* group interaction, further analysis was required. Paired t tests were used to examine each group individually for change in 6-minute walk score from pretest to post-test. This analysis revealed a decline in functional mobility that was significant for the walking group (p = 0.0119) and approached statistical significance for the talking group (p = 0.0874). No significant change occurred in the combined group.

Pair-wise comparisons of the time* group interactions revealed that the change over time was similar for the walking and conversation groups. However, the change in functional mobility occurring in the combined treatment group differed significantly from what occurred in both the assisted walking and conversation treatment groups. This analysis is consistent with the findings that, from baseline to follow-up, subjects in the assisted walking group experienced a 20.9% decrease in the distance walked in 6 minutes and subjects in the conversation treatment group decreased 18.8%. In contrast, subjects in the combined treatment group essentially maintained their level of functional mobility declining only 2.5% (Table 4).

Treatment fidelity differed significantly among the

TABLE 3. *Baseline characteristics: comparison of means by treatment group*

	Treatment group			
Characteristic	Walking, mean (n = 26)	Conversation, mean (n = 24)	Combined treatment, mean (n = 21)	p value
Age	87.4 (5.87)	89.6 (6.53)	84.3 (7.53)	0.0341
Mini-Mental status	9.8 (5.98)	12.5 (5.92)	10.8 (6.0)	0.2853
6-minute walk (in feet)	356.6 (241.58)	271.6 (171.35)	343.3 (251.02)	0.3681
Number of comorbidities	6.1 (4.11)	5.5 (3.62)	5.2 (2.86)	0.7192
Length of stay	1134 (825)	1012 (820)	1003 (1011)	0.8445

Numbers in parentheses indicate standard deviations.

three groups and offered a possible explanation for the unexpected decline in functional ambulation in the walking group. Therefore an analysis of covariance was performed to examine the effect of treatment fidelity on the 6-minute walk scores at follow-up. After adjusting for both baseline score and treatment fidelity, the mean 6-minute walk distance at post-test was 238.5 (SD 30.2) for the conversation group, 284.8 (SD 29.01) for the walking group and 322.6 (SD 28.3) for the combined treatment group. Because of the previously mentioned problem with variance instability, analysis of covariance was performed comparing the log adjusted post-test 6-minute walk means of the 3 groups adjusting for the effect of the pretest 6-minute walk and treatment fidelity. This analysis revealed a significant group effect (Table 5). The pairwise comparisons demonstrated that, after controlling for treatment fidelity and the pretest 6-minute walk scores, the conversation group walked a significantly shorter distance in 6 minutes at post-test than did either the walking or the combined treatment groups but that the walking and combined treatment groups were not different from each other (Table 5).

DISCUSSION

Other studies comparing the effect of strengthening or endurance exercise programs to attention control in institutionalized elderly individuals have demonstrated a clear benefit from an exercise intervention (Jirovec, 1991; Folstein, et al., 1975; Fiatarone, et al., 1994). We therefore anticipated that subjects in the conversation-only treatment group would experience a greater decline in functional mobility, as measured by the 6-minute walk, than would subjects in either of the groups receiving walking intervention. Based on the normal response to exercise we would have expected the conversation group to have declined more in the distance ambulated in 6 minutes than either of the groups receiving walking intervention. However, our data showed a decline in 6-minute walk in both the walking and conversation groups whereas the combined group did not decline significantly.

TABLE 5. *Analysis of covariance for log-transformed 6-minute walk data controlling for baseline scores and treatment fidelity*

Effect	*F* statistic
Group	5.59*
Baseline score	34.36*
Treatment fidelity	3.98†

*Significant at $p = 0.01$ or better; †significant at $p = 0.05$ or better.
Subsequent pairwise comparisons showed significant differences between the conversation group and both the walking group ($p < 0.05$) and the combined treatment group ($p < 0.01$).

Because this finding was unexpected, we examined the possible role of treatment fidelity in our findings. We found that when treatment fidelity is statistically equalized across the three groups the combined group continues to have the highest score but the walking group score is no longer significantly different from the combined group; both groups receiving the walking intervention scored significantly higher than the conversation group. This implies that the difference between the walking and the combined treatment groups in change in functional mobility was largely due to differences between these groups in treatment fidelity. These findings also imply that the conversation component of the combined walking and conversation treatment intervention improved treatment fidelity, thereby improving the outcome of the intervention.

The research assistants who provided the walking-only intervention were instructed not to initiate conversation with the subjects. Therefore, subjects in this group were given no encouragement or social support during the intervention. There is evidence that social support is effective in increasing compliance with medical prescriptions and lifestyle changes such as participation in diet or exercise programs (McMurdo and Rennie, 1994; Green, 1987; Becker, 1985; Wilson and Pratt, 1987; Sluijs et al., 1993; Williams et al., 1991), although individual attention is not always sufficient in improving adherence (Fishman, 1995). A study by Perkins et al. (1986) examined the effectiveness of a structured social support program in increasing exercise in nursing home residents. The social support examined in the Perkins study, consisting of praise and tangible rewards provided by the physical therapy staff, has been found effective in increasing exercise levels in other populations as well (Wing et al., 1996).

The findings of this study suggest that an exercise program consisting of 30 minutes of assisted walking three times a week is an effective intervention for preventing deterioration in functional mobility in nursing home residents with AD. Our findings also suggest that social interaction during walking exercise is essential in order to achieve a level of compliance sufficient to produce a response to the exercise.

It has been noted that individuals with late stage AD maintain the desire to interact with others even if they initially evidence withdrawal or resistance (Lamar et al., 1994). Unfortunately, it has also been observed that nursing home staff frequently fail to interact with cognitively impaired residents, spending less time with demented residents than with the nondemented (Ekman et al.,

1991). Yet the results of this study indicate that such interaction may be critical to the efficacy of any exercise program with this population. Our conclusion is that it is essential for staff to receive both training and support for engaging in social interaction with individuals with AD if this type of exercise intervention is to be effective in maintaining functional mobility in this population.

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