INCREASING DISTANCE AND INDEPENDENCE OF AMBULATION IN ELDERLY NURSING HOME RESIDENTS

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We tested the effectiveness of a prompt-and-praise procedure for increasing walking distance and independence in eight nursing home residents. Walking distance and method of ambulation were observed just prior to mealtimes; in addition, mobility and social interaction were time-sampled in the living areas throughout the day. Treatment was lagged in a multiple baseline design across lunch and dinner meals within subjects, and across subjects within each of three units. In the mealtime setting, two subjects began walking the maximum scored distance during baseline; the other six subjects showed a marked increase in walking beginning with the first meal in which the intervention was applied. Six of the eight subjects also progressed to more independent means of ambulation. Generalization of walking to the second meal was observed in all four of the subjects in whom this could be assessed. Generalization across subjects was not observed nor was generalization to the living areas. Staff successfully implemented the procedures in the mealtime settings and the effects were maintained at the 4-month follow-up.

DESCRIPTORS: behavioral gerontology, elderly, geriatric patients, walking behavior, institutions

The most frequently cited deficit of elderly nursing home residents is impairment of mobility (Kane & Kane, 1981). Concern for elderly patients with mobility limitations appears to be well-founded because the sequelae are often serious, ranging from hypostatic pneumonia and urinary incontinence to insomnia and depression (Hogue, 1985).

In a series of observational studies, Baltes, Honn, Barton, Orzech, and Lago (1983) demonstrated that walking and various self-care behaviors are rarely followed by staff reinforcement in nursing homes. Instead, dependent behaviors, such as requests for assistance, are readily reinforced by staff.

The results of intervention studies suggest that reinforcement techniques may be effective for increasing walking in elderly clients. Sachs (1975) dispensed tokens to two elderly nursing home residents contingent on the number of minutes of

observed walking with one subject and the number of feet walked by the second subject. Sachs used an A-B design, and results suggested that the intervention was effective in increasing walking behavior. Unfortunately, few details were provided on the observational system, interobserver reliability coefficients were not reported, and follow-up was not conducted. In a similar study, Sperbeck and Whitbourne (1981) used verbal praise to increase mobility in four elderly nursing home residents. The investigators targeted both walking and self-wheeling and used nursing home staff as behavior change agents. Using an A-B design, an increase in the number of feet walked was demonstrated for only one of the four subjects. It is unclear why the intervention was ineffective for three of the four subjects; the possibility that verbal praise was not an effective reinforcer for these subjects was not assessed. A 6-month follow-up was discussed, but data were not presented.

Using a reversal design, MacDonald and Butler (1974) demonstrated the effectiveness of a prompt plus contingent staff interaction and praise to increase distance walked by two elderly nursing home

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residents. However, on examination of the baseline procedure, it is unclear to what extent the clients were given the opportunity to walk during this phase. In addition, the intervention was not conducted by nursing home staff nor was the procedure transferred to the staff to ensure long-term maintenance. Follow-up data were not presented.

These investigations focused on increasing the distance elderly persons walk in nursing homes. A target behavior of equal importance, but one that has not been examined in previous research with the elderly, is the degree of independence of ambulation. More independent ambulation requires less staff involvement and would more likely be maintained in the natural environment. Therefore, the purpose of this study was to examine the use of a prompt-and-praise procedure, similar to that used by MacDonald and Butler (1974), to increase both walking distance and independence in eight nursing home residents. In addition, an assessment of cross-setting and cross-subject generalization was conducted. Finally, the application of the intervention was transferred to nursing home staff, and long-term maintenance was evaluated.

METHOD

Setting and Subjects

The setting was a 240-bed skilled-chronic nursing facility in which 70% of the residents were 65 years of age or older. Observations were conducted in two settings within the institution: the dining areas and living areas of three separate units.

Because increasing walking in certain elderly residents could place them at risk for injury, subjects were included if, in the subjective judgment of the interdisciplinary team, each subject was adequately oriented, physically capable of walking, and able to profit from increased walking. Subjects were seven women and one man who ranged in age from 69 to 90. Two subjects had suffered cerebrovascular accident; one had degenerative rheumatoid arthritis; one had a history of hip fracture. In addition, four were diagnosed with dementia, four with depression, and five received regular doses of neuroleptic medication.

Behavior Definitions

Mobility. Mobility status was separated into nine mutually exclusive and exhaustive categories: (a) Independent walking: completing at least one step without staff assistance or the use of a prosthetic device, including walking while making contact with a wall or wall rail; (b) Walking with a cane: walking while making contact with a cane; (c) Walking with a walker: walking while making contact with a walker; (d) Walking with a wheelchair: walking while pushing a wheelchair; (e) Walking with staff assistance: walking while making contact of any duration with staff; (f) Sitting in wheelchair, self-propelled: the patient was in a wheelchair and moving it without the assistance of another person; (g) Sitting in wheelchair, staff-propelled: the patient's wheelchair was propelled by staff; (h) Sitting in chair: the patient was sitting immobile in a wheelchair or stable chair; (i) In bed: the patient was lying or sitting in bed with at least one leg not touching the floor.

Social interaction. Social interaction included touching, or speaking or listening to another person while the subject was within 10 ft of another person and had his or her head oriented toward that person. Listening to a conversation between two staff members was excluded.

Observation and Reliability

All observations were conducted by the experimenters and two research assistants.

Dining areas. Observations in the dining area were conducted twice daily, Monday through Friday, before the lunch and dinner meals for all subjects except Subject 5, who was available only during lunch. During all phases of the study, observation was initiated when the subject was given the opportunity to walk to the table. Walking to the table was chosen for observation because it provided a reliable and naturalistic opportunity for the patient to walk. Both the number of feet walked and duration of walking were recorded. To assess the number of feet walked, a 15-ft-long strip of tape was placed in the area immediately approaching the patient's seat at the table. Additional strips of tape intersected the tape at 1-ft intervals, allow-

ing the observers to record the number of feet traversed. A distance of 15 ft was chosen based on the recommendation of the physical therapist. Duration of walking was assessed by starting a stopwatch when the subject took the first step. It was stopped when the patient reached the seat or no forward motion was detected for 10 s. Each patient's mobility was scored in reference to one of the first seven categories cited above.

Living areas. A momentary time-sampling procedure (Bailey & Bostow, 1979) was used to assess mobility and social interaction in the living areas. Twelve time samples were scheduled between 9 a.m. and 5 p.m., and conducted at 40-min intervals.

Observations were conducted in a predetermined sequence of areas in the institution. When a subject was spotted, the observer immediately recorded mobility status and the occurrence or non-occurrence of social interaction. If a subject was not located during observation rounds, the patient was scored "off-unit" and this sample was excluded from data calculation. An average of nine daily samples was taken on all subjects. If the number of samples dropped below four for a patient on a given day, it was considered a missing data point. The data were converted to percent occurrence.

Interobserver agreement. Checks were conducted by two observers who independently and simultaneously conducted observations during 24% of the dining area assessments and 21% of the living area assessments. In the dining area assessments, an agreement was scored for number of feet walked if both observers recorded the same number of feet plus or minus 1 ft. An agreement was scored for duration if both observers recorded the same number of seconds plus or minus 2 s. Interobserver agreement on these and the individual mobility categories was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Bailey & Bostow, 1979). Mean percentage of agreement was 92% for number of feet walked and 96% for duration. Mean percentage of agreement on the occurrence of mobility categories ranged from 84% to 96% for the seven categories scored in this setting.

In the living areas, an agreement was scored when both observers marked that a target behavior either occurred or did not occur during a specific sample, and a disagreement was scored when one observer recorded a behavior during a sample and the other observer scored a different behavior. Mean percentage of agreement ranged from 99% to 100% in the living areas.

Experimental Procedures

Pre/post measure. Twenty-seven nursing aides on day and evening shifts who frequently interacted with the subjects responded to a 4-item questionnaire designed to assess the staff's views of mobility in the elderly and their patient's level of mobility and social interaction. Specifically, they reported on 0–3 point scales how often each subject participated in scheduled activities, how often the subject interacted with others, how often the subject walked, and how important the staff member thought it was for wheelchair patients to walk more frequently. During postintervention assessments, staff completed questionnaires only for those subjects they had rated during preassessment.

Baseline. Mobility was monitored during the lunch and dinner meals in the dining areas. Upon entering a dining area, the experimenter asked the subject to "please get to the table the way you normally would." If the patient walked, the distance and duration were recorded. If the patient asked for experimenter or staff assistance or a prosthetic device, this was provided. Patients who did not respond to the request within 1 min were wheeled to the table. No prompts or praise for walking were delivered during this phase. In every case, the appropriate mobility category was recorded.

In the living areas, nursing home staff were told that the subjects were involved in a mobility study, and they were requested not to change their behavior toward the subjects in any way.

Intervention. As the patient entered the dining area, if he or she was not walking towards the table, a verbal prompt was delivered by the experimenter: "Mrs. Smith, your doctors have decided that you need to start walking more. I would like you to try to walk to the table today. I'll give

you as much help as you want and you can use a wheelchair, walker, or cane if you would like." The experimenter helped the patient to stand if the patient requested help or if the experimenter considered it necessary for the patient's safety. Praise was delivered for walking, regardless of speed, and for engaging in conversation. If the subject asked to sit down at any time before reaching the table, the wheelchair was provided and the patient was wheeled the remaining distance to the table.

Once a patient approached the maximum distance (15 ft), the experimenter began prompting and praising increasingly independent ambulation. The physical therapist ranked the various categories of ambulation from least to most independent and therapeutically desirable in the following order: walking with staff aid, walking with a wheelchair, walking with a walker, walking with a cane, and independent walking. Based on the medical condition and cognitive status of each subject, the experimenter and physical therapist agreed on the following mobility goals for individual subjects: for Subjects 1, 2, and 5, walking with a walker and staff assistance; Subjects 3, 4, and 6, walking with walker and no staff assistance; Subjects 7 and 8, independent walking.

Staff training in the dining areas. To facilitate long-term maintenance of the intervention, implementation of the intervention was transferred to the staff. Once stability in number of feet and ambulation goals was reached for all subjects in a setting, the experimenter met separately with each nursing aide having patient responsibilities in the dining areas. The intervention was described to the staff, and they were asked to watch the experimenter conduct sessions. The staff was then requested to conduct sessions under the supervision of the experimenter. Praise for appropriate performance of the procedure and corrective feedback were administered. Experimenter involvement was completely faded within 2 weeks of the transfer.

Staff training in the living areas. After all patients were trained and control of the intervention was transferred to staff in the dining areas, in-service training was conducted to describe how prompt-and-praise procedures could be applied to

promote mobility in the general living areas. Natural opportunities to increase walking were discussed with staff (e.g., walking instead of wheeling a patient from bedroom to the dayroom). For the patients who did not need staff supervision for walking, staff were urged to prompt walking frequently and praise the behavior whenever it was observed. For patients who required staff supervision, staff were assigned to conduct three to four training sessions per day. Finally, these instructions were written into the medical record as a physician's order.

Maintenance and follow-up. In the dining areas, staff continued to monitor and reinforce walking, and instructions for the intervention were entered into the medical record as a physician's order. The head nurse was responsible for monitoring staff compliance, prompting staff, and providing corrective feedback. Follow-up data were collected once weekly for 16 weeks. The schedule of dining area follow-up observations was not known to the staff. Due to the unavailability of observers, no follow-up data were collected in the living areas.

Design. Subjects were distributed among three units with three separate dining areas. Subjects 1–3 were in unit A, Subjects 4–5 were in unit B, and Subjects 6–8 were in unit C. For each subject, the intervention in the dining area was time-lagged across meals, allowing an assessment of generalization across meals. Within each unit, the intervention was applied according to a multiple baseline across subjects design, allowing an assessment of generalization across subjects within a unit. Because data were simultaneously collected in the dining areas and the living areas, generalization across settings could also be examined. Intervention in the living areas was initiated on all units on the same day, conforming with a A-B design.

RESULTS

Pre/post Measure

Pre- and posttreatment means for the four items on the staff questionnaire were compared using *t* tests. Results indicate that staff reported patients

to be walking more frequently ($t = 7.78$, $p < .001$) and interacting more often with others ($t = 1.87$, $p < .05$) after training than before training.

Dining Area

Distance walked. Figures 1–3 display the number of feet walked and means of ambulation for each subject. Results indicate an immediate increase in walking during the first meal in which the intervention was applied for six of the eight subjects. Subjects 1, 2, 4, 5, and 6 walked rarely or not at all during baseline but, when prompted and praised for walking, increased walking to ceiling or near-ceiling level. Subject 8's walking was variable during baseline but increased to ceiling following intervention. Subjects 3 and 7 started walking the full distance within a few days after initiation of baseline observations.

Within 2 to 5 days, generalization of walking to the second meal was observed in all four of the subjects whose data allowed this assessment (Subjects 1, 2, 4, and 6). Subjects 3 and 7 began walking the maximum distance at both meals during baseline, thus precluding the assessment of cross-meal generalization. Subject 5 was available for observation only during lunch, and the time lag between the onset of intervention for the two meals for Subject 8 was not sufficient to assess generalization.

Generalization effects were always more variable and at a lower level than intervention results. When the intervention was applied during the second meal for Subjects 1, 2, 4, and 6, the variability decreased and the level of walking increased to ceiling. The number of feet walked did not decrease when staff used the interventions. Cross-subject generalization within a unit was not detected, nor did walking increase in the living areas after intervention was initiated in the dining areas.

Independence of ambulation. Data on independence of ambulation are presented to characterize the presence or absence of staff assistance or a prosthetic device (see Figures 1–3). The data suggest that six of the eight subjects progressed to more independent means of ambulation as previously defined by the physical therapist. Subjects 1 and

8, who were completely dependent on staff for assistance in walking at the beginning of training, progressed to using a walker with staff assistance and independent walking, respectively. Subjects 2, 3, and 6 began the study walking with a prosthetic device and staff assistance and gradually required less staff assistance (Subject 2 did not change his means of ambulation until the follow-up assessments). Finally, Subject 7 began walking with the use of a prosthetic device and progressed to independent ambulation. Subjects 4 and 5 did not progress to more independent means of ambulation.

Duration. The duration data were converted to seconds per foot. The mean seconds per foot during the intervention phase for all subjects ranged from 0.5 to 10.7. Split-half means were calculated and compared to determine any changes during intervention. Subject 1 increased walking speed 6 s/ft during the second half of intervention. Walking speed remained essentially the same (± 1.5 s) for the other seven subjects.

Living Areas

The pre- and posttreatment group means for mobility behaviors and social interaction in the living area indicate no significant changes in any of the categories. The most frequently observed behavior was sitting in a chair with no movement (67%), followed by lying in bed (23%). All categories of mobility were scored during a low proportion of observations (range, 0%–8.9%). Likewise, social interaction was rarely observed (5%) across phases.

Follow-up

Follow-up data were collected in the dining areas only and were not available for Subject 5 due to illness.

Distance. With the exception of Subject 1, all subjects continued to walk the maximum distance at meals up to 4 months after the formal termination of the project. Subject 1's mobility became more variable but remained significantly improved compared to her baseline performance.

Independence of ambulation. All subjects

Figure 1. Distance walked and method of ambulation during lunch and dinner for Subjects 1, 2, and 3 (unit A).

Figure 2. Distance walked and method of ambulation during lunch and dinner for Subjects 4 and 5 (unit B).

maintained or improved the level of independence attained during the intervention phase. As noted above, Subject 2 improved independence only during the follow-up phase.

Duration. With the exception of Subject 1, who regressed to walking slower than she had during the first half of the intervention phase, all subjects maintained roughly the same walking speed as was attained during the intervention phase.

DISCUSSION

Our results replicate and extend the findings of MacDonald and Butler (1974) by showing that a simple prompt-and-praise procedure increased ambulation in selected nursing home residents. Two

subjects began to walk during baseline when they were regularly given the opportunity to walk to their tables in the dining area. The increases in walking were in most cases immediate (i.e., patients increased from no walking to walking the maximum distance measured). Generalization across meals was found in all four of the subjects in whom it could be assessed. It occurred after an initial delay of a few days, and, as is typical, the generalization data were more variable than intervention data (Reynolds, 1975). These findings suggest that the absence of walking prior to intervention was not due to physical impairment or skill deficit, but, rather, to environmental contingencies that either discouraged walking or failed to prompt and reinforce the behavior (Baltes et al., 1983).

Figure 3. Distance walked and method of ambulation during lunch and dinner for Subjects 6, 7, and 8 (unit C).

Several limitations of this study are noteworthy. First, the maximum distance that subjects walked was relatively short (15 ft) and probably provided limited health benefits to the subjects. Although it seems likely that prompt-and-praise procedures would be effective in promoting a greater duration and intensity of exercise, the efficacy of such procedures and the assessment of the health and psychological impact of increased exercise await further research. Attempts to increase the intensity and duration of exercise should be undertaken only with adequate medical consultation regarding the physical limitation of the elderly and adequate safeguards to protect the participants. Second, although we suspect that prompting and contingent praise may be required to maintain consistent performance, the factors responsible for maintenance were not systematically analyzed. Finally, generalization across subjects was not observed. This suggests that merely observing other residents being rewarded for walking may not be sufficient to increase walking in the institutionalized elderly.

In addition to increasing the amount of walking, the prompt-and-praise procedure was also effective in increasing the independence of ambulation in six of the eight subjects. During the latter phases of the intervention, seven of the subjects did not require staff assistance during most of the sessions. This is important for long-term maintenance of the effect, because procedures that require substantial staff time are unlikely to be maintained (Burgio, in press).

Duration data showed no significant changes in the amount of time it took the patients to walk to the tables. This was not surprising because an increase in speed was not targeted for intervention. Furthermore, increasing the speed of walking may be contraindicated in this population because increased speed could increase the risk of falling.

Transferring the control of the intervention to nursing home staff was not associated with decrements in either the distance walked or the independence of ambulation. Follow-up data indicated that the staff members were able to maintain these effects (with the exception of an increase in the

variability of Subject 1's performance) up to 4 months after the formal termination of the project.

A major consideration for future research is improving the assessment of walking in the living areas. In contrast to data obtained via direct observation, the staff reported on the questionnaire that their patients were walking more frequently and were more sociable after the intervention was begun. It is possible that relatively infrequent but beneficial increases in walking and interaction were not detected with our momentary time-sampling procedure. An alternative interpretation is that staff reports were erroneous. Extending the effect to the living areas is of obvious importance and needs to be examined further. Changing the behavior of residents in the living areas requires that institutional staff alter their usual procedures. Research has suggested that staff are not likely to increase their productivity in response to in-service training and scheduling without the addition of formal contingencies for staff performance (Whitman, Scibak, & Reid, 1983). A recent review of the literature indicates that there has been little systematic research conducted on staff training and management in geriatric long-term care settings (Burgio, in press). If nursing aides are to play an instrumental role in improving or maintaining elderly patients' functional skills, formal staff training and management procedures need to be developed.

Geriatric long-term care is gradually changing its emphasis from custodial care to rehabilitation and training (Barney, 1983). Our study indicates that elderly nursing home residents can improve distance and independence of ambulation even in the presence of cognitive and physical deficits, and suggests the possibility of realizing similar improvement across a number of other functional behaviors.

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