

# The Effects of In-Home Rehabilitation on Task Self-Efficacy in Mobility-Impaired Adults: A Randomized Clinical Trial

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**OBJECTIVES:** To examine the effect on mobility self-efficacy of a multifactorial, individualized, occupational/physical therapy (OT/PT) intervention delivered via tele-technology or in-home visits.

**DESIGN:** Randomized, clinical trial.

**SETTING:** One Department of Veterans Affairs and one private rehabilitation hospital.

**PARTICIPANTS:** Sixty-five community-dwelling adults with new mobility devices. Thirty-three were randomized to the control or usual care group (UCG), 32 to the intervention group (IG).

**INTERVENTION:** Four, once-weekly, 1-hour OT/PT sessions targeting three mobility and three transfer tasks. A therapist delivered the intervention in the traditional home setting (trad group n = 16) or remotely via tele-technology (tele group n = 16).

**MEASUREMENTS:** Ten-item Likert-scale measure of mobility self-efficacy.

**RESULTS:** The IG had a statistically significantly greater increase in overall self-efficacy over the study period than the UCG (mean change: IG 8.8, 95% confidence interval (CI) = 3.8–13.7; UCG 1.2, 95% CI = –5.8–8.2). Descriptively, the IG exhibited positive changes in self-efficacy for all tasks and greater positive change than the UCG on all items with the exception of getting in and out of a chair. Comparisons of the two treatment delivery methods showed a medium standardized effect size (SES) in both the tele and trad groups, although it did not reach statistical significance for the tele group (SES: tele = 0.35, 95% CI = –2.5–0.95; trad = 0.54, 95% CI = 0.06–1.14).

**CONCLUSION:** A multifactorial, individualized, home-based OT/PT intervention can improve self-efficacy in mobility-impaired adults. The trend toward increased self-

efficacy irrespective of the mode of rehabilitation delivery suggests that telerehabilitation can be a viable alternative to or can augment traditional in-home therapy. *J Am Geriatr Soc* 54:1641–1648, 2006.

**Key words:** assistive technology; home modification; in-home services; occupational therapy; physical therapy; telerehabilitation; self-efficacy; activities of daily living

Many factors influence the development and progression of disability. One factor purported to favorably influence functional performance and activities of daily living (ADLs) is the perception of self-efficacy. Specifically, self-efficacy in task performance refers to an individual's beliefs regarding their ability to marshal the necessary cognitive, motivational, and physical resources and abilities to perform the salient functionally oriented tasks required for successful day-to-day living.<sup>1,2</sup> The importance of this concept lies in the possibility that *perceived* ability rather than *actual* ability is a better predictor of day-to-day performance.<sup>3–5</sup>

Evidence suggests that self-efficacy is an important aspect of rehabilitation in terms of a patient's propensity to engage in a rehabilitation program as well as in the outcomes of the program. First, a number of studies have shown that self-efficacy can enhance or impede rehabilitation efforts with older adults.<sup>1,2,6</sup> These include response to behavior interventions,<sup>7,8</sup> participation in rehabilitation activities,<sup>2,9</sup> and exercise interventions.<sup>10</sup>

Self-efficacy has also been linked to a variety of patient outcomes in the older adult and geriatric population. Low self-efficacy has been found to be an independent predictor of disability and activity restriction, in addition to that warranted by physical disability,<sup>11–14</sup> hospitalization or institutionalization,<sup>15,16</sup> depression,<sup>2</sup> falls risk and prevalence,<sup>17,18</sup> and poor health or functional status.<sup>12,16,19,20</sup> Conversely, high self-efficacy has been linked to a host of positive outcomes, including better recovery from trauma or injury<sup>16</sup> and longer duration of recovery in older persons with newly acquired disabilities.<sup>21</sup> Finally, higher self-efficacy scores were found to be one of the few factors associated with ADL recovery in a sample of the oldest old.<sup>22</sup>

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Self-efficacy can have important implications for successful rehabilitation outcomes. A number of studies have effectively manipulated self-efficacy through education, exercise training, and positive reinforcement for successful task completion.<sup>3,4,23–27</sup> Typically, these interventions depend on real-time, two-way observation, communication, and improvisation between therapist and patient. This real-time, two-way communication is perceived as the only reliable way to understand the complex person–environment interactions that characterize task performance and to develop ecologically based, individualized interventions.<sup>8,28</sup> Reciprocal interaction between therapist and patient provides the opportunity for immediate feedback on task performance and positive reinforcement of appropriate task-related behaviors. These factors, in turn, exert a positive influence on the patient's self-efficacy for that task, increasing motivation for and the likelihood of future appropriate task performance.<sup>2</sup>

Traditional in-home therapy provides the opportunity for these patient–therapist interactions to occur within the context of everyday task performance. Nonetheless, although in-home rehabilitation has been generally successful at preventing ADL decline<sup>29,30</sup> and facilitating recovery of ADL functioning and locomotion,<sup>9,31</sup> cost, travel distance, and lack of personnel limit its utility. To overcome these limitations, several pilot studies have demonstrated that in-home therapy delivered using interactive video teleconferencing can successfully treat ADL task-performance deficits.<sup>32,34</sup> These studies suggest that relatively inexpensive video teleconferencing technology (e.g., as little as \$1,200 for two videophones and a video camera) that uses the telephone system can maintain the integrity of the didactic communication between therapist and patient and provide a practical alternative to traditional home visits by a therapist for improving task self-efficacy.

Whereas descriptive studies have linked self-efficacy to ADL performance, no studies have been undertaken to examine the effects of occupational and physical therapy (OT and PT) interventions on task self-efficacy in ADLs. In addition, the scope of tasks examined and interventions delivered limited previous studies of teletechnologies. First, previous teletechnology studies focused on only a small number of ADL tasks, limiting the generalizability to other ADLs. Second, interventions in these studies were limited to teaching individuals adaptive techniques. As a result, the potential of televideo for delivering the same type of comprehensive, multifactorial intervention as traditional in-home rehabilitation (i.e., functional exercise, assistive technologies and equipment, and home modifications in addition to adaptive techniques) is not known.

To address the limitations of previous work, the goal of this study was to demonstrate that an in-home OT/PT intervention could effect a change in mobility self-efficacy in a group of mobility-impaired adults and, secondarily, to explore the effects of two different approaches (i.e., remote therapist using teletechnology vs therapist on site in the home) to delivering therapy. This article reports the results of a randomized clinical trial that examined changes in self-efficacy in patients with newly prescribed mobility aids (walkers and wheelchairs) who received a 4-week, in-home, multifactorial OT/PT intervention delivered via remote televideo technology or a traditional home visit. The article

compares the self-efficacy of patients who received the therapeutic interventions with that of patients who received only usual care and secondarily reports exploratory analyses that examined the effects of each of the two intervention delivery systems.

## METHODS

Approval for the study was obtained from the institutional review boards for the Durham Veterans Affairs Medical Center (VAMC), Shepherd Center, and the Atlanta VAMC. All patients provided informed consent and a release to use their image.

### Experimental Design

The study was a randomized trial using a computer-generated random numbers table and concealed allocation. A person unconnected with the study filled sequential, sealed envelopes, which the project coordinator administered after subject enrollment. Patients enrolled in the study were randomized to a usual care group (UCG) or to one of the two intervention groups (IGs; tele or trad). The UCG received no therapy as part of the study. All subjects in the IG received the same 4-week therapy intervention. One IG received the intervention from a remote therapist via teletechnology operated by a research assistant in the home (tele group), whereas the other group received the intervention from a therapist physically present in the home (trad group). Given the interactive nature of the intervention, neither the subjects nor the investigators were blinded to the intervention.

### Setting

Study participants were recruited from one VAMC and one private rehabilitation center.

### Study Sample

The sample consisted of community-dwelling adults of all ages with a prescription for a new mobility aid (walker or wheelchair) who had not used the same type mobility aid for more than 1 month in the preceding year. This study sample was selected because of concern that practitioners who have not had a chance to see the patient in the home may prescribe mobility aids, patients recently prescribed a mobility aid may be having mobility difficulty with more than one type of mobility task, and the patients might benefit from training in the environment in which the device will be used.

### Eligibility Criteria

In addition to receipt of a new mobility aid, eligibility was contingent upon permission granted by each prospective subject's primary care physician or the physician prescribing the new mobility aid. Further eligibility criteria were geographic proximity to the medical center (approximately 1 hour driving time for home visits and data collection), sufficient cognitive ability to follow directions and complete self-report items (Short Portable Mental Status Questionnaire score of  $> 8/10$  or Mini-Mental State Examination score of  $> 26/30$ ), and life expectancy of longer than the 6-month duration of participation in the study based on physician review of the medical record.

## Intervention

Patients in the two IGs received 1-hour therapy sessions for 4 consecutive weeks. The intervention focused on three transfer tasks (bed, toilet, and tub/shower) and three mobility tasks (locomotion throughout the home, negotiation of the entrance and doorways within the home, mobility in the kitchen). The intervention included an exercise component and an adaptive strategy component. The exercise component of the intervention (e.g., dips, bridging, and buttock lifts) targeted underlying impairment at the body structure/function and activity level domains, whereas adaptive strategies targeted external contextual factors (reducing the demands and increasing the safety of the environment) to help compensate for extant disability. Based on the nature and number of problems identified during the baseline traditional home or televideo visit, individualized “adaptive prescriptions” were scripted for each subject. These prescriptions included three types of interventions: adaptive techniques/methods (e.g., bed mobility training, transfer training), assistive technologies designed to increase functional abilities (e.g., overhead or mobile lift, trapeze bar, sliding board, commode chair), and recommendations for home modifications chosen to reduce environmental demands (e.g., add lighting, rearrange furniture, install grab bars, add a ramp). The exercises and adaptive prescriptions were similar to contemporary OT/PT practices typical of home health care for patients with nonspecific functional decline, or impaired mobility, or both. Detailed procedures for these interventions are reported elsewhere.<sup>33</sup>

Analysis of daily activity logs maintained by the subjects served as an intervention check. Subjects in the IG exercised much more often and reported participating in more therapy sessions from baseline through Week 6. Mean number of exercise sessions  $\pm$  standard deviation was  $2.2 \pm 6.3$  for the UCG, versus  $6.7 \pm 6.8$  for the IG, over 5 weeks. This difference was statistically significant ( $P = .008$ ). Subjects in the UCG reported participating in only  $1.0 \pm 2.3$  therapy session on average, whereas the IG reported a mean of  $4.2 \pm 2.4$  therapy sessions over the same period ( $P = .001$ ).

## Equipment

The mobile, wireless televideo system used in this study consisted of off-the-shelf technology that used telephone lines to transmit real-time, two-way audio and video between the patient’s home and the therapist in a clinic. The basic system was developed for a previous study<sup>35,36</sup> and adapted for the current study.<sup>33</sup> The televideo enables a remote camera to move freely throughout the house, with live two-way video and audio communication between patient and therapist. A research assistant operated the equipment in the home, the training and background of the research assistant being designed to mimic the expertise and abilities that might reasonably be present in a home health aide.

## Measures

Trained research staff collected all data. Subject characteristics and outcome measures (sociodemographic information, self-reported physical functioning, self-efficacy, and health status) were obtained via telephone interviews in all subjects at Week 1 (baseline) and Week 6 (1 week after completing the 4-week intervention).

## Self-Efficacy

Although no validated task efficacy scale currently exists for mobility-impaired adults, the Falls Efficacy Scale (FES) is a well-validated and reliable<sup>37–39</sup> measure of confidence in completing 10 routine household mobility tasks. Individual items on the scale range from 1 (not confident at all) to 10 (completely confident) for each of the 10 activities: getting dressed and undressed, cleaning the house, preparing simple meals, bathing, shopping, going up and down stairs, reaching into cabinets or cupboards, getting in and out of a chair, walking around the neighborhood, and hurrying to answer the phone. The total for the scale ranges from 1 to 100.

The FES focuses on frequent fallers, although the 10 household tasks are equally applicable to any mobility-impaired population. Because the FES is intended for frequent fallers, it asks the question: “How confident are you in performing the following activities *without falling*?” To adapt the protocol for the current study, the scale was modified by removing the words “*without falling*.” The question simply asked: “How confident are you in performing the following activities?” providing a direct measure of confidence in perceived ability to perform the 10 tasks appropriate for anyone with mobility impairment, irrespective of falls history. Internal consistency (Cronbach alpha) of the measure with the present sample was 0.91 for the 10 items.

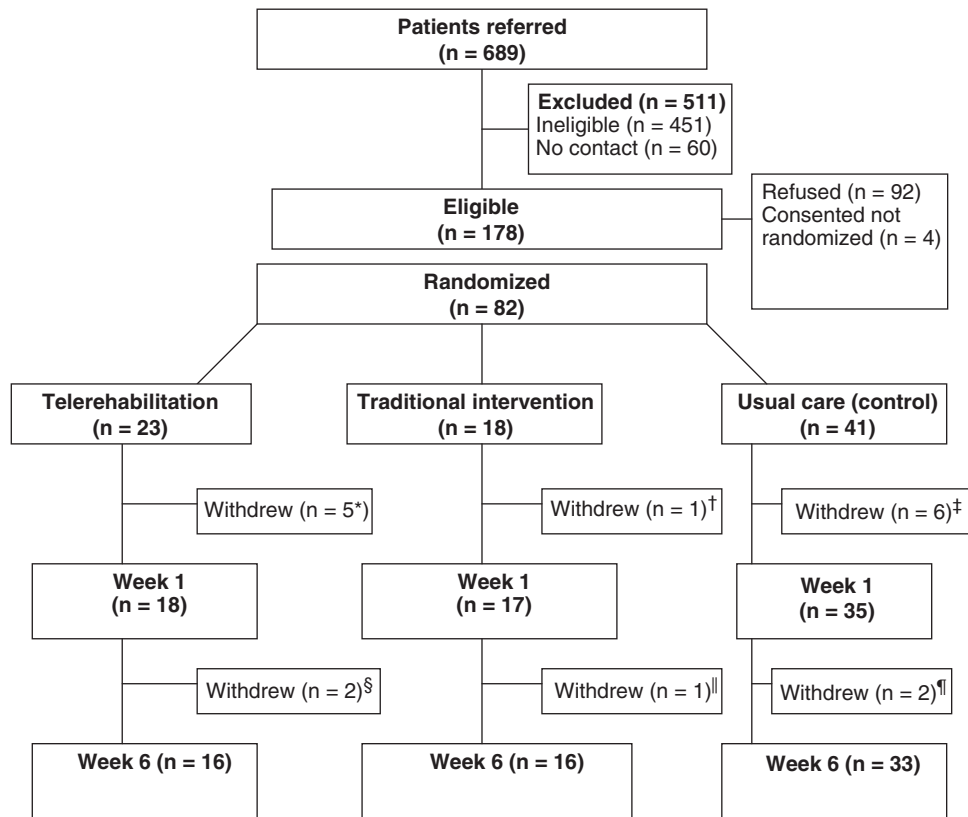
## Data Analysis

Primary data collected at each site were entered into the Statistical Package for Social Sciences version 10 (SPSS Inc., Chicago, IL) for analyses and verified using inspection and cleaning, along with double entry of approximately 10% of the data. Univariate descriptive statistics were computed to describe the groups at baseline and at the 6-week follow-up. The chi-square test was used to determine the significance of differences for categorical variables, and the analysis of variance *F*-test was used for continuous variables. To test the primary hypothesis, repeated-measures analysis of covariance (ANCOVA) was used. A priori, the authors planned to include covariates in the final model, based on any differences between the study groups at baseline, theoretical effect on task self-efficacy, significant moderate ( $>0.35$ ,  $P < .05$ ) correlation with the primary outcome variable, and data meeting the assumptions required of ANCOVA.<sup>40</sup> ANCOVA addressed the primary research question concerning group differences in task self-efficacy changes over time between the IG and the UCG. For the second, more-exploratory analysis, the standardized effect sizes (SEs) and 95% confidence intervals for the average change in task self-efficacy were computed for the trad group and the tele group and compared with that of the UCG.

## RESULTS

### Sample Description

A total of 689 patients in both hospitals were referred to the study for eligibility (Figure 1). Of the referrals, 178 were eligible, and consent was obtained from 86 (48% of those eligible). Reasons for ineligibility included geographic location greater than 1 hour from the hospital (52%), health status (18%), hospitalization or institutionalization rather than discharge to the community (12%), unable to



**Figure 1.** Telerehabilitation subject flow: \*death (n = 1), medical (n = 1), time constraints (n = 2), homeless or lost to follow-up (n = 1); †time constraints (n = 1); ‡medical (n = 2), time constraints (n = 2), homeless or lost to follow-up (n = 2); §medical (n = 1), time constraints (n = 1); ¶medical (n = 1); ¶death (n = 1), medical, (n = 1).

contact (12%), and other personal considerations (6%). There were no significant differences between the consenters and nonconsenters with regard to sex or type of device prescribed. The lack of consent precluded additional comparisons on personal health information. Sixty-seven of the 82 randomized subjects (4 consented subjects withdrew before randomization) completed all four interventions. Of these, 65 (16 in each of the two IGs and 33 in the UCG) completed the 6-week follow-up data collection. Reasons for attrition were concomitant medical problems unrelated to the intervention (n = 6), time constraints (n = 6), unexpected homelessness and other personal considerations (n = 3), and death due to causes unrelated to the intervention (n = 2).

Sociodemographic, functional, and health characteristics of the study participants at baseline are reported in Table 1. Randomization resulted in comparable distributions of all baseline patient characteristics for the UCG and IG. The sample reflects the veteran population from which the vast majority of subjects (90%) were drawn. Approximately 84% of the participants were male. The mean age was 62 (range 42–86). Fifty percent of the sample were Caucasian, 45% African American, 2% Hispanic, and 2% American Indian. More than three-quarters of the patients reported earning a minimum of a high school diploma, and 87% reported living with at least one other person.

All of the subjects were able to walk independently or with assistance at least some of the time, and the majority of subjects in both groups were using walkers. Sixty-four percent of the sample were using more than one mobility aid at baseline. Fifty-one percent were still using more than

one mobility aid at Week 6. There were no significant differences between the study groups in self-reported task difficulty levels or dependence on another person for help with the transfer and mobility tasks. At baseline, no subjects were totally independent, and all reported some difficulty with some of the tasks. On average, subjects needed help from another person with at least one of the six tasks and reported experiencing difficulty in performing three of the tasks. There were no significant differences in average dependency or difficulty scores as a function of time or group ( $F = 0.458$ ,  $P = .50$ ).

#### Effects of Intervention on Overall Self-Efficacy

At baseline, there were no differences between the two groups in task self-efficacy scores (Table 2). The final model included group and ADL difficulty and dependency in the predictive model. It showed that time had a significant effect on change in self-efficacy from baseline to Week 6 ( $F = 6.32$ ,  $P = .02$ ) and that there was a statistically significant group-by-time interaction ( $F = 4.25$ ,  $P = .04$ ), suggesting that the change in self-efficacy is primarily attributable to the intervention. Specifically, there was an 8.7-point increase in self-efficacy scores in the IG (from 56.3 to 65.0), which was more than seven times as great as the increase of 1.2 points (from 59.1 to 60.3) in the UCG.

#### Effects of Intervention on Self-Efficacy by Task

The IG showed improvement of more than half a point in confidence for nine of the 10 items, compared with a similar

**Table 1. Study Subject Characteristics at Baseline**

Characteristic	UCG (n = 33)	IG (n = 32)	P-value*	Telerehab	Traditional In-Home	P-value†
				(n = 16)	Group (n = 16)	
Age, mean ± SD	62.7 ± 16.3	61.8 ± 12.9	.82	57.8 ± 11.7	66.1 ± 13.2	.08
Male, %	83.9	84.4	.96	83.9	84.4	.956
White, %	56.3	43.8	.32	56.3	31.3	.15
High school graduate, %	63.8	80.6	.28	93.3	68.8	.08
Lives alone, %	12.5	12.5	1.00	12.5	12.5	1.00
Income <\$15,000, %	50.0	44.8	.72	40.0	50.0	.59
Number of chronic conditions, mean ± SD	2.91 ± 1.49	3.00 ± 1.24	.79	2.94 ± 1.13	3.06 ± 1.38	.94
Hospitalized in previous 6 months, %	69.7	71.9	.85	68.8	75.0	.91
Depression, %	45.5	46.9	.91	50.0	43.8	.93
Number of dependent ADLs, mean ± SD	1.30 ± 1.93	1.31 ± 1.91	.98	1.00 ± 1.63	1.50 ± 2.19	.86
Number of difficult ADLs, mean ± SD	3.06 ± 2.32	3.25 ± 2.44	.75	3.56 ± 2.25	2.93 ± 2.64	.80
Total difficulty score, mean ± SD (range 0–12)	3.85 ± 3.35	4.43 ± 3.66	.50	4.75 ± 3.39	4.12 ± 3.99	.71
Type of mobility aid prescribed, %			.51			.50
Cane	15.2	9.4		6.3	12.5	
Crutches	0	3.1		0	6.3	
Walker	66.7	59.4		56.3	62.5	
Wheelchair	18.2	28.1		37.5	18.8	

\* Significance level usual care group (UCG) and combined intervention group (IG).

† Significance level UCG, Telerehab, and IG.

SD = standard deviation; ADL = activity of daily living.

change in only two of the 10 items for the UCG (Figure 2). A gain in confidence of more than 1 point was seen in 40% of the items for the IG, versus only 10% in the UCG. To control the rate of Type I error, testing for statistical significance was limited to the composite measure of task efficacy. Descriptively, the IG exhibited positive changes for all items and greater positive change than the UCG on all items with the exception of getting in and out of a chair. The UCG group declined in confidence between baseline and Week 6 in going up and down the stairs.

medium effect size<sup>41</sup> (SES = 0.35 in the tele group; SES = 0.54 in the trad group), which reached statistical significance only in the trad group. When effect sizes were examined as a percentile standing of the average intervention participant relative to the average control participant,<sup>8</sup> both methods of intervention delivery had a much larger change than the UCG. Specifically, at 6 weeks, the self-efficacy in standing of the average subject in the tele group and the trad group exceeded the average percentile standing of a subject in the UCG by 64% and 71%, respectively.

**Effects of the Method of Providing the Intervention**

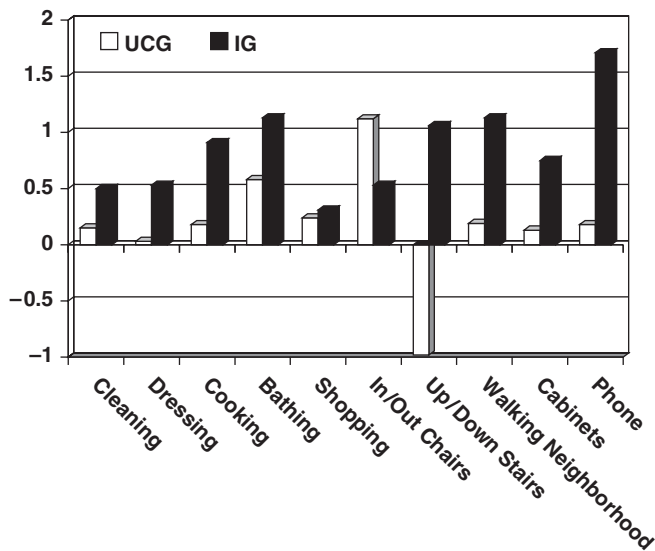
Table 3 shows results of exploratory analyses of the effect size related to the way that the intervention was delivered (tele vs trad). For both groups, the intervention had a

**DISCUSSION**

The study goal was to show that a 4-week, in-home OT/PT intervention could effect a change in mobility self-efficacy in a group of mobility-impaired adults and, secondarily,

**Table 2. Self-Efficacy by Group and Time**

Study Group	Self-Efficacy Score by Time			P-value		
	Baseline	6 Weeks	Change	Group	Time	Group by Time
	Mean ± Standard Deviation (95% Confidence Interval)					
All (n = 65)	57.7 ± 22.4 (52.2–63.3)	62.6 ± 20.6 (57.5–67.7)	4.9 ± 17.4 (.61–9.2)			
Usual care group (n = 33)	59.1 ± 22.2 (51.2–66.9)	60.3 ± 19.9 (53.2–67.4)	1.2 ± 19.7 (– 5.8–8.2)			
Intervention group (n = 32)	56.3 ± 22.8 (48.1–64.5)	65.0 ± 21.2 (57.4–72.7)	8.8 ± 13.9 (3.8–13.7)	.70	.02	.04



**Figure 2.** Changes in task self-efficacy items. Range 1 to 10; positive change reflects an increase in task self-efficacy. IG = intervention group; UCG = usual care group.

to explore the effects of two different approaches to delivering the intervention—by a remote therapist using teletechnology versus a therapist physically present in the home. Overall, the significant differences between pre- and postintervention scores at baseline and 6 weeks for the IG and UCG demonstrated the effect of the intervention on mobility task self-efficacy. Some of those differences can be attributed to natural recovery—the participants were mobility-impaired adults who had received new mobility aids. If for no other reason, some improvement in task performance and self-efficacy in the UCG group should have occurred through increasing familiarity with the new mobility device and any physician-ordered therapy that they received. Nonetheless, the change scores in the IG were more than seven times as high as those of the UCG at Week 6, suggesting that even a short, 4-week intervention of less than 1 hour per visit can positively influence self-efficacy for task performance.

When individual mobility tasks were examined, the IG improved on all of the individual task items, whereas the UCG group showed a large decline in stair use and had mixed results on others. However, the statistical significance of the intervention does not necessarily equate with

something that is clinically meaningful. Confidence in ascending and descending stairs is not only a prerequisite for accessing multiple floors in one's home, but it is also crucial for getting out of one's home and engaging in community activities. Just as important as the large effects on going up and down stairs are the spread effects of the intervention over the other nine tasks. Not only did the intervention appear to have some effect on all tasks, but those tasks that depended on the mobility and transfer skills similar to those targeted by the intervention appeared to be the ones with the larger effect sizes, suggesting that the skills provided increased self-efficacy in more-complex tasks.

Traditional in-home therapy, which provides the opportunity for these patient-therapist interactions, has been generally successful at preventing or reversing ADL impairment and decline,<sup>29,30</sup> as well as facilitating recovery of ADL functioning and locomotion.<sup>9,31</sup> In-home video teleconferencing has also been used successfully for OT home assessments and to treat ADL task performance.<sup>32–36</sup> However, none of the prior studies examined the effects of OT/PT interventions on task self-efficacy. Many studies did not use teletechnologies, or if they did, they did not examine multiple mobility and transfer tasks or use the full range of OT/PT interventions that would be used in traditional in-home rehabilitation. In contrast, the current study showed that a comprehensive multifactorial intervention aimed at improving a range of mobility and transfer tasks can enhance self-efficacy whether it is delivered by a remote therapist or an on-site therapist in the individual's home.

This study also suggests that individualizing prescriptions and in-home training in the use of mobility aids and other durable medical equipment and assistive technologies is an effective means of improving benefit from the devices. This finding supports a prior report<sup>42</sup> that veterans aged 50 to 75 who had individualized prescription of wheelchairs, assistive devices, and home modifications coupled with multimodal patient education had significantly greater use of wheelchairs in everyday life for more than 6 months than a usual care group that received a standard wheelchair and no training. Findings from the present and prior studies have important implications for the delivery of home health care. These studies not only support the need for individualized prescription of interventions, but also suggest that training in the use of these interventions, including training in the home, should be considered whenever mobility aids and assistive technologies are prescribed.

**Table 3.** Self-Efficacy Score According to Time in the Study and the Standardized Effect Size of Telerehab Group (Tele) and Traditional Group (Trad) Compared with Usual Care Group on Change in Self-Efficacy

Group	Baseline	6 Weeks	Change	Standardized Effect Size (95% CI) Percentile*	
	Mean ± Standard Deviation (95% CI)				
Tele (n = 16) <sup>†</sup>	55.2 ± 23.1 (42.9–67.5)	62.4 ± 20.9 (51.2–73.6)	7.2 ± 14.6 (–0.6–14.9)	.346 (–0.25–0.95)	64
Trad (n = 16) <sup>‡</sup>	57.4 ± 23.2 (45.0–69.7)	67.7 ± 21.8 (56.1–79.3)	10.3 ± 13.4 (3.2–17.5)	.540 (0.06–1.14)	71

\* Percentile standing of the average intervention participant relative to the average control participant.

<sup>†</sup> The tele group received the intervention from a therapist using teletechnology.

<sup>‡</sup> The trad group received the intervention from a therapist physically present in the home.

CI = confidence interval.

Finally, the study suggests that televideo and traditional methods for providing in-home rehabilitation can be effective. Although these analyses are only exploratory because of the small sample size in each group ( $n = 16$ ), they nonetheless have important implications for the delivery of OT/PT services in the home. Travel time and distance pose significant challenges to provision of traditional in-home rehabilitation services. Local specialists capable of providing in-home care may be limited, particularly in rural areas, and the cost associated with practitioners traveling large distances typically restricts the provision of in-home services to small geographic areas. Moreover, when in-home rehabilitation is provided, the continuity of care is often compromised, because the therapist providing care is seldom the same individual who provided inpatient services. Televideo may help address this problem in several ways—home health nurses might use it to provide therapists with important information before a home visit, increasing efficiency and effectiveness; it could be used in consultation with providers who treated the patient in the hospital, improving coordination of care; and it could be used for cost-effective follow-up after an in-home OT/PT visit. The results from this study are encouraging for the potential utility of televideo as a way to meet needs for in-home OT/PT.

The population of interest in this study included adults who had been recently prescribed a walker or wheelchair, regardless of etiology or falls history. This resulted in a heterogeneous study group and did not lend itself to a uniform, one-size-fits-all type of intervention. This group is a realistic representation of the typical patients seen for in-home rehabilitation, for whom interventions need to be individualized and for whom the therapist–patient, real-time interaction is vital. Although the protocol was standardized to include exercises, adaptive strategies, adaptive devices, and home modifications, all components of the intervention could be individualized to the unique skills, needs, and homes of the patient. Quite possibly, the interactive, didactic nature of the intervention contributed to the positive changes in self-efficacy in the IGs. Feedback and positive reinforcement from the therapist for appropriate task behavior coupled with specific recommendations and strategies to improve performance as needed should increase the odds of successful outcomes and thereby serve as powerful motivators for future performance.

### Limitations of the Study

The most obvious limitation of the present study was the small sample size, which prohibited examination of subgroups such as race, sex, and type of mobility aid prescribed and limited the power to determine the statistical significance of the mode of intervention delivery. Although the patients studied were a heterogeneous group of persons with mobility disorders, the study sample was predominantly drawn from one VAMC, which may limit generalizability to the private sector. In addition, it may be difficult to generalize results to the geriatric population, because the study was not limited to older individuals (e.g., persons aged  $\geq 65$ ). Studies have shown that the Department of Veterans Affairs (VA) population is frailer and sicker at a younger age than the non-VA population.<sup>43</sup> The dropout rate of 20%

over the course of the study is another limitation. Although the dropout rate did not differ according to study group, it is not known how the dropouts might have responded had they stayed in the study. Finally, the small sample size limits the statistical power of the study. In particular, the televideo method of delivery just missed statistical significance, and the in-person method just reached statistical significance. This is most likely due to the small sample size of the two IGs. Although the CIs for the standardized effect size of the two delivery modalities overlap, it is possible that in person is a more potent way of delivering the intervention than is televideo. Nonetheless, the results of the exploratory analyses comparing the two intervention delivery methods are encouraging for the use of teletext technology to deliver OT/PT interventions such as this, and it warrants further study. This is particularly important, because in-home rehabilitation, although proven to be effective, suffers from limited resources.<sup>44</sup> As a result, teleconferencing technology may offer the best opportunity to maximize therapists' access to patients in their homes.

Access to the home, whether in person or via video teleconferencing, enables therapists to observe and assess patients performing tasks in their own homes to make adjustments, change and provide new prescriptions for adaptive methods, and suggest home modifications and assistive technologies that patients would otherwise not receive. However, an increase in program outlays for home health in the 1990s has been a key concern in recent Medicare policy for home health.<sup>45</sup> Indeed, the costs of providing in-home rehabilitation have precluded broad implementation of interventions<sup>9</sup> that have been shown to be beneficial when provided in the home. The intervention developed for this study was designed to be consistent with the more-limited reimbursement available for in-home rehabilitation under prospective payment, to be consistent with current rehabilitative clinical practice, and to supplement rather than substitute for extant therapies that might be provided in the inpatient or outpatient setting. The results support the feasibility of using televideo technology to provide this intervention. Televideo technology has the potential to facilitate continuity of care with the inpatient/outpatient therapist, as well as maximize the efficiency of care by the home health therapist. It is vital that cost-effective ways of meeting the needs of older people for in-home rehabilitation be identified.

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**Author Contributions:** Jon A. Sanford was principal investigator of the project and was responsible for oversight of all aspects of the project and preparation of the manuscript. Patricia C. Griffiths was project manager and was involved in data entry, production of tables, data analysis, and manuscript preparation. Peg Richardson was

involved in developing the intervention, recruitment, delivery of the intervention, and manuscript review. Katina Hargraves was involved in recruitment, delivery of the intervention, data acquisition, and manuscript review. Tina Butterfield was involved in development of the intervention, data entry, and manuscript review. Helen Hoenig was the coprincipal investigator on the project and was responsible for the design and development of the intervention, drafting of the manuscript, and all other aspects of the project in collaboration with Jon Sanford.

**Sponsor's Role:** The investigators determined the design, conduct, and analyses.

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