



AOTA Evidence Briefs

Older Adults

**A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

OA#5

Assistive technology and environmental interventions may benefit frail older adults in greater functional independence, less pain, and lower cost

Mann, W. C., Ottenbacher, K. J., Fraas, L., Tomita, M., & Granger, C. V. (1999). Effectiveness of assistive technology and environmental interventions in maintaining independence and reducing home care costs for the frail elderly: A randomized controlled trial. *Archives of Family Medicine, 8*, 210–217.

Level: IA1b

Randomized control trial, 20 or more participants per condition, high internal validity, moderate external validity

Why research this topic?

There has been little research on the effectiveness of “assistive technology” devices (walkers, bath benches, etc.) and “environmental interventions” (addition of ramps, lowering of cabinets, etc.) in increasing the independence of older adults. Further, there has been no research on the potential of these devices and interventions to reduce home health care costs.

What did the researchers do?

Mann and his colleagues, variously of the University of Buffalo (New York) and the University of Texas Medical Branch (Galveston), sought to rectify the situation by evaluating the effectiveness of assistive technology and environmental interventions in promoting the independence of frail older adults and reducing their health care costs.

At the beginning of the study, there were 104 participants, who had been referred by (a) a county agency providing services to homebound older adults eligible for Medicaid, (b) hospital physical medicine and rehabilitation programs providing short-term rehabilitation, or (c) a visiting nurses association serving both Medicare- and Medicaid-eligible people. Thirty-one of the participants were men, 73 women. Their average age was 73 years. All met the study's eligibility requirement of a score greater than 23 on the Mini-Mental State Examination (MMSE), indicating no cognitive impairment (as measured by the MMSE). All also had difficulty with one or more areas of the motor section of the Functional Independence Measure (FIM™). Forty reported fair or poor vision. By the end of the study, 14 participants had withdrawn or died.

The researchers randomly assigned the participants to one of two groups: intensive services or standard care. Intensive services included a comprehensive functional assessment of the participant and his or her home by an occupational therapist, recommendations for needed assistive devices and home modifications, provision of the devices and modifications, training in their use, and continued follow-up as needs changed. A nurse and a technician experienced in home modification assisted the therapist.

Standard care consisted of various home-based services for older adults: medical services following hospitalization and rehabilitation, nursing services (home health care aids and some medical interventions), and nonmedical services such as Meals-on-Wheels and assistance with shopping.

All participants were visited in their home every 6 months for 18 months. They also were contacted by telephone every month regarding problems they were experiencing.

The outcome areas of interest to the researchers were *functional independence* (as measured by the total score on the FIM™ and the cognitive and motor subsections; the instrumental-activities-of-daily-living measure of the Older Americans Research and Services Center Instrument; and the physical independence, mobility, occupation, and social integration subsections of the Craig Handicap Assessment and Reporting Technique); *pain* (as measured by the Functional Status Index); and *health care costs* (as indicated by equipment, personnel, and institutional expenses). Assessments were made before the study began and every 6 months afterward until it ended.

What did the researchers find?

Over the 18 months, both groups declined **significantly** (see *Glossary*) on the FIM™ total score and on its motor and cognitive measures; on the instrumental-activities-of-daily-living measure of the Older Americans Research and Services Center Instrument; and on the social integration subsection of the Craig Handicap Assessment and Reporting Technique. The standard-care group also increased significantly (experienced more pain) on the Functional Status Index and declined significantly on the motor and cognitive subsections of the FIM™.

The researchers failed to provide information about significance levels and **effect sizes** (see *Glossary*) (although they reported computing effect sizes [d-indexes] for *t*-tests).

A comparison of the two groups showed significant differences between them on FIM™ motor scores, Functional Independence Measure total scores, and pain scores, all favoring the intensive services group.

In terms of costs, the intensive services group spent significantly more than the standard-care group on assistive technology devices and environmental interventions. The standard-care group spent significantly more on institutional care, nurse visits, and case manager visits. There was **no significant** (see *Glossary*) difference between the groups in total costs, but the effect size was large, with the intensive services group spending an average of \$14,173, and the standard-care group an average of \$31,610.

What do the findings mean?

For therapists and other providers, the findings suggest that assistive technology and environmental interventions will benefit frail older adults in greater functional independence, less pain, and lower costs.

What are the study's limitations?

The study has several limitations. The sample consisted of volunteers who may have been more motivated than those who declined to participate. Both the control group and experimental group were receiving various in-home services (nursing and rehabilitation) while participating in this study, which may have influenced the results. In addition, the researchers failed to report whether the 14 participants who did not complete the study differed from the 90 who did.

Glossary

effect size (Cohen's r)—An effect size is a measure of clinical significance. It provides information about the magnitude of effect of the treatment. Although related to significance, it is not as influenced by the size of the sample. Therefore, it is possible to have an outcome on which the treatment had a large effect (i.e., the treatment group improved a lot more than the control group) and still have a non-significant result. If the results have a large effect but no significance, this means that this effect may be sample specific and not generalizable outside the study. There are many different types of effect sizes. What is reported here is Cohen's r . Cohen's r can be interpreted in a manner similar to a Pearson's correlation coefficient:

Effect size r	Size of the effect
<0.10	Negligible
0.10 – 0.29	Small
0.30 – 0.49	Medium
>0.50	Large

Cohen, J. (1977). *Statistical power analysis for behavioral sciences*. New York: Academic Press.

nonsignificant or no significance—A statistical term that refers to study findings that are likely to be due to chance differences between the groups rather than to other factors (like the treatment of interest). A nonsignificant result is not generalizable outside the study. Like significance, a nonsignificant result does not indicate the clinical effect. Often, studies will show nonsignificant results, yet the treatment group's mean will be better than the control group's. This is usually referred to as a trend in the right direction. Because significance is closely determined by sample size, nonsignificant results would often become significant if the sample size were increased.

significance (or significant)—A statistical term, this refers to the probability that the results obtained in the study are not due to chance, but to some other factor (such as the treatment of interest). A significant result is one that is likely to be generalizable to populations outside the study.

Significance should not be confused with clinical effect. A study can be statistically significant without having a very large clinical effect on the sample. For example, a study that examines the effect of a treatment on a client's ability to walk may report that the participants in the treatment group were able to walk significantly longer distances than the control. However, if you read the study you may find that the treatment group was able to walk, on average, 6 feet, while the control group was able to walk, on average, 5 feet. While the outcome may be statistically significant, a clinician may not believe that a 1-foot increase will make his or her client functional.

■ Terminology used in this document is based on two systems of classification current at the time the evidence-based literature reviews were completed: *Uniform Terminology for Occupational Therapy Practice—Third Edition* (AOTA, 1994) and *International Classification of Functioning, Disability and Health (ICIDH-2)* (World Health Organization [WHO], 1999). More recently, the *Uniform Terminology* document was replaced by *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2002), and modifications to *ICIDH-2* were finalized in the *International Classification of Functioning, Disability and Health* (WHO, 2001).

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For more information about the Evidence-Based Literature Review Project, contact the Practice Department at the American Occupational Therapy Association, 301-652-6611, x 2040.



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