
Occupational Therapy Interventions to Improve Performance of Daily Activities at Home for Older Adults With Low Vision: A Systematic Review

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MeSH TERMS

- activities of daily living
- age factors
- occupational therapy
- outcome assessment (health care)
- vision, low

The impact of age-related vision loss on older adults' independence at home is profound. The purpose of this systematic review was to identify the effectiveness of interventions within the scope of occupational therapy practice to maintain, restore, and improve performance in daily activities at home for older adults with low vision. We searched and screened abstracts from multiple electronic databases and identified 17 studies that fulfilled our inclusion and exclusion criteria. Three themes in intervention approaches emerged: multicomponent intervention, single-component intervention, and multidisciplinary intervention. Strong evidence of effectiveness was found in studies that applied a multicomponent approach; these interventions involved teaching knowledge and skills that older adults with low vision need to help overcome the disablement process. Evidence also suggests that multiple sessions of training with low vision devices and special viewing skills to compensate for vision loss are necessary to have a positive effect on daily activities. Finally, multidisciplinary intervention that focused on personal goals yielded greater positive outcomes than interventions that were not personalized.

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Activities of daily living (ADLs) and instrumental activities of daily living (IADLs) are two essential occupations in the scope of occupational therapy practice. We conducted a systematic review to inform occupational therapy practitioners, educators, and researchers regarding results of recent, high-quality clinical trials that examined the effectiveness of interventions within the scope of occupational therapy to maintain, restore, and improve ADLs and IADLs at home for older adults with low vision. The review addressed the following focused question: What is the evidence for the effectiveness of interventions within the scope of occupational therapy to maintain, restore, and improve performance in ADLs and IADLs at home for older adults with low vision?

Background and Statement of Problem

In 2011, the first wave of baby boomers reached age 65. This quickly growing older population will soon raise the demand for occupational therapy services to remain independent at home as their physical and mental capacities decline. The *Centennial Vision* of the American Occupational Therapy Association (AOTA; 2007) identifies low vision services as an emerging area of practice. Research is constantly evolving and serves as a primary means to advance and validate knowledge of occupational therapy intervention. To help current and future occupational therapy practitioners better serve older adults with vision loss and to help occupational therapy researchers understand the status of current low

vision rehabilitation research in older adults, we identified, appraised, and synthesized high-quality empirical studies published between 1990 and 2010.

Low vision is a visual impairment that cannot be corrected by regular eyeglasses, contact lenses, medication, or surgery, and it interferes with the ability to perform everyday activities (National Eye Institute, 2010). This definition implies that low vision is more than a vision problem, even though most epidemiological studies have used visual acuity <20/40 in the better seeing eye as the single criterion for low vision (Congdon et al., 2004; Horowitz, 2004). Epidemiological studies using this visual acuity criterion have found that the prevalence of low vision increases from 1% to 4% from ages 65 to 79 and, after age 80, increases dramatically to 17% (Congdon et al., 2004).

Age-related macular degeneration (AMD), glaucoma, diabetic retinopathy, and cataracts are the four main causes of low vision in older adults (Congdon et al., 2004; Horowitz, 2004). These conditions result in progressive and, in most cases, irreversible vision loss that poses a threat to functional independence for older adults. Although older adults also suffer from hearing loss, the threat to independence from low vision is greater than from hearing loss (Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002a). Among many vision factors, visual acuity and contrast sensitivity are the two most frequently measured, and both are highly associated with the ability to perform ADLs and IADLs (Burmedi et al., 2002a; Haymes, Johnston, & Heyes, 2002; West et al., 2002).

Low vision adversely affects many daily activities, such as writing a check, telling time, looking for daily items, using a phone, managing medications, and preparing a meal. A considerable body of literature has demonstrated a strong linear relationship between low vision and the inability to perform ADLs and IADLs in older adults (Burmedi et al., 2002a; Girdler, Packer, & Boldy, 2008; Haymes et al., 2002; Rudman, Huot, Klinger, Leipert, & Spafford, 2010; Stevenson, Hart, Montgomery, McCulloch, & Chakravarthy, 2004; West et al., 2002; Windham et al., 2005). Older adults with low vision struggle to maintain participation in important occupations; eventually, the deteriorating vision forces them to relinquish occupations, reduce physical and social life spaces, and lose occupational roles (Girdler et al., 2008; Rudman et al., 2010; Stevenson et al., 2004).

The impact of low vision on older adults is multi-layered. Older adults with low vision undergo not only functional changes but also emotional changes. Depression is a common comorbidity of low vision, particularly if the vision loss is caused by AMD (Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002b; Casten, Rovner,

& Tasman, 2004; Rovner & Casten, 2002). The presence of depression can aggravate the disabling effects of low vision (Casten, Edmonds, & Rovner, 2002). Researchers have shown that older adults with low vision experience frequent errors and loss of speed while performing occupations (Owsley, McGwin, Sloane, Stalvey, & Wells, 2001; West et al., 2002; Windham et al., 2005). These experiences can lead to frustration, embarrassment, and self-doubt (Teitelman & Copolillo, 2005).

Vision loss causes a misfit between a person and his or her environment (Wahl, Oswald, & Zimprich, 1999), so performing daily tasks becomes challenging even in a familiar environment such as the home. When options for medical or surgical interventions are limited, low vision rehabilitation is the best approach to address age-related low vision (Watson, 2001). Because, as defined, low vision is irreversible, it is practical to modify the environment to eliminate the lack of fit between the person and the environment. Occupational therapy practitioners who work in low vision rehabilitation often recommend environmental modifications, facilitate independence in ADLs and IADLs, and teach application of optical devices in daily activities (Copolillo, Warren, & Teitelman, 2007). In general, strategies that occupational therapy practitioners use include, but are not limited to, teaching clients how to use low vision devices (optical and non-optical); changing the environment consistent with principles of lighting, contrast, size, pattern, and organization; and promoting the use of sensory and cognitive functions (Ellexson, 2004; Gilbert & Baker, 2011).

Although occupational therapy has long been involved in low vision rehabilitation (Warren, 1995), few systematic reviews have evaluated the effects of occupational therapy in older adults with low vision. As part of the evidence-based literature review project initiated by AOTA, this study focused on the review of empirical evidence that addresses interventions within the scope of occupational therapy to maintain, restore, and improve ADLs and IADLs at home for older adults with low vision.

Method for Conducting the Evidence-Based Review

An in-depth description of the methodology used in this systematic review can be found in "Methodology for the Systematic Reviews on Occupational Therapy Interventions for Older Adults With Low Vision" in this issue (Arbesman, Lieberman, & Berlanstein, 2013). This section provides a brief overview of the literature screening and quality rating related to this particular review.

During the screening process, the criterion of low vision was met (1) when the term *low vision* or *visual impairment* was used in the article; (2) when study participants had a diagnosis of AMD, cataracts, diabetic retinopathy, or glaucoma; or (3) when a specific level of visual acuity was used as a cutoff for low vision in participant recruitment. The scope of occupational therapy practice, ADLs, and IADLs were defined consistent with the *Occupational Therapy Practice Framework: Domain and Process* (2nd ed.; AOTA, 2008). In the initial screening phase, two reviewers (Brost and Horton or Kenyon and Mears) screened each study title and abstract independently to see whether it met the predefined inclusion and exclusion criteria. If the title and abstract did not provide sufficient information, the reviewers appraised the full text. In the second screening phase, the reviewers examined the full text of potential eligible studies. When the two reviewers disagreed, a third reviewer (Liu) was consulted to make the final decision about the study's eligibility for further review.

Studies selected after screening then underwent a review to ascertain the quality of research. Study authors' names, affiliated institutions, and journal names were blinded to assigned reviewers in order to ensure unbiased assessment. A 24-item questionnaire developed by MacDermid (2004) was used to assess the quality of research. The 24 items assess the quality of a study in seven areas: question, design, participants, intervention, outcomes, analysis, and conclusions and clinical recommendations. Each item was given a score of 0, 1, or 2; a higher score indicates higher satisfaction. The total quality score (TQS) of a study is the sum score of these 24 items divided by 48; thus the highest possible TQS is 1.

Two reviewers rated the quality of research independently and then met to discuss results. When they did not reach consensus on any result, the third reviewer was consulted, and the three discussed the issues until they reached agreement. Finally, the reviewers carefully appraised and synthesized information on participant characteristics, study design, intervention, and outcomes for each study.

Results

The electronic database search yielded 510 records. We also received 107 records from a related evidence-based literature review project (Justiss, 2013). Colleagues who were aware of this review referred two additional studies for consideration. Review of titles and abstracts of these studies reduced the number of records to 41. We identified an additional 10 studies in the references of these 41 studies. After screening the full texts and removing

duplicates, we selected 17 studies for this review (9 Level I studies, 5 Level II studies, and 3 Level III studies). Findings from these 17 studies were published in 23 articles. Supplemental Table 1 summarizes the studies reviewed (available online at <http://ajot.aotapress.net>; navigate to this article, and click on "Supplemental Materials").

Quality of Research

The degree of research quality echoed the level of evidence. For Level I studies, the TQS ranged from .69 to .92, with a mean of .81. For Level II studies, the TQS ranged from .56 to .84, with a mean of .69. For Level III studies, the TQS ranged from .40 to .67, with a mean of .57.

Characteristics of Studies

Study Participants. The mean age of study participants ranged from 69 to 82 yr. The majority of participants were in their late 70s or early 80s. AMD was the most common low vision condition in all studies. Eight trials recruited older adults with AMD exclusively (Birk et al., 2004; Brody et al., 2002; Brody, Roch-Levecq, Thomas, Kaplan, & Brown, 2005; Dahlin Ivanoff, Sonn, & Svensson, 2002; Eklund & Dahlin-Ivanoff, 2007; Eklund, Sjöstrand, & Dahlin-Ivanoff, 2008; Eklund, Sonn, & Dahlin-Ivanoff, 2004; Nilsson, 1990; Reeves, Harper, & Russell, 2004; Scanlan & Cuddeford, 2004; Smith, Dickinson, Cacho, Reeves, & Harper, 2005; Vukicevic & Fitzmaurice, 2009).

Outcome Measures. Most outcome measures related to ADLs or IADLs were self-report, standardized questionnaires. Some questionnaires assessed other functional or health domains in addition to ADLs and IADLs; for example, the 25-item National Eye Institute Visual Functioning Questionnaire (Mangione et al., 2001) includes questions related to the impact of vision loss on health, daily activities, driving, locus of control, and social participation. Therefore, we could not separate results specific to ADLs and IADLs from other domains in these questionnaires.

Synthesis of Study Findings

We identified three intervention approach themes according to the number of components and the number of disciplines involved in the intervention: (1) multicomponent intervention, (2) single-component intervention, and (3) multidisciplinary intervention. The following sections report study findings by intervention approach theme.

Multicomponent Intervention. For studies in the multicomponent intervention theme, interventions included multiple components to target different aspects of low vision, and participants met in small groups weekly for 5–8 wk. Occupational therapists, social workers, or other trained

health professionals led the groups. The components included teaching of knowledge about low vision, training in the use of low vision devices, training in problem-solving skills, training in relaxation skills, and exchange of low vision information and resources. Participants learned and discussed one component each week. Homework was typically assigned to help participants apply learned skills at home.

Four studies incorporated a multicomponent intervention. Two randomized controlled trials (RCTs) implemented self-management programs drawing on research in the area of chronic disease self-management (Brody et al., 2002, 2005; Girdler, Boldy, Dhaliwal, Crowley, & Packer, 2010; Packer, Girdler, Boldy, Dhaliwal, & Crowley, 2009). A third RCT implemented a health education program (Dahlin Ivanoff et al., 2002; Eklund & Dahlin-Ivanoff, 2007; Eklund et al., 2004, 2008). The health education program was based on the Health Belief Model and the concept of self-efficacy (Rosenstock, Strecher, & Becker, 1988). The occupational therapists who led the health education program provided information and skills training focused on eight occupations. The goal of the program was to sustain and restore participants' performance of ADLs. Other health professionals were invited to the group to provide information on low vision.

The fourth study, a Level II study, applied six modules of psychosocial intervention: progressive muscle relaxation; exchange of experience in vision loss; increase in awareness of thought, emotion, and behavior; increase in awareness of resources; problem solving; and exchange of information (Birk et al., 2004). The purpose of this psychosocial intervention was to help older adults with AMD adapt to vision loss.

Among the 4 studies that used a multicomponent intervention, 1 recruited participants with severe vision loss (Dahlin Ivanoff et al., 2002; Eklund & Dahlin-Ivanoff, 2007; Eklund et al., 2004, 2008), whereas the others included participants with a range of visual impairments (Birk et al., 2004; Brody et al., 2002, 2005; Girdler et al., 2010; Packer et al., 2009). Additionally, all studies in this theme demonstrated significant positive outcomes at the end of the intervention (Birk et al., 2004; Brody et al., 2002, 2005; Dahlin Ivanoff et al., 2002; Eklund & Dahlin-Ivanoff, 2007; Eklund et al., 2004, 2008; Girdler et al., 2010; Packer et al., 2009). Of the 3 studies that included follow-up assessments, the effect on ADLs and IADLs was maintained in some of the participants (Brody et al., 2002, 2005; Dahlin Ivanoff et al., 2002; Eklund & Dahlin-Ivanoff, 2007; Eklund et al., 2004, 2008; Girdler et al., 2010; Packer et al., 2009).

Single-Component Intervention. Studies in the theme of single-component intervention focused on one type of

intervention. Four studies focused on training in using low vision devices. Among these 4 studies, 2 RCTs and 1 Level II study compared multiple sessions of training to either one session of training (Nilsson, 1990; Scanlan & Cuddeford, 2004) or attention control (Stelmack, Moran, Dean, & Massof, 2007; Stelmack et al., 2008). All 3 studies found favorable results for the intervention group, indicating that multiple sessions of training are more beneficial than one session of training or no training. Of these 3 studies, 1 recruited participants with severe vision loss (Nilsson, 1990), and the other 2 included participants with various degrees of vision loss (Scanlan & Cuddeford, 2004; Stelmack et al., 2007, 2008).

The last study in this theme is a Level II study (La Grow, 2004) that compared a comprehensive low vision service (a preclinical assessment, an initial low vision examination, training with any low vision device, and a follow-up home visit) with multiple skills training (independent living skills, orientation and mobility, communication, and recreational and leisure activities) in participants with moderate or greater vision loss. Multiple skills training served as the control condition. The researchers found no statistical differences between the two groups in ADL and IADL ability.

Four other studies that used a single-component intervention focused on the effect of wearing prisms, eccentric viewing training, home visits by service teachers, or lighting adjustment at home. One RCT compared wearing custom prisms with wearing standard prisms or nonprism spectacles at home for 3 mo (Smith et al., 2005). The participants had vision loss ranging from mild to severe, and no differences were found between groups. One Level II study compared eight training sessions of eccentric viewing at home with an attention control in participants with severe vision loss (Vukicevic & Fitzmaurice, 2009). With *eccentric viewing*, the client uses peripheral vision by relocating fixation to a functioning area of the retina that is away from the central scotoma. The study showed a significant improvement in ADL outcomes in the intervention group.

One Level III study evaluated outcomes of home visits by service teachers and found no improvements in ADL outcomes (Engel, Welsh, & Lewis, 2000). Another Level III study evaluated the effect of basic lighting adjustment in the kitchen, hall, and bathroom in the homes of participants with mild to severe vision loss (Brunnström, Sörensen, Alsterstad, & Sjöstrand, 2004). The researchers found significant improvements in two kitchen tasks: pouring a drink and slicing bread.

Multidisciplinary Intervention. Five studies evaluated the approach of using a multidisciplinary low vision rehabilitation

team. In 4 of these studies, an occupational therapist was reported as being a member of the intervention team (de Boer et al., 2006; Lamoureux et al., 2007; McCabe, Nason, Demers Turco, Friedman, & Seddon, 2000; Pankow, Luchins, Studebaker, & Chettleburgh, 2004).

One study, an RCT, examined the effect of tailoring the intervention to meet participants' personal rehabilitation goals (Pankow et al., 2004). The researchers found that the intervention group had significantly greater gains in living skill performance than the control group, which received regular services that were not tailored. A Level II study compared a multidisciplinary intervention with a single-disciplinary intervention provided by an optometrist (de Boer et al., 2006). Participants in both interventions showed improvements in reading and doing fine work after 1 yr, but no statistical differences were found between the two intervention groups. Although no differences were found, it is worth noting that the optometrist provided training in using low vision devices in addition to prescribing these devices. In addition, Lamoureux and colleagues (2007) performed a program evaluation of a rehabilitation team and demonstrated that participants who received a combination of occupational therapy and mobility and orientation services showed significant improvement in mobility and independence.

The other 2 studies evaluated the effect of extra services in addition to regular services provided by the low vision rehabilitation team. McCabe and colleagues (2000), in an RCT, compared results between two groups that both received multidisciplinary low vision rehabilitation. The intervention group included family members in all training sessions, whereas the control group excluded family members from training sessions but offered family education afterward if requested. Both groups improved in ADL and IADL outcome measures, but no differences were found between groups.

In another Level I study, Reeves and colleagues (2004) evaluated the effect of providing home visits. The intervention group received three home visits in addition to conventional low vision rehabilitation. In comparing all three groups (i.e., intervention group, usual care group, and usual care with attention control group), the researchers found no significant difference when home visits were added.

Discussion and Implications for Practice, Education, and Research

The purpose of this review was to evaluate the effectiveness of interventions within the scope of occupational therapy to maintain, restore, and improve ADLs and IADLs at

home for older adults with low vision. We appraised 17 studies and found three intervention themes: multicomponent intervention, single-component intervention, and multidisciplinary intervention. We found robust evidence in support of multicomponent intervention and single-component intervention when delivered over multiple training sessions. We also found evidence that tailoring multidisciplinary intervention to participants' goals and including occupational therapy can improve independence at home for older adults with low vision.

Evidence indicates that multicomponent group interventions for older adults with low vision are an effective approach. The multicomponent interventions in the reviewed studies taught strategies to deal with various issues older adults with low vision faced at home. Older adults learned new knowledge or skills each week. The programs ran for several weeks, allowing participants to apply learned knowledge and skills in their living environment even though the intervention did not directly occur at home. Additionally, the small-group format provided social support.

Some multicomponent low vision interventions stem from chronic disease self-management research (Brody et al., 2002, 2005; Girdler et al., 2010; Packer et al., 2009). In such programs, people are regarded as their own principal caregivers, and they learn problem-solving skills to manage their own health (Bodenheimer, Lorig, Holman, & Grumbach, 2002). The relationship between the health care provider and the client follows a collaborative partnership paradigm, which is assumed to help older adults take charge of their own health.

Results from studies of single-component interventions suggest that multiple sessions of training in use of low vision devices or eccentric viewing improve older adults' independence at home. Previous research has indicated that clients' satisfaction with low vision rehabilitation services depends on their ability to successfully identify and learn to use low vision devices (Copolillo & Teitelman, 2005). In the study that applied multiple sessions of eccentric viewing at home, the researchers used a computer program for the training (Vukicevic & Fitzmaurice, 2009). The length of eight training sessions was chosen on the basis of the researchers' pilot study, in which participants' progress stalled at the fourth or fifth session but showed continued improvement after six training sessions. These findings highlight the importance of providing sufficient training in low vision devices and eccentric viewing for older adults with low vision.

This systematic review also suggests that multidisciplinary intervention, especially when the intervention is tailored to the client's goals, can result in positive outcomes. Surprisingly, one study showed no benefits of adding home

visits to conventional low vision rehabilitation (Reeves et al., 2004). The nonsignificant finding may be attributable to the fact that the outcome measure, which mainly evaluated reading tasks, did not capture the intervention's effect on ADL or IADL improvement. Another study examined the effect of involving family members in all training sessions but did not find better results compared with a usual rehabilitation service (McCabe et al., 2000). Older adults with low vision may not understand the necessity of having family members present in the treatment session. In a previous low vision self-management study (Dahlin-Ivanoff, Klepp, & Sjöstrand, 1998), participants expressed the opinion that no family members should participate in their group sessions because the program was designed to enable people with problems with ADLs to manage on their own; they also reported that they would consider the situation differently if the people were more dependent on assistance with ADLs. These results indicate that having family members simply present in the rehabilitation sessions may not lead to improved performance in clients' ADLs and IADLs.

Implications for Practice

Age-related vision loss is a progressive condition. Older adults living with visual impairment need more than low vision devices to perform ADLs and IADLs. To maintain their daily occupations at home, they need a set of skills to deal with day-to-day challenges. This review indicated that multiple components and multiple training sessions are the key to low vision intervention for older adults. The intervention must cover knowledge of low vision, use of low vision devices, problem-solving strategies, and community resources. These components can be taught through a self-management program, a patient education program, or a multidisciplinary team. Moreover, the intervention must last for multiple sessions so that older adults have sufficient time to adopt new knowledge and skills into daily activities.

Implications for Education

The demand for occupational therapy services in the area of low vision rehabilitation will increase dramatically in the next few decades in parallel with the fast-growing older adult population. AOTA (2007) has identified low vision services as an emerging area of practice. *Healthy People 2020* has also set objectives to increase the nation's vision health by increasing the use of vision rehabilitation services and the use of assistive and adaptive devices in people with visual impairment (U.S. Department of Health and Human Services, 2011). To meet the demand for low vision services for older adults, content on low

vision rehabilitation is needed in entry-level occupational therapy education. Continuing education on low vision rehabilitation must also be available for current practitioners. We suggest that educational programs on low vision for occupational therapy students and practitioners include multicomponent training content because such training is the trend in low vision rehabilitation best supported by the evidence. Multicomponent training can help older adults gain knowledge about low vision conditions, use of low vision devices, problem-solving skills, and low vision resources, providing them with a set of skills to overcome barriers when performing daily tasks.

Implications for Research

Research on low vision interventions within the scope of occupational therapy to maintain or improve ADLs and IADLs at home for older adults with low vision is growing rapidly. Research that examines the effect of occupational therapy, however, is still sparse. Of the Level I studies we reviewed, only 2 included interventions led by occupational therapists (Eklund et al., 2008; Girdler et al., 2010). More research in this area is needed to support the unique contribution of occupational therapy to low vision rehabilitation for older adults. Additionally, AMD has been the most studied low vision condition. Studies with people who have visual conditions other than AMD are needed to help occupational therapy practitioners tailor intervention strategies to people with different low vision conditions.

As with most research, this review has limitations. First, although we searched multiple electronic databases for potential eligible studies, some studies may not have been captured by our search terms. Second, studies in this review recruited a high proportion of participants with AMD, so generalization of review results to people with other low vision conditions may be limited. Finally, some studies used outcome measures that focused on well-being as well as ADL and IADL performance, which may have obscured the ADL and IADL outcomes reported in this review.

Conclusion

Although age-related vision loss is irreversible, the disablement process in older adults with low vision can be slowed. The results of this review suggest that occupational therapy has the potential to maintain, restore, or improve ADL and IADL performance at home in older adults with low vision. The findings of this review yield two principles for occupational therapy practitioners:

1. Multicomponent interventions that cover knowledge of low vision, use of low vision devices, problem-solving strategies, and community resources are the most effective approaches.
2. Multiple sessions of training allow sufficient time for older adults to incorporate new knowledge and skills into daily activities. ▲

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