International Handbook of Occupational Therapy Interventions

Chapter 13
Low Vision Intervention: Decision-Making for Acquiring and Integrating Assistive Technology

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> *The occupational therapist and optometrist were very helpful and introduced me to a lot of technology. The OT had a pretty good grasp of the technology and was fairly abreast of what was available. I take my hat off to her.*
>
> —Client

Abstract Occupational-therapy intervention can enable strong, independent decision-making primarily related to assistive device acquisition and use for clients with *low vision*. In developed nations, occupational therapists provide interventions for older adults with acquired vision impairments more frequently than for any other population. Therefore, the information here will be applicable mostly to that age group. This chapter explores two main topics: (1) the decision-making process involved in acquiring and integrating low-vision assistive technology for clients with low vision, and (2) the types of assistive technologies available to clients with low vision.

Keywords Assistive technology • Low vision.

Definition of Assistive Low-Vision Technology

Low-vision assistive technology is any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional visual capabilities of an individual with a disability (adapted from the general definition of the U.S. Assistive Technology Act of 2004).

Categories of low-vision assistive devices are as follows:

- *Hand-held magnifier:* portable magnifier designed to be carried by the user.
- *Stand magnifier:* magnifier placed over the material to be viewed; designed primarily for reading, in a stationary situation, usually while the user is sitting at a table.

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- *Closed-circuit television* (CCTV): a video magnifier; items to be viewed are placed under a camera, and magnified images are projected onto a television screen for easier viewing.
- *Controlled area lighting:* high-intensity, glare-controlled light for reading and detail work.
- *Screen magnification and voice output readers:* accessories or software available to assist with computer use.
- *Activities of daily living (ADL)/instrumental activities of daily living (IADL) adaptive devices:* a variety of low-vision devices used throughout the home and community to enhance visibility, reduce risk of injury, or enable use of other senses to compensate for vision loss.

Background

Persons with vision impairment require substantial assistance to acquire low-vision assistive devices and integrate them into their daily routines. Since visual input is so essential to searching for and examining the wide range of assistive technologies one might choose, the vision impairment itself poses a considerable barrier to accessing the technologies. Persons with vision impairment must often rely on others for this process, especially in cases of severe vision loss. The information they receive comes from a variety of sources of varying degrees of reliability. Occupational therapy from skilled low-vision specialists that simplifies access to assistive technology is, therefore, greatly appreciated, and often life-changing for persons with low vision and blindness. However, for this population, improving access meets only part of the need. Other important components of successful intervention include assisting the low-vision client to choose the right technology by experimenting with a variety of devices; customizing use through exploration of specific device characteristics; moving from controlled, therapist-guided device acquisition and use to independence in the natural environment; and adjusting to lifestyle changes imposed by vision impairment.

Purpose

The main purpose of using low-vision assistive technology (AT) is to optimize usable vision and compensate for vision loss. Persons with low vision use assistive technology mainly for reading and writing. Therefore, ADLs requiring these skills, such as reading medicine bottles or recipes, paying bills, and reading mail are often improved with AT. Reducing the risk of injury is another main purpose for the use of AT. For example, simple devices that improve depth perception and contrast on stairs or reduce the potential for spilling hot liquids are frequently used.

Method

Candidates for the Intervention

Major causes of blindness worldwide are cataract, glaucoma, and age-related macular degeneration. The most prevalent diseases leading to blindness and low vision in developed nations are macular degeneration, diabetic retinopathy, and glaucoma. Occupational therapists (OTs) provide services to clients with these diagnoses but also design interventions for people with vision loss from stroke, traumatic brain injury, and multiple sclerosis.

Epidemiology: World Statistics on Vision Impairment

World Health Organization data from 2002 set the worldwide prevalence of vision impairment in excess of 161 million people, of whom 37 million were blind (Resnikoff et al., 2004). The prevalence of blindness in developed countries is typically less than 0.3%, but increases to greater than 1% in the least developed countries.

Cataract, typically remediated through ocular surgery in developed countries, is the leading cause of blindness and low vision in developing countries and globally, due to increased incidence plus the limited availability of surgery (Resnikoff et al., 2004). Throughout the world, the prevalence of visual impairment is substantially greater for people with diabetes (Center for Disease Control and Prevention, 2004).

Settings

Service Provision Process

Low-vision rehabilitation services are provided in a variety of health system contexts and by health professionals with a wide range of training backgrounds, including low-vision specialists, vision rehabilitation teachers, orientation/mobility specialists, and OTs. Among the specialists in low-vision rehabilitation, OTs typically obtain training through continuing education and post-degree programs and courses (Copolillo et al., 2007). Throughout the world, there is a vast shortage of low-vision health care practitioners trained to provide rehabilitation services (American Foundation for the Blind, 1999). This represents a barrier to adequate care of persons with vision impairment and reduces the potential for obtaining and using devices in a timely and effective manner.

When low-vision rehabilitation services are available, referral by ophthalmologists and other physicians is limited and often delayed (Crews, 2000). Patients who may have benefited from rehabilitation early in the disease process frequently become

aware of such programs only after their vision impairments have become severe. Anecdotal evidence from practitioners indicates that intervention early in a progressive eye disease process can be highly beneficial because it is easier to learn to use adapted strategies, apply methods for finding AT, and make appropriate environmental adaptations when available vision is at its highest. As low vision approaches blindness in progressive eye diseases, the challenges to learning and initiating adaptive strategies for the first time become substantially greater and decrease the potential for success.

Types of Low-Vision Services

Low-vision rehabilitation services are provided in both group and individual therapeutic venues. Health-promotion and self-management programs are effective methods for teaching persons with low vision and blindness about available assistive technologies and their application. Group interactions provide opportunities for individuals to make decisions about what devices to acquire and how to integrate them into their lives (Brody et al., 2002, 2005; Ivanoff et al., 2002).

Within some health care systems, occupational therapy practitioners primarily intervene with clients with low vision on a one-to-one basis. Patients are seen in low-vision rehabilitation programs, typically with a two-person rehabilitation team consisting of either an ophthalmologist or optometrist and an OT. Additional professional services may be provided regularly by psychologists, nurses, or orientation/mobility specialists, but services from these professionals are more frequently acquired through referral from the low-vision rehabilitation team.

In a low-vision rehabilitation program, the physician conducts detailed eye examinations and interviews patients to determine the extent of their disability. The physician prescribes optics and identifies appropriate magnification and lighting needs. The OT collects specific information about the client's performance of basic ADL and IADL, work skills, and recreation and leisure activities, thus taking the basic results of the physician's vision testing and identifying the impact of the vision loss on performance of daily activities. The OT's evaluation leads to interventions that assist the client in performing desired activities by further identifying the functional extent of usable vision and teaching the client to make the best use of it (Warren, 1995; Warren et al., 2006).

The Role of the Occupational Therapist

Occupational-therapy practitioners working in low-vision rehabilitation collaborate with their clients to develop multifaceted interventions. Identification and use of all available vision and compensation for vision loss are the primary objectives. Activities that rely particularly on reading skills and mobility are frequently at the core of the intervention. Therefore, technologies that improve the ability to read,

increase safety and ease of mobility, improve performance of IADL, and, on a lesser scale, basic ADL are identified and explored in the rehabilitation process.

Results

Clinical Application

Making Decisions About Use of Assistive Technology

As part of the process of acquiring new skills in rehabilitation, the client is assisted in finding the most useful assistive technologies and environmental adaptations for performance of desired activities. The client and therapist work together to perfect the use of the devices and adaptations, primarily through practice in multiple settings and under various conditions. Through exposure to a variety of technology resources, including the Internet and local, national, and international vision associations, the client learns a process of accessing, acquiring, and integrating needed technologies. Clients learn to judge the usability of technology by questioning its application in multiple settings, comparing costs, and seeking or requesting trial use before finally deciding to accept devices for longer-term or permanent use.

Decision-making is a special form of problem solving in which, from a variety of potential solutions, the client identifies the most satisfying outcome (Yates and Patalano, 1999). This requires the OT to compare and contrast possibilities and weigh benefits against obstacles. This complex procedure depends on the client's individual problem-solving strategies. How the problem is defined, life experience, familiarity with the problem, and the impact of the environment all contribute to decision-making (Berg et al., 1998).

Assistive Technologies for Low Vision

A wide variety of assistive technology devices are commercially available to the client with low vision. Low-vision rehabilitation programs often keep devices on site to allow clients to find ones that best fit their needs and practice using them before purchasing or accepting them for ongoing use.

Magnification and Controlled-Area Lighting

The most appropriate and useful technologies for persons with low vision provide the right combination of magnification, controlled-area lighting, and proper contrast for optimizing usable vision. Finding the right magnifiers and lighting options, therefore, are two of the main responsibilities of the OT practitioner working

with persons with low vision. There is a wide range of magnifiers available, typically divided into *stand* and *hand-held* varieties. Stand magnifiers are used on a flat surface. The user learns to place the magnifier over the item to be read or examined and to look through it at an optimal distance and position from it. Stand magnifiers can have lighting attached and can include glare filters. Examples of how a stand magnifier might be used include reading a newspaper, book, or letter while seated at a desk or table. Hand-held magnifiers are designed for the user to carry; their usefulness is in being portable. They are often smaller and lighter than stand magnifiers. The key to their use lies in learning to distance the magnifier correctly from the object to be observed and then to place the head and eyes in the optimal position and at the correct distance from the magnifier. This varies according to the level of magnification of the magnifier and the size of the object. Examples of the use of hand-held magnifiers are reading labels on items in a grocery store, price tags on clothing, dosage on prescription medicine bottles, or menus in a restaurant. High-intensity lighting or filtered lighting to reduce glare are often built into magnifiers or used in combination with them. Figure 13.1 shows both stand and hand-held magnifiers and accompanying lighting systems that improve functional vision.

Closed-Circuit Television

Magnification, lighting, and contrast are also the main features on closed-circuit television (CCTV), which many people with vision impairment regard as a life-changing device (Copolillo and Teitelman, 2005). The user places an item on a platform below the magnifier; the item is enlarged to a set magnification and projected onto a television screen directly in front of the user (Fig. 13.2). For many, the cost of these items is an inhibiting factor, especially in health care systems where assistive technology is not reimbursed, as is the case for most health insurance in the United States.

Personal Computers and Computer Software

Personal computers (PCs) and the Internet have become popular for people with mild-to-moderate visual acuity problems. Many software systems purchased with PCs have built-in disability resources that can be turned on by the user, allowing for such adaptations as changes in background and print, and icon color and size. Other software, such as ZoomText, Jaws, and Kurzweil, are commercially available. These screen-magnification voices output readers provide some variety of contrast adjustment, and audible text, all features that may be appealing to persons with vision impairments.

Adaptive Devices

There is a wide variety of devices designed to compensate for vision loss while simplifying daily routines and improving safety (Fig. 13.3). Extra-large universal

Fig. 13.1 Hand-held and stand magnifiers.

remote controls, extra-large calendars, large-print books, watches with magnifying lenses, and liquid-level indicators are among the many items that can be purchased. As more people acquire vision impairments, Internet resources for online shopping have become more sophisticated and accessible to the low-vision community. OT practitioners should strive to stay up-to-date on these resources so that they can teach clients how to navigate through them and make needed viewing adjustments.

Fig. 13.2 Closed-circuit television.

Some online Web sites offer opportunities for contacting vendors and for consumers to receive electronic alerts when new equipment becomes available. OTs knowledgeable about such features will be more helpful to their clients.

How Low-Vision Rehabilitation Enables Independence

Low vision creates major disruptions in family life, employment, and social interaction, and often leads to functional dependence and depression (Horowitz and Reinhardt, 1998). While assistive technology improves function and decreases problems with mood and depression (Raasch et al., 1997), older adults unfamiliar with the devices and how to acquire them may experience difficulty in deciding about their initial and ongoing use.

Obstacles to the Use of Assistive Technology

Cost has been identified as the primary barrier to acquiring all assistive technology, including low-vision devices (LaPlante et al., 1992). Limited knowledge of the

Fig. 13.3 Examples on adaptive devices.

varieties and types of device available also contributes substantially to either never acquiring devices or delaying acquisition (Leonard, 2002; Mann et al., 1993). Once solutions to these barriers are found, older adults face other concerns in the process of making decisions. For example, with self-images altered from disability, older adults often ask how assistive devices might change others' perceptions of them and their own sense of roles, responsibilities, and status in their families and communities (Copolillo, 2001; Gitlin et al., 1998).

Questions about one's capability of using a device arise, and older adults react to them by examining whether they are young and healthy enough to manage, sometimes concluding they are too old and too sick (D'Allura et al., 1995). Older adults' perceptions that device use is not yet warranted can also delay the decision to search for, acquire, and integrate a device (Copolillo, 2001). Some studies indicate that stigma and a potential for marginalization are considered when deciding when and under what circumstances to use devices (Copolillo, 2001; Fine and Asch, 1988; Mann and Tomita, 1998; Zola, 1985).

In addition to the negative attitudes toward low-vision devices, other problems that may affect device use include increased dissatisfaction with the devices as vision worsens (Mann et al., 1993), and quality and quantity of training in their use.

Poor ability to transfer what has been learned in a training environment to the community can also hamper ongoing device use (D'Allura et al., 1995).

References

American Foundation for the Blind. (1999). National Aging and Vision Network Work Group, March 6–7, 1999, report from the Josephine L. Taylor Leadership Institute: Chapter 2, Advocacy Efforts. http://www.afb.org/section.asp?Documentid = 609.

Berg, C.A., Strough, J., Calderone, K.S., Sansone, C., and Weir, C. (1998). The role of problem definitions in understanding age and context effects on strategies for solving everyday problems. *Psychology and Aging*, 13(1), 29–44.

Brody, B.L., Roch-Levecq, A.C., Gamst, A.C., Maclean, K., Kaplan, R.M., and Brown, S.I. (2002). Self-management of age-related macular degeneration and quality of life: a randomized controlled trial. *Archives of Ophthalmology*, 120(11), 1477–1483.

Brody, B.L., Roch-Levecq, A.C., Thomas, R.G., Kaplan, R.M., and Brown, S.I. (2005). Self-management of age-related macular degeneration at the 6-month follow-up: A randomized controlled trial. *Arch Ophthalmol*, 123 (1), 46–53.

Centers for Disease Control and Prevention. (2004). Prevalence of visual impairment and selected eye diseases among persons aged >50 years with and without diabetes—United States, 2002. MMWR (Morbidity and Mortality Weekly Report), 53(45), 1069–1071.

Copolillo, A., and Teitelman, J.L. (2005). Acquisition and integration of low vision assistive devices: understanding the decision-making process of older adults with low vision. *Am J Occup Ther*, 59(3), 305–313.

Copolillo, A., Warren, M., and Teitelman, J.L. (2007). Results from a survey of occupational therapy practitioners in low vision rehabilitation. *Occup Ther Health Care*, 21(4), 19–37.

Copolillo, A.E. (2001). Use of mobility devices: the decision-making process of nine African-American older adults. *Occup Ther J Res*, 21(3), 185–200.

Crews, J.E. (2000). Patterns of activity limitation among older people who experience vision impairment. In: Stuen, C., Arditi, A., Horowitz, A., Lang, M.A., Rosenthal, B., and Seidman, K.R., eds. Vision Rehabilitation: Assessment, Intervention and Outcomes (pp. 754–757). Exton, PA: Swets and Zeitinger.

D'Allura, T., McInerney, R., and Horowitz, A. (1995). An evaluation of low vision services. *J Vis Impair Blindness*, 89(6), 487–493.

Fine, S.M., and Asch, A. (1988). Disability beyond stigma: social interaction, discrimination, and activism. *J Social Issues*, 44, 3–21.

Gitlin, L.N., Luborsky, M.R., and Schemm, R.L. (1998). Emerging concerns of older stroke patients about assistive device use. *Gerontologist*, 38, 169–180.

Horowitz, A., and Reinhardt, J.P. (1998). Development of the adaptation to age-related vision loss scale. *J Vis Impair Blindness*, 92(1), 30–41.

Ivanoff, S.D., Sonn, U., and Svensson, E. (2002). A health education program for elderly persons with visual impairments and perceived security in the performance of daily occupations: A randomized study. *Am J Occup Ther*, 56, 322–330.

LaPlante, M.P., Hendershot, G.E., and Moss, A.J. (1992). Assistive Technology Devices and Home Accessibility Features: Prevalence, Payment, Need, and Trends. Advance Data from Vital and Health Statistics; No. 217. Hyattsville, MD: National Center for Health Statistics.

Leonard, R. (2002). Statistics on Vision Impairment: A Resource Manual, 5th ed. New York: Arlene R. Gordon Research Institute of Lighthouse International.

Mann, W.C., Hurren, D., Karuza, J., and Bentley, D.W. (1993). Needs of home-based older visually impaired persons for assistive devices. *J Vis Impair Blindness*, 87, 106–110.

Mann, W.C., and Tomita, M. (1998). Perspectives on assistive devices among elderly persons with disabilities. *Technol Disabil*, 8, 119–148.

Raasch, T.W., Leat, S.J., Kleinstein, R.N., Bullimore, M.A., and Cutter, G.R. (1997). Evaluating the value of low-vision services. *J Am Optom Assoc*, 68 (5), 287–295.

Resnikoff, S., Pascolini, D., Etya'ale, D., et al. (2004). Global data on visual impairment in the year 2002. *Bull WHO*, 82(11), 844–851.

Relton, J. Policy Issues. (2005). The Assistive Technology Act of 2004. AFB ACCESSWORLD ®. Technology and People Who Are Blind or Visually Impaired. (6)1. http://www.afb.org/afbpress/pub.asp?DocID=aw060109.

Warren, M. (1995). Providing low vision rehabilitation services with occupational therapy and ophthalmology. *Am J Occup Ther*, 49, 877–883.

Warren, M., Bettenhausen, D., Kaldenberg, J.M., Sokol-McKay, D.A., and Weisser-Pike, O.M. (2006). Low-vision rehabilitation: A reflection on specialized practice. *OT Pract*, 11(5), 19–23.

Yates, J.F., and Patalano, A.L. (1999). Decision making and aging. In: Park, D.C., Morrell, R.W., and Shifren, K., eds. Processing of Medical Information in Aging Patients: Cognitive and Human Factors Perspectives (pp. 31–54). Mahwah, NJ: Lawrence Erlbaum.

Zola, I.K. (1985). Depictions of disability—metaphor, message, and medium in the media: a research and political agenda. *Soc Sci J*, 22(4), 5–17.