Supplemental Table 1. Summary of Selected Evidence on Interventions to Improve Reading Ability of Older Adults With Low Vision

Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
			Theme 1: Effectiveness of Low Vision Devices		
Nguyen, Weismann, & Trauzettel-Klosinski (2009)	To determine the effects of LVDs on the reading ability of people with AMD	Level III One-group, nonrandomized study with a pretest–posttest design; data collected retrospectively *N* = 530 participants in different stages of AMD *M* age = 82 yr; 73% were 75–90 yr old	*Intervention* First, participants read a passage of text (similar to newspaper print) without the use of LVDs. Then they were prescribed an appropriate LVD, trained in its use, and required to practice reading with the device for ≥30 min. They then read another passage of text while using the LVD. *Outcome Measure* Reading speed (wpm)	At pretest, only 16% of participants could read without a LVD; at posttest, 94% were able to read with a LVD. 58% of participants achieved reading ability with an optical visual aid, and 42% required electronic magnification (i.e., CCTV). Mean reading speed significantly from 16 wpm without LVDs to 72 wpm using LVDs.	The article did not report who carried out the intervention or in which the setting the intervention was conducted. No control group was used.
			Theme 2: Comparison of Optical and Electronic Magnifying Devices		
Goodrich & Kirby (2002)	To compare the effects of 3 LVDs—a stand CCTV, a handheld CCTV, and a prescribed optical device—on reading speed, reading duration, and participant preference	Level I Within-participant design; participants served as their own controls *N* = 22 veterans (20 men and 2 women) with severe low vision Age range: 53–87; *M* = 73.3 yr	*Intervention* Participants received eccentric viewing training and then were provided 5 sessions of formal reading rehabilitation training in the use of 3 LVDs. They then read paragraphs with each device and answered questions regarding device preference. *Outcome Measures* • Reading speed (wpm), duration (min), and comprehension • Reading productivity (words per sitting; reading speed × duration).	Reading speed, duration, and productivity were greater with CCTVs than with prescribed optical devices. Optical devices required lower magnification than CCTVs but closer working distances. For participants with 20/200 acuity or greater, stand-mounted CCTVs resulted in the greatest reading speeds. For those with <20/200 acuity, handheld CCTVs produced highest reading speeds. Participants preferred the stand-mounted CCTV, reporting that it was easiest to use, more convenient for lengthy reading, and most likely to be purchased considering its out-of-pocket expense. For short reading, 50% preferred the handheld CCTV and 50% preferred the stand-mounted CCTV.	Training in the use of low vision assistive devices was provided by four different instructors, which may have affected the uniformity of the intervention across participants; however, all instructors had extensive previous experience in clinical instruction, and no indication was found of systematic differences between instructors.
Peterson, Wolffsohn, Rubinstein, & Lowe (2003)	To determine the advantages of various EVES compared with the participant's own optical magnifier in improving objective	Level I Within-patient design	*Intervention* In a hospital ophthalmology low vision clinic, participants received an explanation, demonstration, and 2-min	Previous experience with magnifiers or EVESs did not significantly influence task performance.	The article did not identify who carried out the intervention. The participants received only 2 min of training for each EVES, and for many this was

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	near-task performance and to analyze the effect of previous optical and EVES experience on reading speed and task performance	*N* = 70 participants (35 male and 35 female) with low vision; specific diagnoses included AMD (*n* = 40 participants), vascular retinopathy (*n* = 11), diabetic retinopathy (*n* = 9), corneal conditions (*n* = 6), and open-angle glaucoma (*n* = 4) *M* age = 70 yr	training regarding the use of a personal optical magnifier, a mouse-based EVES with monitor viewing, a mouse-based EVES with HMD viewing, and a stand-based EVES with monitor viewing. Each participant then completed four tasks using the four devices. *Outcome Measures* • Reading speed and acuity using MNRead Acuity Charts (Precision Vision, LaSalle, IL) adapted for the study • Column tracking (tracking from one print column to the next) • Map tracking (following a map route and locating a specific feature) • Label identification (identifying information on a medicine bottle) • Perception of ease of use of each magnifier and difficulty of each test on a 0–5 scale.	Reading speeds were fastest using the stand EVES, followed by the mouse EVES with HDM viewing and personal optical magnifiers. Personal optical magnifiers resulted in faster completion rates for column tracking than the other magnifiers. Personal optical magnifiers and stand EVESs with monitor viewing resulted in faster completion rates for map tracking than the other magnifiers. Personal optical magnifiers and stand or mouse EVESs with monitor viewing produced the fastest completion rates for label identification. Participants rated the stand EVES with monitor viewing easiest to use, followed by the mouse EVES with monitor viewing. The mouse EVES with HMD viewing and personal optical magnifiers were rated at similar difficulty levels. In general, participants rated a stand EVES and a mouse EVES similarly in ease of use. EVESs may be easier to use, but optical magnification also can provide the magnification and speed needed for many ADLs.	their first exposure to and use of an EVES; this duration may have been insufficient for the participants to become familiar with the EVES.
Theme 3: Effectiveness of Low Vision Rehabilitation Programs That Include Occupational Therapy					
Eklund, Sjöstrand, & Dahlin-Ivanoff (2008)	To compare the effects of a health promotion program with an individual program on ADL dependence of older adults with AMD	Level I RCT *N* = 131 participants with AMD Health promotion group *n* = 62 Individual (control) group *n* = 69 Age = 65+	*Intervention* The health promotion program was a group intervention led by occupational therapists. Groups met for one 2-hr session per wk for 8 wk. Other professionals (ophthalmologist, optician, low vision therapist, lighting expert) also provided information. The individual program was considered standard care and consisted of one or two 1-hr individual sessions with an occupational therapist trained in low vision.	At 28-mo follow-up, participants in the individual group were more dependent in ADLs than participants in the health promotion group. Participants in the health promotion group maintained their current level of function in ADLs at follow-up.	Many participants were lost between recruiting and follow-up. The evaluators were not blinded to which intervention the participants had received.

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Supplemental Table 1. Summary of Selected Evidence on Interventions to Improve Reading Ability of Older Adults With Low Vision (*cont.*)

Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
			Outcome Measure Level of dependence in ADLs measured on a scale ranging from 0 (*independent*) to 9 (*dependent*)		
Markowitz, Kent, Schuchard, & Fletcher (2008)	To determine the effects of low vision rehabilitation on the ability of older adults with low vision to read standard medication labels	Level III Prospective, nonrandomized interventional case series design *N* = 57 participants (61% female, 31% male) with AMD (78%), glaucoma (9%), and other conditions (13%) Age range = 49–95 yr; *M* age = 80 yr	*Intervention* Participants were instructed in the assembly, maintenance, and use of prescribed LVDs (high-powered reading glasses, magnifiers, and/or electronic magnification). Occupational therapists trained participants to use large-print materials, proper reading distances, adequate illumination, and strategies for viewing curved surfaces. *Outcome Measure* Ability to read standard labels on prescription medication bottles, rated on a 0–2 scale	At initial evaluation, 58% of participants were unable to identify information on their prescribed medications (0 on the scale), 40% were partially able to read the information (1 on the scale), and 2% were able to read the information (2 on the scale). At discharge, 94% of participants rated their ability as 2, 4% rated their ability as 1, and 2% rated their ability as 0, indicating a major improvement in ability to read medication labels after LVD prescription and training.	The study did not incorporate nonvisual techniques to read the labels, which is an alternative for those who cannot visually read labels.
McCabe, Nason, Demers Turco, Friedman, & Seddon (2000)	To determine whether vision rehabilitation involving optometry, occupational therapy, and social work services improved the functional ability of older adults with low vision	Level I RCT *N* = 97 participants; diagnoses included macular degeneration (64%), diabetic retinopathy (13%), other retinal diseases (12%), optic neuropathy (7%), glaucoma (3%), and cataracts (1%) Individual protocol *n* = 48 Family protocol *n* = 49 25 participants withdrew from the study, leaving a final *N* of 72. *M* age = 69 yr	*Intervention* Participants received the standard vision rehabilitation of training in the use of prescribed optical and nonoptical devices, instruction in adaptive techniques, and/or adjustment counseling. The occupational therapist trained participants to use optical and nonoptical devices and adaptive techniques to maximize visual capacities. *Outcome Measures* • *Modified FAQ:* gains in functional activity • *FVPT:* speed and accuracy in spot reading tasks, short-term text reading, identification of paper currency, and clock reading.	Participants experienced a significant gain in visual capacity, as measured by the FVPT, and a significant decrease in dependency and self-reported difficulty in performing tasks, as measured by the FAQ. These findings indicate that vision rehabilitation intervention involving services from an optometrist, an occupational therapist, and a social worker is effective in improving performance of visual tasks.	The table providing participant characteristics included the participants who dropped out and were not included in the results.
Theme 4: Effectiveness of Low Vision Rehabilitation Programs That Do Not Include Occupational Therapy Services					
Scanlan & Cuddeford (2004)	To determine the effectiveness of a low vision rehabilitation program for older adults with	Level I RCT	*Intervention* The experimental group received extensive training in reading techniques	The experimental group significantly improved in reading speed and accuracy compared with the control group, and the	The participants were recruited from a limited geographic area.

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
	AMD that included an extended period of education in the use of LVDs	$N = 64$ Experimental group $n = 32$ Control group $n = 32$ M age = 81 yr	such as eccentric viewing and in the correction of skills. The instructor also assigned progressively more difficult reading activities. *Control* The control group received a 1-hr traditional training session. *Outcome Measures* • Pepper Visual Skills for Reading Test: reading speed and accuracy • NEI VFQ–25: health-related quality of life.	benefits of the extended training sessions were maintained over time. The experimental group indicated significantly greater improvement in perceived quality of life compared with the control group after completion of the extended training period.	No follow-up was done.
Stelmack et al. (2008)	To examine the effectiveness of an outpatient low vision rehabilitation program, the Low Vision Intervention Trial (LOVIT), on reading performance and visual ability	Level I Multicenter RCT $N = 126$ with diagnoses of AMD, macular dystrophy, macular hole, and inflammatory disease of the macula Treatment group $n = 64$ Control group $n = 62$ Nine participants in the treatment group dropped out before completion, leaving 55 in the treatment group and 117 in the entire study. M age = 79 yr	*Intervention* The treatment group received a low vision examination, education, LVD prescription, six weekly low vision therapy sessions (one completed at home), and homework. Low vision therapy addressed visual ability, including near spot checking, table reading, long-duration reading, spot checking at far and intermediate distances, glare control, and long-duration distance viewing. *Control* The control group received treatment after a delay of 4 mo (typical amount of time veterans spend on a waiting list). They received two telephone calls per month. *Outcome Measure* Low Vision Visual Functioning Questionnaire–48: reading ability	Participants in the treatment group reported significant improvement in visual reading ability from baseline to the 4-mo follow-up compared with the control group. Participants in the control group showed a slight decrease in visual reading from baseline to the 4-mo follow-up. This common low vision rehabilitation intervention model was effective in improving visual reading ability for people with low vision.	Because this study did not use a placebo for the control group, the authors indicated they could not rule out a Hawthorne effect in which participants change their behavior simply because they are aware they are being studied.
			Theme 5: Effectiveness of Nonoptical Devices		
Bowers, Meek, & Stewart (2001)	To compare an objectively determined optimal illumination with preferred illumination on reading performance in older adults with AMD	Level I RCT; participants acted as their own controls $N = 20$ participants with AMD	*Intervention* In a clinic, participants binocularly read MNRead Acuity Charts without using LVDs at six levels of task illumination (50, 300, 600, 1,000, 2,000,	Reading speed improved the most between the illumination levels of 50 lux and 2,000 lux. Compared with normal room illumination (600 lux) or with typical home light-	The article did not indicate who carried out the intervention.

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Supplemental Table 1. Summary of Selected Evidence on Interventions to Improve Reading Ability of Older Adults With Low Vision (*cont.*)

Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
		Age range = 60–85 yr	and 5,000 lux) presented in random order. *Outcome Measures* • Reading speed (wpm) • Optimal illumination level • Preferred illumination level.	ing (50 lux), reading rate and acuity were best at optimal illumination. Maximum reading rate improved by 36 wpm between 50 and 5,000 lux. Most participants (70%) preferred a lower level of illumination than that at which they optimally performed.	
Eperjesi, Maiz-Fernandez, & Bartlett (2007)	To compare 4 commonly used lamps of varying radiance on the reading performance of older adults with either age-related maculopathy or nonexudative AMD	Level I Prospective RCT; participants acted as their own controls *N* = 13 participants with either AMD or age-related maculopathy Age range = 55–82; *M* age = 69 yr	*Intervention* At a 40-cm reading distance and an illumination level of 2,000 lux, participants read from a MNRead card (to establish their threshold print size) under 4 lamps: standard (clear envelope) incandescent, daylight simulation (blue tint envelope) incandescent, halogen incandescent, and compact cool white fluorescent. *Outcome Measure* Reading speed (wpm)	No significant difference was found between any of the lamps and their effects on reading performance. This research adds to the body of evidence indicating that the type of light source is not a critical factor when recommending task lighting to older adults with low vision.	The sample size was small, and only two diagnoses were represented. Some participants' visual acuity was adequate.
Kabanarou & Rubin (2006)	To compare the effects of binocular vs. monocular viewing reading performance in participants with bilateral AMD	Level I One-group, within-subjects study *N* = 22 diagnosed with bilateral late-stage AMD *M* age = 81 yr	*Intervention* Participants read aloud with both eyes, then with their better eye while the other eye was occluded. Text size was adjusted for each task on the basis of acuity. *Outcome Measure* Reading speed (wpm)	Participants read faster when using binocular viewing compared with monocular viewing; however, the difference was not significant. Reading speed in the better eye is a good predictor of binocular reading speed. No significant difference was found in binocular vs. monocular reading performance.	If the participants read a sentence incorrectly, it was excluded from analysis unless the participant corrected the error. Inaccurately read sentences were not included in the data analysis, which may have falsely enhanced the positive findings.
Russell-Minda et al. (2007)	To review available evidence regarding the attributes of typefaces on text legibility for people with low vision	Level I Systematic review *Inclusion criteria:* Articles were written in English and addressed legibility and attributes of French-language typefaces for people with low vision who desire to read. All types of low vision diagnoses and study designs were included. Issues regarding international guide-	*Intervention* Two of the authors separately reviewed and rated the abstracts on the basis of level of evidence. Studies were primarily nonrandomized or experimental or were unpublished. *Outcome Measure* Attributes of typefaces influencing text legibility for people with low vision	The review, which included 18 studies, was inconclusive regarding serifs, yet there may be a subjective preference for sans serif fonts. Fonts such as Veranda, Helvetica, Arial, and Adsans may be more readable than Times New Roman. Boldface, sans serif typefaces that are at least 12 points in size are preferred for reading medication information on both rounded and flat surfaces.	The authors did not review research on optimal typefaces and print size associated with computer accessibility.

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
		lines or standards for legibility of typefaces for print-disabled people were included. Studies of computer accessibility were excluded.		Font size should be at least 16–18 points, although no consensus exists on the best font size for low vision materials. Print size must be larger when reading in the periphery than with central vision. Adequate letter spacing aids legibility for people with low vision.	
Vukicevic & Fitzmaurice (2005)	To determine the effects of eccentric viewing and magnification interventions on the ability of older adults with AMD to perform ADLs	Level I RCT *N* = 58 participants (39 women and 19 men) with AMD with an absolute scotoma Eccentric viewing *n* = 22 Combination *n* = 12 Magnification *n* = 12 No intervention *n* = 12 Age range = 60–96; *M* age = 82 yr	*Intervention* *Eccentric viewing group:* Trained in eccentric viewing using the EccVue computer program over 8 weekly sessions *Combination group:* Trained in eccentric viewing and instructed in magnification use *Magnification group:* Instructed in the use of magnification *No-intervention group:* Received a weekly phone call of ≤15 min over 8 wk *Outcome Measures* • Near print size determined with the Bailey–Lovie Reading Card • Performance of ADLs using the Melbourne Low Vision ADL Index Part A, ability to perform high-acuity daily tasks, and Part B, ability to perform lower acuity daily tasks.	Participants in each experimental group significantly improved their near print size scores. The eccentric viewing and combination groups maintained these scores at the follow-up. All three experimental groups significantly improved their Part A scores on the Melbourne Low Vision ADL Index. The eccentric viewing and combination groups improved significantly in Part B scores. The majority of participants in the eccentric viewing (77%) and combination (75%) groups reported the intervention had been helpful, compared with 58% of the magnification group and 0% of the no-intervention group. Eccentric viewing training along with magnification training was recommended.	Although the study found improvements in ability to perform ADLs with use of eccentric viewing and magnification, the authors did not specify what ADLs they assessed or which improved. Therefore, it is not possible to tell whether the increase in ability can be attributed to tasks that involved reading.

Note. This table describes selected articles that helped answer the focused question in the evidence-based literature review and were representative of the themes of the categories of the review. A total of 32 studies were included in the review. ADLs = activities of daily living; AMD = age-related macular degeneration; CCTV = closed-circuit television; EVES = electronic vision enhancement system; FAQ = Functional Assessment Questionnaire; FVPT = Functional Vision Performance Test; HMD = head-mounted display; LVD = low vision device; *M* = mean; NEI VFQ–25 = 25-item National Eye Institute Visual Function Questionnaire; RCT = randomized controlled trial; wpm = words per minute.

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