411 Vision Performance in Everyday Life Activities
Wednesday, May 04, 2016 8:30 AM–10:15 AM
Tahoma 5, TCC Paper Session
Program #/Board # Range: 4336–4341
Organizing Section: Low Vision Group
Contributing Section(s): Lens, Visual Neuroscience

Program Number: 4336
Presentation Time: 8:30 AM–8:45 AM

Functional Outcomes of the Low Vision Depression Prevention Trial (VITAL) in Age-Related Macular Degeneration
Ashley Deemer1, Robert W. Massof2, Barry Rovner3, Robin Casten2.
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Purpose: Depression and decreased visual function are common in patients with age-related macular degeneration (AMD). A RCT was conducted to determine if treatment effects of optometric low vision rehabilitation services (LVR) in conjunction with either behavior activation (BA) and occupational therapy, provided in the patient’s home by an occupational therapist (OT), or supportive therapy (ST), an attention control condition provided by a social worker in the patient’s home, reduces the risk of depression. Here we analyze and report baseline and 4 month follow-up Activity Inventory (AI) responses to compare the functional outcomes of in-home BA vs ST treatment after standard optometric low vision services.

Methods: Data from the VITAL study were used to analyze the functional outcomes of BA+LVR vs ST+LVR treatment. 188 subjects with AMD were randomized into the two groups. Eligibility criteria required patients to be at risk for developing depression based on sub-threshold depressive symptoms measured with the Patient Health Questionnaire-9. The AI was used to assess self-reported visual function and outcome variables for functional vision domains were estimated using Rasch analysis.

Results: Improvements in functional vision measures were seen in both the BA and ST groups at the goal level (d=0.71; d=0.56 respectively). At the task level, BA patients showed more improvement in reading, inside the home tasks and outside the home tasks when compared to ST patients. When comparing the functional vision outcomes and group effects of BA vs ST, small differences between groups were seen with only measures of outside the home tasks reaching statistical significance (d=0.27, p=0.029).

Conclusions: Based on the AI data, we conclude that post-optometric care by an OT results in greater improvement in visual function at the task level. The improvements shared by the two groups may be attributed to the optometric services both received. Both groups also received attention in the home, which could account for the lack of difference in outcomes observed at the goal level. The primary outcome of VITAL study concluded that BA is more effective than ST at preventing depression in an at risk group of AMD patients. The results of this secondary study lends support to the conclusion that in-home BA+LVR is more effective at improving functional vision than attention alone after optometric low vision services.

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Effectiveness of portable electronic vision enhancement systems (p-EVES) compared to optical magnifiers for near vision activities in visual impairment
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Purpose: Low vision aids (LVAs), such as optical magnifiers, can improve performance of everyday tasks for individuals with visual impairment. With the introduction of p-EVES (portable handheld electronic LVAs), the question arises whether these offer real benefits to users, compared to simple LVAs. This prospective two-arm cross-over randomised controlled trial aimed to determine the clinical effectiveness, acceptability, and incremental cost-effectiveness of p-EVES compared to optical LVAs.

Methods: Experienced optical aid users (n=100) were recruited from Manchester Royal Eye Hospital, UK. Reading, performance of near vision activities, and device usage, were evaluated at baseline; and at 2 and 4 months, at the end of each study arm (A: existing optical aids plus p-EVES; B: optical aids only). Incremental cost-effectiveness ratios (ICERs) and cost-utility analyses were based on health-and-vision-related QoL questionnaires using bootstrapping techniques. Economic evaluation was undertaken from a societal perspective, and included carer time costs.

Results: Overall, maximum reading speed for high contrast sentences was the same for optical aids and p-EVES, although the critical and threshold print sizes accessed with p-EVES were both significantly smaller (p<0.001). Optical aids were used for more tasks (p<0.001), and more frequently (p<0.001). However 70% preferred p-EVES for leisure reading, and p-EVES gave longer duration of reading (p<0.001). During the study arm with p-EVES, participants carried out more tasks independently (p<0.001), and reported less difficulty with near vision activities (p<0.001). An ICER of £735.77 (95% confidence interval = £481.03 - £1152.18) was found for a 6.73% improvement in ‘near vision’ visual function. Cost per QALY was estimated between £56,991.43 (lower 95% CI = £19,801.27) and £66,490.00 (lower 95% CI = £23,054.59). Sensitivity analysis reduced ICERs by up to 75%, with QALYs falling below £30,000.

Conclusions: The p-EVES tested did not replace optical aids, but were more effective for certain tasks. p-EVES are likely to be a cost-effective way to improve visual function at near, but this does not translate into improved quality of life, wellbeing and capability. However, sensitivity analysis indicated that cost-effectiveness may be achievable with a lower cost intervention.

Commercial Relationships: Chris Dickinson, None; Rachel Bambrick, None; Andrew Brand, None; Nathan Bray, None; Michelle Dutton, None; Robert Harper, None; Barbara Ryan, None; John J. Taylor, None; Rhiannon Tudor Edwards, None; Heather Waterman, None

Program Number: 4337
Presentation Time: 8:45 AM–9:00 AM

Effectiveness and cost-effectiveness of portable electronic vision enhancement systems (p-EVES) compared to optical magnifiers for near vision activities in visual impairment
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Clinical Trial: NCT00769015

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Clinical Trial: NCT01701700

Program Number: 4338
Presentation Time: 9:00 AM–9:15 AM

The preferred retinal locus used to watch videos
Francisco M. Costela, Sidika Kajtezovic, Russell L. Woods. Harvard Medical School - Ophthalmology, Scheipers Eye Research Institute, Boston, MA.

Purpose: Eccentric viewing is a common strategy used by patients with central vision loss (CVL) to direct the eye such that the image falls onto healthy peripheral retina, known as the preferred retinal locus (PRL). Typically, fixation tests are used to determine the location of the PRL. It has been long acknowledged that we do not know whether the PRL used in a fixation test is also used when performing tasks. There is some evidence of multiple PRLs and the PRL moving depending on the conditions. We present an innovative method to determine whether the same PRL observed during fixation task was used to watch videos.

Methods: The gaze of a group of 60 normal vision (NV) observers was used to define a democratic center of interest (COI) of video clips from movies and television. This democratic COI approach takes into account that people look at the same objects most of the time (Dorr et al. 2010; Goldstein et al. 2007). People with CVL are expected to look at the COI, but with less ability, due to reduced resolution (identifying objects of interest), unstable fixation, and poor eye movement control. For each participant, we computed the gaze offsets from the COI across the video clips. The distribution of gaze offsets of the NV subjects was used to define the limits of NV behavior. If the gaze offset was within this 95% degree confidence interval, then the same PRL was used for fixation and video watching.

Results: As expected, CVL patients had wider gaze-offset distributions than NV subjects (p < 0.00005) indicating worse eye movement control. The largest gaze offset of a CVL patient was ~13 degrees. Gaze offsets of 13/20 CVL patients were outside the NV confidence interval (further from the COI than expected). For none of 15 NV subjects watching the same videos with spherical defocus blur had a gaze offset that was decentered (outside the NV confidence interval), suggesting that resolution was not the problem.

Conclusions: These results are in agreement with recent reports that visual search may adapt already after a few hours of search training to the presence of a simulated central scotoma (Kwon et al., Curr. Biol., 2013; Walsh et al., J. Vis., 2013) and with gaze-contingent scotoma simulation, when central vision is lost, both in patients with AMD (Geringswald et al., J. Vis., 2013) and with gaze-contingent scotoma simulation, due to high visual working memory demands of visual exploration with a scotoma (Geringswald and Pollmann, JEP: HPP, 2015). Here, we investigated whether visual search training with a central scotoma simulation can improve contextual cueing in normal-sighted observers.

Methods: We examined contextual cueing in five consecutive sessions, spread on average over 10 days, of a T-among-L visual search task (Figure 1, cf. Geringswald et al., Front. Hum. Neurosci. 2012) with novel and repeated search displays in young normal-sighted observers. Repeated displays were different in each session. We compared a gaze-contingent central scotoma simulation group (n = 23) to an unrestricted viewing control group (n = 24). The central scotoma was simulated as an opaque disk of 7° diameter, smoothly fading out at the border. The disk was of the same grey as the background, so that the black T and L stimuli disappeared into the background when covered by the scotoma.

Results: In the control group, contextual cueing led to increasingly faster search in repeated than novel displays already in Session 1 (Figure 2), indicated by both a significant main effect of configuration (novel, repeated; F(1,23) = 6.21, p < .05) and a significant configuration x time (epochs 1-4) interaction (F(3,69) = 6.03, p < .05). In the scotoma group, contextual cueing was first observed in session 3 (configuration main effect: F(1,22) = 6.77, p < .05; interaction: F(3,66) = 4.38, p < .05).

Conclusions: These results are in agreement with recent reports that visual search may adapt already after a few hours of search training to the presence of a simulated central scotoma (Kwon et al., Curr. Biol., 2013; Walsh and Liu, Vis. Res. 2014). We extend these findings by showing that such training, probably by reducing visuospatial working memory load, enables memory-guided search in the presence of central vision loss. Apart from its theoretical importance, this may show a promising way for training programs in patients with central vision loss.
Gait parameters associated with fall risk in glaucoma patients
Alekksandra Mihailovic, David S. Friedman, Sheila K. West, Pradeep Y. Ramulu. Ophthalmology, Johns Hopkins University/ Wilmer Eye Institute, Baltimore, MD.

Purpose: Falls are the leading cause of accidental mortality in individuals over age 60, and visual field (VF) loss in glaucoma is strongly associated with falls and gait variability. Here, we examine which gait parameters are associated with falls in a glaucoma cohort, and whether severity of VF loss modifies this relationship.

Methods: The GAITRite Electronic Walkway (CIR Systems Inc) was used to characterize participants’ gait. Pointwise sensitivity data measured using Humphrey 24-2 VF testing was integrated to mean sensitivity in the integrated VF (IVF). Fall data were collected prospectively over 6-22 months via a falls diary and analyzed as a rate of falls per steps taken adjusting for IVF sensitivity, comorbidities, number of medications, age, race and gender. Average daily steps were inferred from a one-week accelerometer trial.

Results: The 246 study participants had a mean age of 70.6 years (SD=7.6) and a mean IVF sensitivity of 26.1 dB (IQR=25.1 to 29.7 dB, range=1.7 to 33.9 dB). Higher fall rates were associated with a broader base of support (mean value=10.2 cm, 15% higher risk per cm, p=0.007), step length difference between the two feet (mean value=2.2cm, 22% higher risk per cm difference, p<0.001), smaller step length (mean value=56.1cm, 7% higher risk per cm shorter, p=0.003), and shorter single foot support time (mean value=37.2%, 17.5% higher risk per 1% of gait cycle time, p=0.004). Higher fall rates were also associated with increased variability in stride velocity (mean value=7.1%, 10% higher per 1% increase in variability, p=0.001) and stance time (mean value=5.2%, 8% higher per 1% increase in variability, p=0.022). Significant interactions (p<0.05) were observed between IVF sensitivity and step length difference between feet, variability in stride velocity, and variability in stance time, with each parameter noted to pose a higher fall risk in persons with more advanced VF loss.

Conclusions: Numerous gait parameters are associated with a higher risk of falling in glaucoma patients. Given that nearly all falls occur while walking, the identified parameters may serve as markers to identify individuals who are at a greater risk for falls and help develop targeted gait interventions to prevent falls in glaucoma patients.

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Support: NIH/NEI Grant R01 EY022147

Program Number: 4340
Presentation Time: 9:30 AM–9:45 AM

Does Loss of Vision Impact a Pedestrian’s Ability to Estimate their Own Street Crossing Time?
Shirin E. Hassan. School of Optometry, Indiana University, Bloomington, IN.

Purpose: To determine how well a visually impaired person can estimate their street crossing time.

Methods: The actual street crossing time of 129 visually impaired subjects (64 subjects self-reporting “difficulty crossing the street” and 65 subjects self-reporting “no difficulties”) was measured four times along a street that was two lanes of one-way traffic. Subjects also estimated their street crossing time four times by imagining themselves crossing the same street. Subjects said “start” and “stop” when they imagined themselves stepping off the curb and reaching the other side of the street respectively. The time interval between “start” and “stop” was recorded and street crossing estimates were measured both before and after subjects actually crossed the street. A linear mixed model with repeated measures for subject was used to determine if the ratio between subjects’ estimated and actual crossing times changed as a function of subject group (with and without self-reported difficulties) and before and after actually crossing the street.

Results: No significant difference was found in the ratio between subjects with (ratio=1.02) and without (ratio=0.96) self-reported difficulties in crossing the street (p=0.16). Overall, subjects’ estimates of their crossing time decreased significantly (on average by 8%) after they had the experience of crossing the street (p=0.0006). The reduction in the ratio before and after crossing was significant for the subjects who self-reported difficulties (p=0.002) but not for the subjects who self-reported no difficulties in crossing the street (p=0.08).

Conclusions: Our data suggests that reporting having difficulties crossing the street does not affect a visually impaired pedestrian’s ability to judge their own crossing time. Familiarity with the street significantly reduces a visually impaired pedestrian’s estimate of the time they think they need to cross the street.

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Presentation Time: 9:45 AM–10:00 AM

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