Han Li

Screening for AMD Using Psychophysical Correlates of Macular Dysfunction

Faculty Sponsor: Susan Culican

Recipient National Eye Institute Travel Grant

LINK: ARVO 2013 Abstract:

Purpose: To assess the utility of our novel, rapid computerized vision task as a screening tool for AMD and other macular disorders.

Methods: We developed a computerized task and administered it to 20 macular disorders participants and 16 age-matched controls.

The task is based on participant identification of interruptions in visual stimuli. Testing was conducted monocularly for both eyes on all participants. Subject distance to the video display was determined by empirical adjustment, by positioning the physiological blind spot at the periphery of stimuli. Stimuli consisted of a central fixation point surrounded by rotating objects. Objective interruptions of some rotating objects were programmed into the stimuli, which the participant reported by striking the keyboard. Based on the symptoms of macular dysfunction, we hypothesized that those with macular dysfunction would subjectively perceive more interruptions than were programmed.

Results: Our visual task discriminates between macular disorder and control groups. There was a significant difference ($p=.001$) in the number of total mistakes, defined as sum of missed objective interruptions and perceived subjective interruptions. Furthermore, there was a significant difference in the number of perceived subjective interruptions between the two groups ($p<.001$). Yet there was no significant difference in the number of missed objective interruptions alone ($p=.158$), suggesting that the number of subjective interruptions signifies macular disorder-related deficits, while missed objective interruptions are associated with subject compliance to instruction and attention.

Near distance visual acuity does not correlate with test performance ($p=.103$ (2-tailed)), while disease status does ($p<.001$), meaning our test reliably detects macular disorder and not visual acuity.

Interocular differences were not detected in control subjects. The number of subjective interruptions from the control participants was analyzed to determine if there was any interocular difference. There was no significant difference ($p=.58$) in average interruptions between the two eyes. Therefore, this suggests that learning curve or fatigue are not concerns in our screening task.

Conclusions: Our preliminary results show significant differences between those with and without macular disorders on our visual task. In particular, the number of perceived subjective interruptions could be used to maximize sensitivity and specificity of the test. Furthermore, subject compliance and understanding of task instructions was high. These results suggest that our novel computer task could be used as a screening tool in detecting macular disorder. However, further testing of our task to demonstrate validity and reliability must be done.

TITLE: Screening for AMD Using Psychophysical Correlates of Macular Dysfunction

ABSTRACT FINAL ID: 5022 - A0184

AUTHORS (LAST NAME, FIRST NAME): Li, Han[1]; Culican, Susan M.[2]

INSTITUTIONS (ALL): 1. Washington University School of Medicine, St. Louis, MO, United States. 2. Dept of Ophthalmology and Visual Science, Washington University School of Medicine, St. Louis, MO, United States.

Study Group:

ABSTRACT BODY:
Purpose: To assess the utility of our novel computerized vision task as a screening tool for AMD and other macular disorders.

Methods: We developed a computerized task and administered it to 20 participants with AMD or other macular disorders, and 17 similarly aged control participants.

The task was based on participant identification of interruptions in visual stimuli. Testing was conducted monocularly. Subject distance to the video display was determined by empirical adjustment, by positioning the physiological blind spot at the periphery of stimuli. Stimuli consisted of a central fixation point surrounded by rotating objects. Objective interruptions of some objects were programmed into the stimuli, which the participant was instructed to report by striking a key. We hypothesized that those with macular dysfunction would subjectively perceive more interruptions than were programmed, due to foveal and parafoveal scotomata.

Results: Our results show significantly different task performance between those with and without macular disorders. Macular disorder participants reported a higher number of subjective interruptions ($n=4.65$ vs $n=0.35$, $p<.001$) as well as total errors, defined as sum of missed objective interruptions and subjective interruptions, compared to controls ($n=6.3$ vs $n=1.24$, $p<.001$). There was no significant difference in the number of missed objective interruptions alone ($n=1.65$ vs $n=0.88$, $p=.158$). Disease status correlates with test performance, while controlling for near distance visual acuity ($p=.001$).

Furthermore, interocular test performance was the same in control participants, with no significant difference in subjective interruptions, missed objective interruptions, and total errors.

Conclusions: Our visual task discriminates between macular disorder and control group participants, independent of visual acuity. Participant attention and instruction compliance were high, while fatigue and interocular learning curve effects were negligible. These results suggest that our novel computer task could be used as a rapid and effective screening tool in detecting macular disorder. In particular, the number of subjective interruptions could be used as a reliable screening parameter. However, further testing in demonstrating reliability and validity of our results must be done.

Commercial Relationship(s) Disclosure:

Han Li: Commercial Relationship: Code N (No Commercial Relationship)

Susan Culican: Commercial Relationship: Code N (No Commercial Relationship)