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ORIGINAL RESEARCH

Validation of a Reading Assessment for Persons With Homonymous Hemianopia or Quadrantanopia

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Abstract

Objective: To preliminarily validate the Visual Skills for Reading Test (VSRT) for assessing reading performance in persons with homonymous hemianopia (HH) or quadrantanopia.

Design: Retrospective chart review.

Setting: University-based outpatient low vision rehabilitation center.

Participants: Persons (N=38) with HH or quadrantanopia who completed the VSRT.

Interventions: Validation procedures included testing for equivalence of the 3 test versions, estimation of internal consistency reliability, and known-group comparison using VSRT results from previous studies of adults with normal vision and central field loss.

Main Outcome Measures: Corrected reading rate, reading accuracy rate, type and number of reading errors, and completion time were recorded and evaluated.

Results: Cronbach α for the VSRT across all participants was .80, which indicated good internal consistency. A known-group comparison showed that persons with a visual field deficit read significantly slower than did normally sighted adults ($t_{580}=10.13$; $P<.0001$). Persons with quadrantanopia read significantly faster than did persons with HH ($t_{36}=2.25$; $P=.03$) or those with central field loss ($t_{48}=3.17$; $P=.0027$). These findings confirmed that the VSRT correctly discriminated between groups in terms of reading performance.

Conclusions: Preliminary validation results indicate that the VSRT demonstrates adequate evidence of reliability and validity to evaluate reading performance in adults with HH or quadrantanopia.

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Homonymous hemianopia (HH) is characterized by blindness in the left or right half of the visual field in each eye, and quadrantanopia is vision loss in the same lower or upper quadrant of the visual field in both eyes.[1] These visual field deficits commonly occur in persons after stroke or traumatic brain injury.[2] Approximately 90% of persons with HH report significant reading impairment due to disruption of the foveal and parafoveal areas of the visual field.[3] Vision loss within the foveal field disrupts reading saccades, slows reading speed, and reduces reading accuracy. Persons with HH may misread words because of omission of letters in the blind visual field, and they experience difficulty navigating the pages of a text. These reading difficulties may result in significantly slower reading speed in persons with HH than in normally sighted adults.[3,4]

Reading is an integral component of many daily activities. Reading accuracy is a critical component of tasks that require accurate identification of words and numbers such as medication management, meal preparation, and financial management. Adequate reading speed is critical in tasks that require quick identification of information, such as dialing a number in an emergency.[5] Thus, it is important that clinicians be able to determine the extent of reading performance impairment in clients with HH or quadrantanopia.

The Visual Skills for Reading Test (VSRT), also known as the Pepper test, is a standardized clinical assessment that assesses reading performance in adults with macular scotomas from age-related macular degeneration.[6] The VSRT was developed to specifically measure visual skills required to read text and provide information missing from the standardly used charts comprising single letters or sentences.[7] Single letter charts cannot assess an

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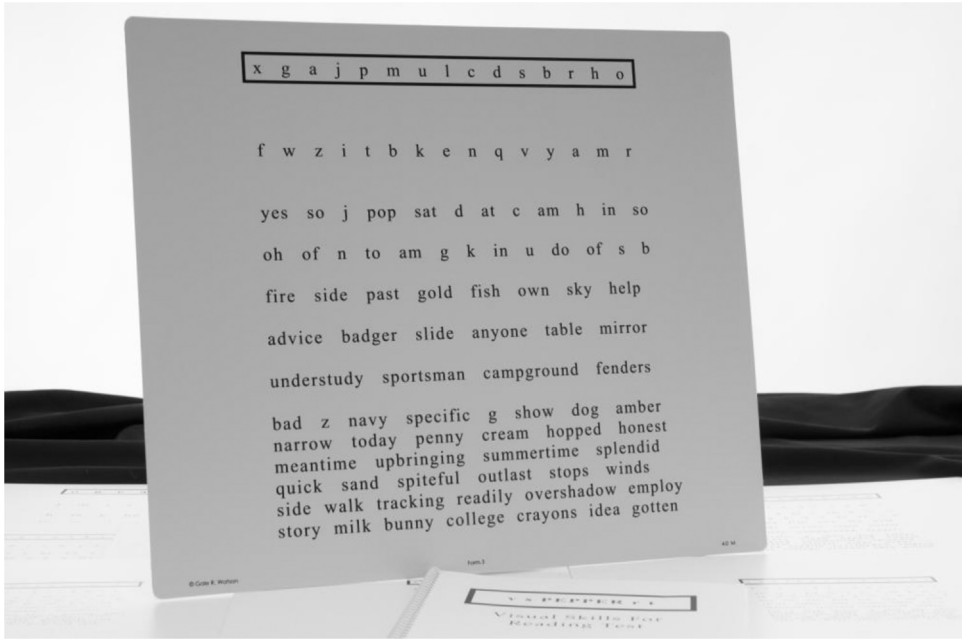

Fig 1 One of the VSRT test cards. Image provided with permission by Fork in the Road Vision Rehabilitation Services, LLC.

individual's ability to identify words or navigate text; charts using sentences provide context and semantics that aid guessing and thus do not accurately measure ability to visually decode words.[7] In contrast, the VSRT presents words in a noncontextual format to force reliance on visual decoding. In addition, the VSRT measures reading accuracy and speed. The VSRT has been shown to be a reliable and valid reading assessment for adults with macular degeneration and central scotomas[6,8] and adults with normal visual acuity.[9]

Although HH is common and frequently causes reading deficits, there is a lack of validated reading performance assessments for clients with HH. Because HH, quadrantanopia, and macular scotomas disrupt the foveal and parafoveal visual fields in a similar manner, the VSRT has been suggested as an appropriate clinical assessment to identify reading limitations in adults with HH or quadrantanopia.[10] However, the VSRT has not been validated as a reading performance assessment for this population. The purpose of this study was to describe the reading limitations of a sample of adults with HH or quadrantanopia as measured by the VSRT and provide evidence of the psychometric properties of the VSRT in this population.

Methods

The university institutional review board approved this study. The first author completed a retrospective chart review of persons who received therapy services for HH or quadrantanopia between January 1, 2006 and May 2014 at a university-based outpatient low vision rehabilitation center. Criteria for chart selection included in this study were (1) optometrist documentation of an HH or quadrantanopia; (2) distance acuity between .00 and .30logMAR (20/20 to 20/40 Snellen acuity) as tested using an Early Treatment Diabetic Retinopathy Study letter acuity chart while the patient was wearing habitual distance correction; and (3) a completed VSRT during the initial occupational therapy evaluation.

List of abbreviations:

HH homonymous hemianopia
SEM standard error of measurement
VSRT Visual Skills for Reading Test

Description of VSRT

The VSRT consists of test cards; each card contains 41 letters and 69 single words arranged in 13 lines. There are 3 versions of the test, allowing for initial, interim, and discharge assessment of the patient. The 3 versions have equivalent word/letter size and spacing, and each test version presents single letters, 3- to 4-letter words, and 7- to 10-letter words at the same location. Each version is printed on 5 cards in font sizes between 1.0M (1.45mm) and 4.0M (5.80mm).[7] The text on each card is arranged so that word length increases and the spacing between words and lines decreases as the person progresses down the chart (fig 1). The use of single random words forces the reader to rely on vision to identify each letter or word without contextual clues. Many of the words can be transformed into another word if some letters are not seen. For example, the word "black" can be misread as "lack." The VSRT has ~31 and 32 words per card that can be misread as a different word. The test also contains 2 word sequences that can be misread as a single word if the space between them is not seen. For example, "for" and "get" may be read as "forget."[7]

The examiner selects a card of an appropriate font size for the person's visual acuity level, instructs him/her to read the card aloud, times the performance, and records the number and type of errors committed and the completion time.[7] The categories of errors recorded on the test are described in table 1. The VSRT also measures reading accuracy rate and corrected reading rate. Reading accuracy rate is expressed as a percentage calculated by dividing the number of correctly read letters/words on a single line by the total number of letters/words on the line to obtain a line percentage; lines 3, 8, and 13 are "dummy" lines and are excluded