The Reliability of Reading Efficiency Measures Obtained by Classroom Educators Using a Low-Cost Eye Movement Recording System
Alexandra N. Spichtig, Ph.D., Jeffrey P. Pascoe, Ph.D., and John D. Ferrara, M. Ed.
Reading Plus, Winooski, Vermont, USA

Background
The Visagraph is a low-cost portable eye movement recording system that uses goggles fitted with infrared emitters and sensors to measure corneal reflections at a sampling rate 60 Hz (Taylor, 2009). The system is used by schools, clinics, and vision specialists to track eye-movement behavior during reading and to assess silent reading efficiency. In previous research (Spichtig, Vorstius, Greene, & Radach, 2009), recordings obtained using the Visagraph yielded measures of reading rate, progressive saccade counts, and fixation durations that aligned well with those obtained using a more sophisticated Eyelink® eye movement recording system.

Aims
This research examined the test-retest reliability of the Visagraph when used by classroom educators to measure silent reading efficiency in students ranging from second to twelfth grade (approximately 7 to 18 years old).

Method

Data Collection
Recordings were collected by educators while students wore the Visagraph goggles and read standardized passages from a normed test booklet. Each passage comprised 12 lines of text containing about 120 words. The Visagraph software automatically discards data from the first and last lines to minimize anomalies resulting from starting and ending a passage. Analyses are based on data from the middle 10 lines, which contain 100 words.

Students read one practice passage followed by four additional passages with a level of text complexity that matched the student’s grade level. Each passage was followed by 10 true/false comprehension questions. Eye movement data were recorded and processed automatically by the Visagraph software.

Figure 1. Student reading text from a normed test booklet while eye movements were recorded using the Visagraph.

Figure 2. Example of a typical Visagraph passage (Left) and a typical true/false comprehension check (Right).

Figures 3. Coefficients of variation across grades for each of the four reading efficiency measures.

Table 1. Relative and Absolute Indices of Reliability for Four Reading Efficiency Measures across Grades.

Conclusions
Educators and researchers with an interest in reading-related eye movement behavior face many sources of variance. One is the inherent variability of reading behavior, which research has shown (e.g., McConkie, et al., 1991), and the present results confirm, is greater in children who are still learning to read. Additional variance arises from variations in text complexity and their interaction with an individual’s level of reading proficiency. As well, there is variance associated with the limitations of the eye movement recording system. All of these factors contribute to the reliability of eye movement recordings. The present results provide estimates of measurement reliability at different grade levels using the Visagraph – data that can be useful when designing experiments (e.g., selecting sample size) and evaluating results.

References