

dots represent saccades, (eye movements between fixations) during which no useful graphic information is transmitted to the brain. Previous eye movement research has substantiated the occurrence of nonfixations during reading (Just & Carpenter, 1987; Paulson, 2000; Rayner, 1997).

Like Paulson's (2000) readers, the first-grade readers in this study did not always fixate words serially from word to word, left to right. As they read, readers engaged in regressive eye movements within print or transitioned from print to pictures and then back to print. They also engaged in fixations that shifted vertically from line to line and diagonally across the print field. Readers did not always fixate words for the same amount of time. They did not always fixate at the center of words, horizontally or vertically. There was a low incidence of fixations that fell between lines of print, between words, and in the blank margins of the page.

All readers spent less than 1.5 seconds in fixating pictures prior to entering print. For monolingual speakers, this amount of picture-viewing time prior to entering print was even further reduced to less than .5 second.

Bilingual readers in this study fixated pictures and print more frequently and for longer periods of time than their monolingual counterparts. Bilingual readers' average fixation times were longer than those of monolingual readers. These findings regarding bilingual readers are not new eye movement research. Cattell (1886) found that second-language readers took more time to read texts. Almost a century later, Oller and Tullius (1973) further substantiated this finding. Although bilingual readers fixated pictures and print more frequently and for longer periods of time, their fixation durations were proportionally similar (in terms of percentages) to monolingual readers.

Among all readers, 20% transitioned from pictures back to print by moving to a word prior, 45% by moving to the same word, 26% by moving to a word beyond, and 9% by moving to other areas outside word boundaries.

On average, regressive eye movements (eye movements which move backwards in the text) accounted for 14% of all eye movements. Regressions within sentences (moving backward across word boundaries within a sentence) accounted for 52% of all regressive eye movements, while regressions within words (moving backward within word boundaries) accounted for 46% of all regressive eye movements.

As Table 1 illustrates, in instances of words with multiple occurrences, readers fixated the same word (in this example, the word *a*) in different contexts for different durations (amounts of time). In some contexts they did not fixate the word at all.

When sampling pictures, readers devoted a majority of their time (fixation duration: 90%) and fixations (number of fixations: 89%) sampling major components such as characters and objects within the pictures.

The first-grade beginning readers in this study were more likely to not fix-