

Contextual and lexical effects in Braille reading using an automated finger tracking method

Zaida McClinton

Johns Hopkins University, Baltimore, Maryland, United States

Emily Silvano

Johns Hopkins University, Baltimore, Maryland, United States

Clarissa Alfonso

Johns Hopkins University, Baltimore, Maryland, United States

Marina Bedny

Johns Hopkins University, Baltimore, Maryland, United States

Colin Wilson

Johns Hopkins University, Baltimore, Maryland, United States

Abstract

Measurement of braille reading with high spatial and temporal accuracy could provide a unique window into incremental processing, complementary to eye tracking and speech perception measures. In braille reading, the fingers move continuously (not in discrete saccades) and perceptual processing is focal (unaffected by parafoveal preview or anticipatory coarticulation). We video-recorded (60fps) nine congenitally blind adults reading linguistically rich passages from the Natural Stories Corpus presented in UEB English braille. Finger locations were tracked with computer vision software, mapped to page coordinates, and converted to word reading times (RTs). In the resulting dense data set, containing >3 million tracked locations and >50,000 word tokens, RTs increased with word length in cells ($r=0.77$), decreased with log word frequency ($r=-0.62$), and increased with context-based surprisal ($r=0.40$, all $ps<0.001$). These results establish lexical and contextual effects with a low-cost, automatic braille tracking method.