Early sign-speech bilingualism helps children learn reading

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A prevailing assumption in science and society is that learning to read requires sound. Yet, deaf signing children without access to sound still become successful readers. Decades of research have shown similarities between spoken and visual sign phonological processing in the brain, as well as cognitive-behavioral benefits in sign-speech bilinguals. Does sign-speech bilingualism impact learning to read? In a cross-sectional study, we investigated higher cognitive factors hypothesized to contribute to reading development, specifically, early bilingual language and reading experience. Data were analyzed from 32 children across 4 groups: younger and older hearing monolinguals (English; H1, N=7, age=4.9±0.6y; H2, N=6, age=7.2±0.4y); younger and older deaf sign-speech bilinguals (English and American Sign Language; D1, N=10, age=5.0±0.9y; D2, N=9, age=7.1y±0.8y). fNIRS brain imaging (higher cognition) and infrared eye tracking (attention) were time-locked during a lexical decision task (behavioral responses). H2 were most accurate for orthographic (pseudoword>false font) and phonological decisions (pseudoword>nonword), followed by D2, then D1. H1 responded the least accurate for both types of decisions. Accuracy and reaction time correlated with brain activation in left inferior frontal cortex (LIFC). Brain activation in LIFC and posterior superior temporal cortex also correlated. Notably, D2 gazed at correct words most for both decisions, followed by H2. Additionally, D1 gazed at correct words more than H1 for orthographic decisions, with the opposite being true for phonological decisions. These findings suggest a biological advantage for sign-speech bilinguals in early reading. Through novel combined brain+eye+behavior, new insight is revealed about the bootstrapping impact of visual sign phonology on reading development. This work has broad scientific and translational impact by identifying factors that may benefit all children in learning to read.