Language-mediated prediction is related to reading ability and formal literacy

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Much evidence has accumulated that language users can predict up-coming words (Altmann & Kamide, 1999; DeLong, et al., 2005; Van Berkum et al. 2005). Though compelling it is noteworthy that almost all studies on prediction in psycholinguistics have used highly literate participants (i.e. university students). It is however well-known from other areas of cognitive psychology that prediction requires substantial levels of relevant expertise. We investigated whether levels of reading expertise attained through formal literacy are related to anticipatory language-mediated eye gaze.

In Experiment 1, Indian low and high literates (2 and 12 years of schooling) listened to simple spoken sentences containing a target word (e.g., "door") while looking at a visual display of four objects (the door, and three distractors). The spoken sentences contained adjectives followed by the (semantically neutral) particle wala/wali and a noun (e.g., 'Abhi aap ek uncha wala darwaja dekhnge', Right now you are going to see a high door). Adjective (e.g., uncha/unchi, high) and particle (wala/wali) are gender-marked in Hindi and thus participants could use syntactic information to predict the target. To maximize the likelihood to observe anticipation effects, we chose adjectives which were also semantically and associatively related to the target object. High literates started to shift their eye gaze to the target object well before target word onset. Low literates' fixations on the targets only started to differ from looks on the unrelated distractors once the spoken target word acoustically unfolded (more than a second later than the high literates).

In Experiment 2, we compared anticipatory eye gaze of low literates with up to 5 years of schooling with high literates. Importantly, both groups were matched on non-verbal IQ (Raven's matrices). A word reading test established low and high levels of reading proficiency. We used the same spoken sentences and target pictures as in Experiment 1 but we replaced the three distractors so that participants could only use semantic/associative information from the adjective for prediction (all words/objects were of the same gender). As in Experiment 1, high literates (but not low literates) initiated eye movements to the target objects well before target onset.

Our findings suggest that formal literacy and reading aptitude are related to language-mediated prediction. Why might this be the case? Reading and spoken language comprehension, for instance, differ in the amount of information that is processed per time unit (approx. 250 vs. 150 words/minute). To maintain such a high reading speed, prediction is presumably helpful (if not necessary). Moreover, readers make use of statistical knowledge in the form of transitional probabilities, i.e. that the occurrence of
one word can be predicted from the occurrence of another (McDonald & Shillcock, 2003). Low levels of reading and writing practice greatly decreases the exposure to such word-to-word contingency statistics in low literates. Thus, formal literacy may enhance individuals' abilities to generate lexical predictions, abilities that help literates to exploit contextually-relevant predictive information in other situations such as when anticipating which object an interlocutor will refer to next in one's visual environment.

References

