SPOKEN-WORD RECOGNITION IN RUSSIAN CHILDREN

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Eye-tracking studies in English found that when the onsets of two words are identical (*candle* vs. *candy*), adults' fixations of the target word are delayed in the presence of its phonological cohort (Allopenna *et al*., 1998). Fernald *et al*. (2006) showed that even 2-year-old infants also exhibit a similar cohort effect with a restricted set of spoken materials. In the present study, we provide the missing link in development of spoken-word recognition between infancy and adulthood by investigating the speed and efficiency of this process in five-to-six-year-old Russian children. The two experiments (1) investigated the cohort effect with young children, (2) explored developmental differences in spoken-word recognition by comparing children with adults, and (3) tested the feasibility of using the free-viewing eye-tracking method and a rigorously controlled adult-like design to study spoken-word recognition in children. The Russian materials were more challenging than the ones used in the English studies, with complex phonology, abundance of polysyllabic words and unpredictable lexical stress patterns.

Thirty-two Russian children and 16 Russian adults viewed computer displays with 4 pictures of familiar objects (a bow, a jar, a fork, a fan) and clicked on them. In half of the 20 trials (the Cohort condition), the names for the 2 of the pictures started with an identical three-phoneme onset (*bant* 'bow' - Target, *banka* 'jar' - Competitor); in the other half (the Non-Cohort condition), the names for all of the pictures were different (*bant* 'bow' - Target, *vilka* 'fork' - Distractor). The target was embedded in a carrier phrase, *Pokazhi, gde zdes' bant* 'Show *where the bow is here'*. Coarse-grain analyses of eye movements indicated that adults produced looks to the competitor on significantly more Cohort trials (47%) in comparison to Non-Cohort trials (37%), whereas children surprisingly failed to demonstrate cohort competition (65% vs. 69%) due to widespread exploratory eye movements across conditions.

Fine-grain analyses, in contrast, showed a robust cohort competition in eye movements in both children and adults. The children were significantly faster in launching their first eye movement to Target in the Non-Cohort (at 627 ms from the onset of the Target) than in the Cohort trials (at 823 ms), $F1 = 6.01$, $p < 0.02$; $F2 = 5.83$, $p < 0.03$. Analysis of time-course of the cohort competition at 33-ms intervals, however, showed that cohort competition is resolved differently in the two groups. By the time the target was heard (on average 527 ms after its onset), the adults overwhelmingly fixated the target, with the number of looks to the competitor and distractor becoming indistinguishable from each other and falling to close to zero. For the children, cohort competition lingered for almost a second and a half after the onset of the target: they continued to look more at the competitor in the Cohort trials than at the distractor in the Non-Cohort trials.

Thus, our results (1) provide a missing link in a developmental trajectory for spoken-word recognition between infancy and adulthood, and (2) emphasize the importance of using multiple behavioral measures (response and eye movement data) in children. The observed developmental dissociation in children between their general patterns of eye movements (coarse-grain) and time course of eye movements (fine-grain) emphasizes the importance of methodology in investigating interactions between language processing and cognitive development. Eye-tracking is emerging as a critical tool for uncovering developmental dissociations between controlled (general patterns of eye movements) and automatic processes (moment-by-moment eye movements), and provides strong evidence that children parse sentences deterministically (Trueswell *et al.,* 1999), i.e., they fail to revise their initially incorrect interpretations of temporary syntactic or referential ambiguities even when disambiguating information becomes available. The present findings also fit well with recent observations of behavioral dissociations in cognitive development that have been attributed to a lack of development of executive functions of the prefrontal cortex responsible for self-regulation, inhibition, planning and modifying behavior, as well as the maintenance of representations in working memory (Davidson *et al*., 2006). All of this taken together points to a need for further integration of developmental studies of language processing and cognitive development.

References

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