

Children's processing of words with form-only and form-meaning-overlap within and between languages – do executive functions matter?

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The bilingual distributed connectionist model [1] suggests that in bilinguals cognates and interlingual homonyms are stored like polysemous and homonymous words in monolinguals, predicting facilitation for form-meaning-overlap words compared to inhibition for form-only-overlap words within (polysemes, homonyms) and between (cognates, interlingual homonyms) languages. Executive functions (EF) influence the processing of form- (and meaning-) overlap words [2, 3], with improved processing with developing EF capacity in late childhood [4]. Against this backdrop, longitudinal study addressed 1) whether meaning relatedness of ambiguous words determine in- or decreased lexical processing costs within (polysemy, homonymy) and between (cognates, interlingual homonyms) languages in child English learners, (2) whether EF influence the processing of ambiguous words in children and (3) if developmental increases in EF capacity modulate the processing of form-overlap words. Sixty-seven German speaking beginning learners of English (aged 8–11), tested in 3rd (T1) and 4th (T2) grades, completed a forced-choice word-recognition-task [5] using object pictures and spoken labels to test processing of English-German cognates and interlingual homonyms (between language ambiguity) and German polysemes and homonyms (within language ambiguity). Accuracy and reaction times (RT) to ambiguous targets and matched controls was collected. EF domains [6] were assessed using digit span for working memory (WM), Go/noGo for inhibitory control (IC) and alternating fluency for cognitive flexibility (CF). Logarithmic RT were analysed using linear mixed-effects models (LMMs), containing word type and vocabulary as fixed effect predictors; EF were included in separate LMMs. Results indicate inhibition for unrelated meanings within and between languages (RT & accuracy $p \leq .01$). Words with related meanings showed facilitation between languages, but inhibition within languages (all RT & accuracy $p < .001$). Significant interactions with word type and testing time were found for inhibitory control and cognitive flexibility. For form-only-overlap words enhanced IC led to increased inhibition in grade 3 but decreased inhibition in grade 4 (interlingual homonymy: $p = .001$; homonymy: $p = .002$). CF modulated processing of interlingual homonyms with enhanced CF resulting in larger inhibition in grade 3 but smaller effects in grade 4 ($p = .027$, *figure 3*). Absent polysemy facilitation challenges the assumption that meaning-relatedness determines processing outcomes of form-overlap words within- and between-languages in identical ways [1]. However, this might be due to insufficient depth of semantic knowledge in the developing semantic networks of children. The results underscore the importance of EF during the processing of form-overlap words and reveal a developmental shift in how EF are employed between 3rd to 4th grade.

References

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Figures

Interactions of executive functions, ambiguity processing and testing time

