Individual Differences in Single Word Recognition for Adults and Children: A Systematic Review & Meta-Analysis

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What is the motivation for this meta-analysis?

Theories explaining skilled and disordered reading are based on observations about the effects of psycholinguistic variables on word naming and lexical decision performance1-4. My interest is in reading processes in adolescents and adults who, in the absence of diagnosed organic difficulties, still struggle to attain skilled reading. In thinking about these learners, knowledge of which predictors inhibit or facilitate strong performance, and their relative importance with each other, may shape teaching practices or resources, so it’s important that we have robust estimates upon which to base teaching decisions5. As a baseline from which to measure this group’s performance in future studies, I embarked upon a meta-analysis of the psycholinguistic research literature that studies contrasting groups and their performance in word naming and lexical decision tasks.

Method

1. A scoping search of the literature using ‘individual differences’ and names of psycholinguistic predictor variables as key words6
2. Abstract-sift and full-text review (n = 328): inclusion criteria of word naming or lexical decision tasks and contrasting groups within sample. Seventy-four studies met the inclusion criteria for data extraction
3. Effect sizes computed using ‘compute.es’7 package in R software environment8
4. Random effects meta-analysis conducted on data, using ‘metafor’9 package in R, as a function of task, outcome and linguistic predictor within adult and child samples
5. Diagnostic tests for heterogeneity10, sensitivity and publication bias11 were also conducted

Summary Effect Sizes for Response Time and Accuracy by Variable, Task and Sample

Effect sizes for RT and accuracy were calculated for a wide range of linguistic predictors like frequency, age of acquisition, letter consistency, length, word and non-word size, letter or phonological encoding, age, gender and frequency measures. The Log(OR) effect sizes were then plotted for the different combinations of variables, tasks and samples, with each plot indicating the relative importance of the predictor within the context of the task, variable and sample.

What could these results mean?

• Ability and frequency variables have the strongest influence across adults, children, tasks and outcomes
• For response time, person-level variables are stronger than word-level variables in adults, while person-level and word-level variables are equally important across tasks involving children
• However, for accuracy, word-level variables appear to be stronger predictors in child samples than person-level predictors
• While the majority of effect sizes are between moderate to large, confidence intervals are ‘embarrassingly large’12 and the F statistic indicates high levels of heterogeneity which may reduce our confidence in these summary effect sizes

References - please see the back of the handout

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- The reduction in word-level variable influence for adults supports the idea of a developmental trajectory of skill13. Skill increases as information from the words is internalised and organised. Their influence can be seen in children as a function of the learning process
- The relative importance of frequency and ability across adults and children may indicate that the consolidated information - both specific and redundant - comes to be represented in these two variables in adult readers14
- Limitations: The majority of results for word-level predictors reflect a within-samples measurement. As main effects, these values may be inflated due small sample sizes, measurement error and sampling variation15
- Future research: Adopting a longitudinal approach could quantify the rate of diminishing returns for word-level variables as skill increases17. Longitudinal design would increase power while reducing measurement error and sampling variation by using repeated measures
- Alternatively, and less expensive, a ‘multi-lab’ approach, collecting many small, community samples using an agreed research protocol, would reduce levels of heterogeneity and stabilise effect sizes through aggregation and meta-analysis, yielding greater confidence in the results