

Effect Sizes for Single Word Recognition Across Adults and Children: A 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** performance^{1,2,3,4}. 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 heterogeneity**¹⁰, **sensitivity and publication bias**¹¹ were also conducted

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

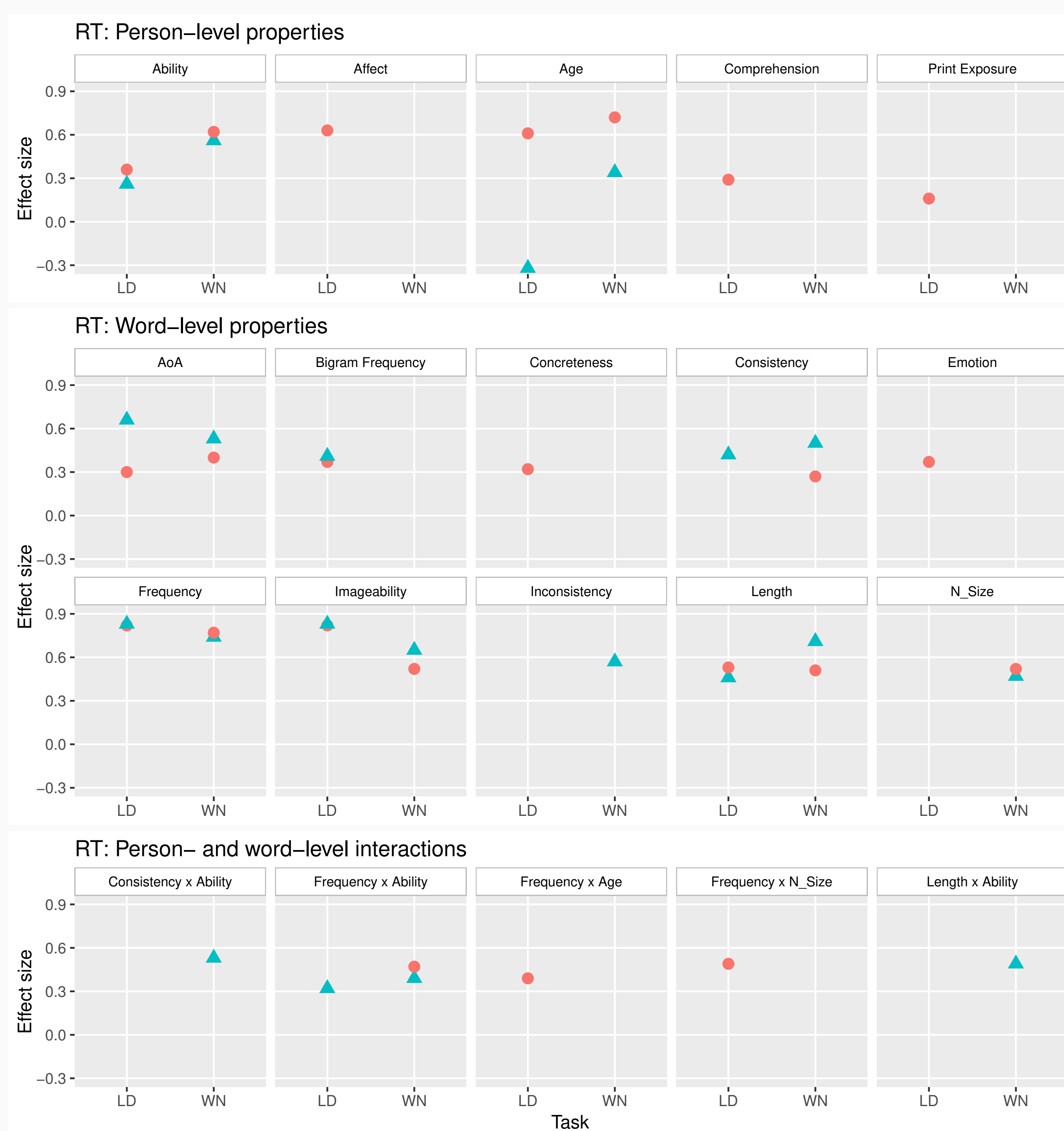


Fig. 1: Response Time as a function of task, sample and predictor variable

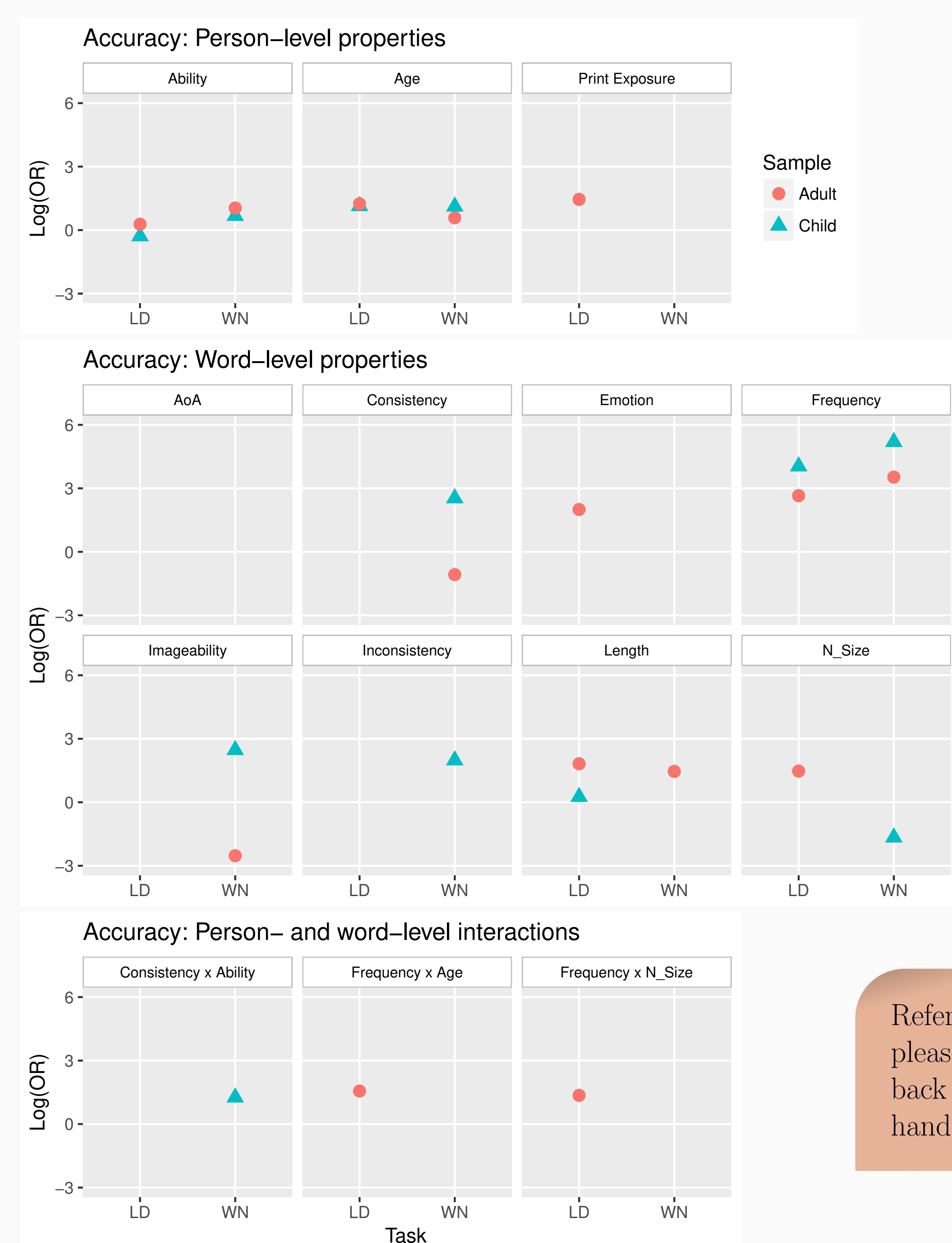


Fig. 2: Accuracy as a function of task, sample and predictor variable

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- **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 I^2 statistic indicates **high levels of heterogeneity** which may reduce our confidence in these summary effect sizes

What could these results mean?

- The reduction in word-level variable influence for adults supports the idea of a **developmental trajectory of skill**¹³. 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 redundant¹⁴ - comes to be represented in these two variables in adult readers¹⁵
- 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 variation¹⁶
- 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