Early Cognitive Indicators of Dyslexia in Preliterate Children at Genetic Risk

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Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis and all sources used, have been acknowledged in this thesis.

Annie-Lou Carn

This thesis is dedicated to my father, John D. Carn,

who is my inspiration.

Thank you

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TABLE OF CONTENTS

CHAPTER FOUR: PAIRED ASSOCIATE LEARNING

CHAPTER SIX: ENUMERATION TASK AND DISCRIMINATION TASKS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The aim of this thesis was to assess a sample of 81 preliterate children (3 to 5 years old) who were from a Family At Risk of dyslexia (FAR) or Not Easily Associated with Risk (NEAR) in respect to a range of working memory and standardised language tasks (children's measures) in an attempt to identify cognitive features that might be implicated in dyslexia. Because dyslexia appears to have hereditary components, parent's performance on a range of reading related tasks was also correlated with children's performance to assess which tasks were most predictive of risk status.

Utilising information gained by previous longitudinal studies, standardized tasks provided a continuous classification of the children's likely risk status based on their own performance. Three factors were gleaned from a factorial analysis, component manipulation ability, rapid automatised naming, and letter knowledge, and this accords with current research (Bishop, 2003) suggesting that these three factors are good predictors of future reading success. In terms of the children's non-standardised measures, the ability to pair visual stimuli with articulated and synthesised sounds was investigated. Measures of central executive functions (cognitive inhibition, susceptibility to interference, various span measures, speed, and controlled attention) were also examined. Tasks were adapted, or developed, specifically to meet the attentional, knowledge and skill levels of these young children.

Children were categorised in terms of risk status using two methods based upon their parent's literacy performance. Firstly, several continuous predictors were identified. Of these, the worst parent's comprehension score was the best predictor of children's performance and supports the idea that the hereditary component of dyslexia appears more likely to involve central executive functions, like speed, and possibly central coherence, which in turn impact on phonological processing. The second method produced the discrete

categories of family at risk (FAR) and not easily associated with risk (NEAR). This method proved to be most informative when categorisation was based on self-report by the parents concerning their past competence in reading.

The only performance differences between NEAR and FAR groups, in terms of paired associate learning was when the FAR group out performed the NEAR group when the sound was synthesised. It is suggested that this may be the result of enhanced perceptual discrimination for acoustic input, with reduced likelihood of language-specific categorical (phonological) processing.

Two measures of cognitive inhibition were designed using picture flanker tasks. Overall, the results suggested that the FAR children were more likely to interpret pictures semantically, relying on a more literal perceptual interpretation, rather than assigning a quick linguistic label. The use of this strategy would require greater reliance on an eidetic memory and thus accords well with their performance on the paired associate tasks.

Using an enumeration task, there were no group differences on the basis of span or controlled attention, yet the FAR group showed a speed of processing deficit supporting similar results for individuals with dyslexia (e.g., Bowers, 1995). Similarly, using a discrimination task, the FAR group demonstrated a trend towards slower response times. The results of the enumeration and discrimination tasks, in conjunction with performance on some of the standardised tasks, highlight a critical role for processing speed.

A sentence completion active span task demonstrated no group differences in span sizes, but FAR children were more susceptible to proactive interference from previous trials and lower span in this group predicted proactive interference. This susceptibility to interference may have a genetic component, where poor sight word reading ability displayed by the parents with the worst reading skills was strongly associated with greater susceptibility to interference for the children.

For simple word span, the NEAR group demonstrated a larger span size for similar real words relative to the FAR group. This provides tentative support that a deficit may lie in the distinctiveness of the phonological representation at a lexical level, leading to difficulty when it comes to retrieval. It is highly possible that if a deficit occurred here, a strategy to overcome this deficit may be to focus on acoustic properties at the time of encoding in order to improve their performance.

Overall, the performance of FAR children would suggest a primary speed of processing deficit that may have a cascading effect. Speed deficits contributed to poor performance not just in tasks that were timed (e.g., rapid automatised naming tasks), but also in tasks requiring the segmentation of speech stream (e.g., rhyme awareness, word blending ability and word elision skills). The pattern of associations between children's measures reported throughout the thesis would suggest that the Matthew Effect is indeed impacting way *before* the reading acquisition process even begins, emphasizing the need for further investigation in the preliterate population.