

## Introduction

- Down syndrome (DS) is the most common genetic cause of intellectual disability<sup>1</sup>.
- ~1 in 691 children born today have DS<sup>2</sup>.
- DS is most often due to nondisjunction during meiosis, resulting in 3 copies of chromosome 21 (see Fig. 1).
- It is associated with common physical features (see Fig. 1) as well as cognitive impairments including weaknesses in language, verbal short term memory, working memory, motor abilities, and reading<sup>3</sup>.
- The average level of reading achievement reported for adults with DS is in the 1<sup>st</sup> to 3<sup>rd</sup> grade range<sup>4</sup>.
- Given the importance of reading for independence and employment, there is a need to understand what cognitive factors underlie reading difficulties in DS.
- Skills like phonological awareness that are the most predictive of reading in typically developing children<sup>5</sup> are less predictive of reading in DS<sup>6, 7</sup>.
- Thus, the current study sought to examine other cognitive abilities that may relate to reading abilities in DS, as these skills could be important alternative targets of intervention to improve reading in this group.

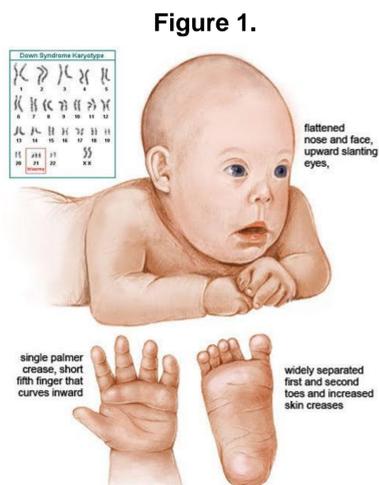


Figure 1.

## Methods

Participants included 29 youth with DS. For demographic information, see Table 1 below. All participants completed the Woodcock Johnson - III Letter Word Identification Subtest, an untimed single word reading task, and scores were correlated with performance on several cognitive tasks. See Table 2.

Table 1.

| n  | Age                                 | IQ                               | Sex (%F) |
|----|-------------------------------------|----------------------------------|----------|
| 29 | M=15.5; SD= 5.6<br>Range = 5-24 yrs | M= 54; SD= 14.8<br>Range = 24-92 | 55.2%    |

## Results

- The objective of this research was to identify cognitive abilities that relate to individual differences in reading in DS.
- Table 2 describes the cognitive skills studied, measures used, and the results of the cognition-reading correlation analyses.

Table 2.

| Cognitive Domain   | Test  | Example | Results  |
|--|---|---------|----------|
| <b>Processing Speed (PS):</b> Perceptual and motor speed, measured here as the speed at which symbol pairs can be identified (PS)  | Wechsler Symbol Search                        |         | r = .48* |
| <b>Phonological (PM)/ Working Memory (WM):</b> the ability to recall small amounts of phonological information, such as strings of digits, verbatim (PM) and to manipulate that information for use during a task, such as recalling digit strings backwards or tapping a series of blocks in reverse order (WM) | Wechsler Digit Span Forward (PM)              | PM, WM: | <br>     |
|  | Wechsler Digit and Spatial Span Backward (WM) | WM:     |          |
| <b>Semantic knowledge (Sem):</b> knowledge of word meanings, measured here using a receptive vocabulary test   | Peabody Picture Vocabulary Test               |         |          |
| <b>Associative Memory (AM):</b> the ability to establish and remember the relationship between two previously unrelated stimuli, measured here with a spatial memory task  | Cambridge Paired Associates Learning          |         |          |
| <b>Inhibition (I):</b> the ability to withhold a prepotent (or overlearned) response in favor of a more appropriate response for a given situation, measured with a modified Stroop task   | Happy Sad Stroop                              |         |          |

+ p<.1, \* p<.05, \*\* p<.01, \*\*\* p<.001

- All cognitive skills were correlated with reading. Because past studies have shown that semantics is especially predictive of reading in DS<sup>6</sup>, partial correlations were run with performance on the PPVT covaried. The magnitude of correlation coefficients decreased for all measures, but continued to be statistically significant for WM (r= .55, p<.01).

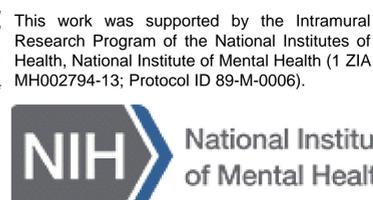
## Conclusion/ Future Work

- WM appears to be a strong (concurrent) predictor of word decoding abilities in DS. Future work could study this relationship longitudinally to see if WM continues to be predictive of reading ability over the course of time. If this work confirms the importance of WM in predicting reading abilities, it suggests that interventions that target WM may be helpful in improving reading in DS.

## References

## Acknowledgements

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