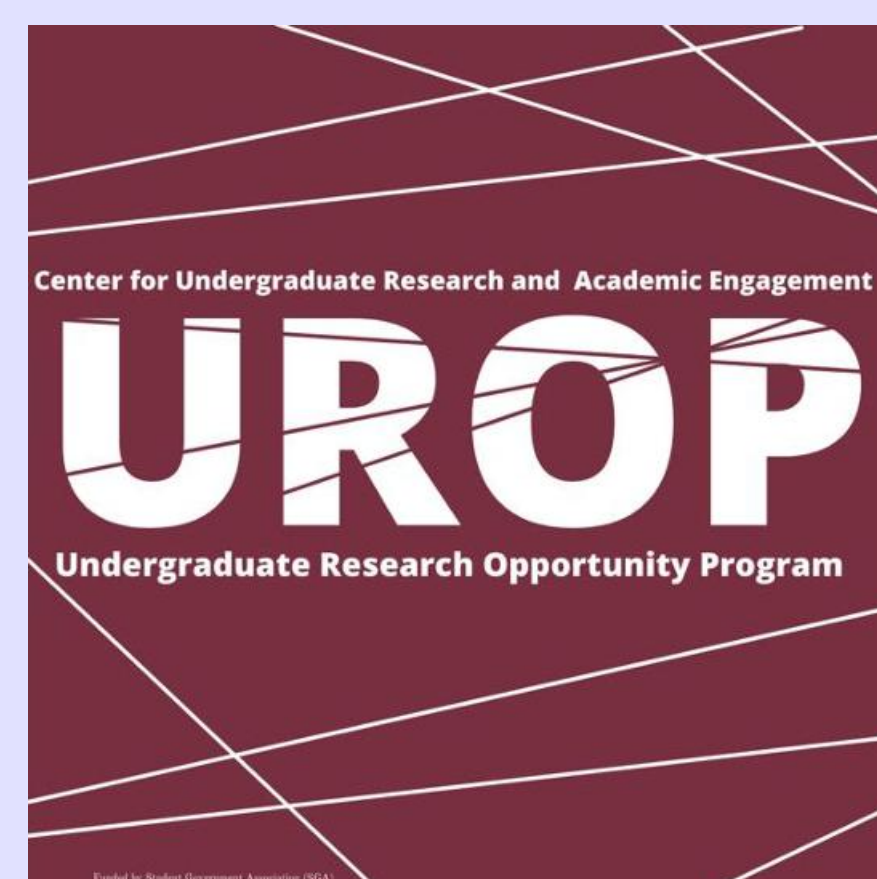


Meta-Analysis in Determining a Comprehensive Prediction Criteria for Developmental Dyslexia



Katya Sniriova, Richard Wagner, Dorota Kossowska-Kuhn, & Fotena Zirps

Introductory Background

Dyslexia affects 1 in 10 people worldwide, being coined a formative disorder which hinders language comprehension, reading capabilities, and influences other cognitive factors. Developmental dyslexia is neurobiological in origin with four key factors characterizing its definition. Firstly, dyslexia impacts specific neurological systems, tied towards phonological understanding and reading capacity, not the whole individual's cognitive abilities. Secondly, due to its origination, dyslexia cannot be developed, the only influence external conditions have on the conditions is the scale of symptomatic relief. The third characteristic expands on the deteriorated phonological loop in individuals with dyslexia, resulting in difficulties with word-reading and spelling. Finally, the disorder may cause secondary deficiency in related cognitive areas, such as vocabulary and comprehension, amongst others. (Wagner, Zirps, & Wood, 2026). Considering the extend of this disorder, research from the past few decades has formulated an extensive criterion for diagnosis. The issue with predicting dyslexia is the lack of a worldwide agreed-upon criteria; mainly, stemming from the lack of communication amongst researchers and varying criteria's coordination. Therefore, the absence or presence of certain symptoms from these predicting sets may influence their accuracy. A pilot study was completed by our lab prior to this current study to outline the most typical predictors amongst a dyslexia diagnosis. Our findings showed that by testing individuals for phonological processing abilities, family history, and response to effective instruction, is a fairly accurate means to determine whether someone has dyslexia. With that, our current study aims to analyze a database of published reports to create an accurate and more comprehensive criteria, containing valid predictors across thousands of studies.

Methods

This study does not follow a typical experimental structure, as the main research mechanism utilized is a meta-analysis. A meta-analysis aims to summarize research findings across a database through calculating estimates of the effect effects and its heterogeneity (source). If there is a high rate of heterogeneity, or how inconsistent the correlation matrices are across the studies, a further study may need to be conducted with moderators to produce more comprehensive and statistically reliant results (Cheung, 2021). For this study, since the premise is to create a comprehensive piece of information, relating to thousands of studies, a meta-analysis is the most effective methodology. The database our team uses to screen articles, or the first stage of this study, is Covidence. Screening articles entails reading through the content and identifying if the research provides evidence towards dyslexia prediction; essentially, this stage determines what articles will later be analyzed for overarching trends in diagnosing dyslexia. Covidence allows for articles to be reviewed by 2 lab assistants and if accepted by both is forwarded to the next stage. If two researchers dispute over an article, there is a higher-ranked individual which resolves the conflict by providing a tie-breaking vote. Once the first stage is completed, the study moves towards analyzing the articles themselves and comprising the comprehensive criteria.

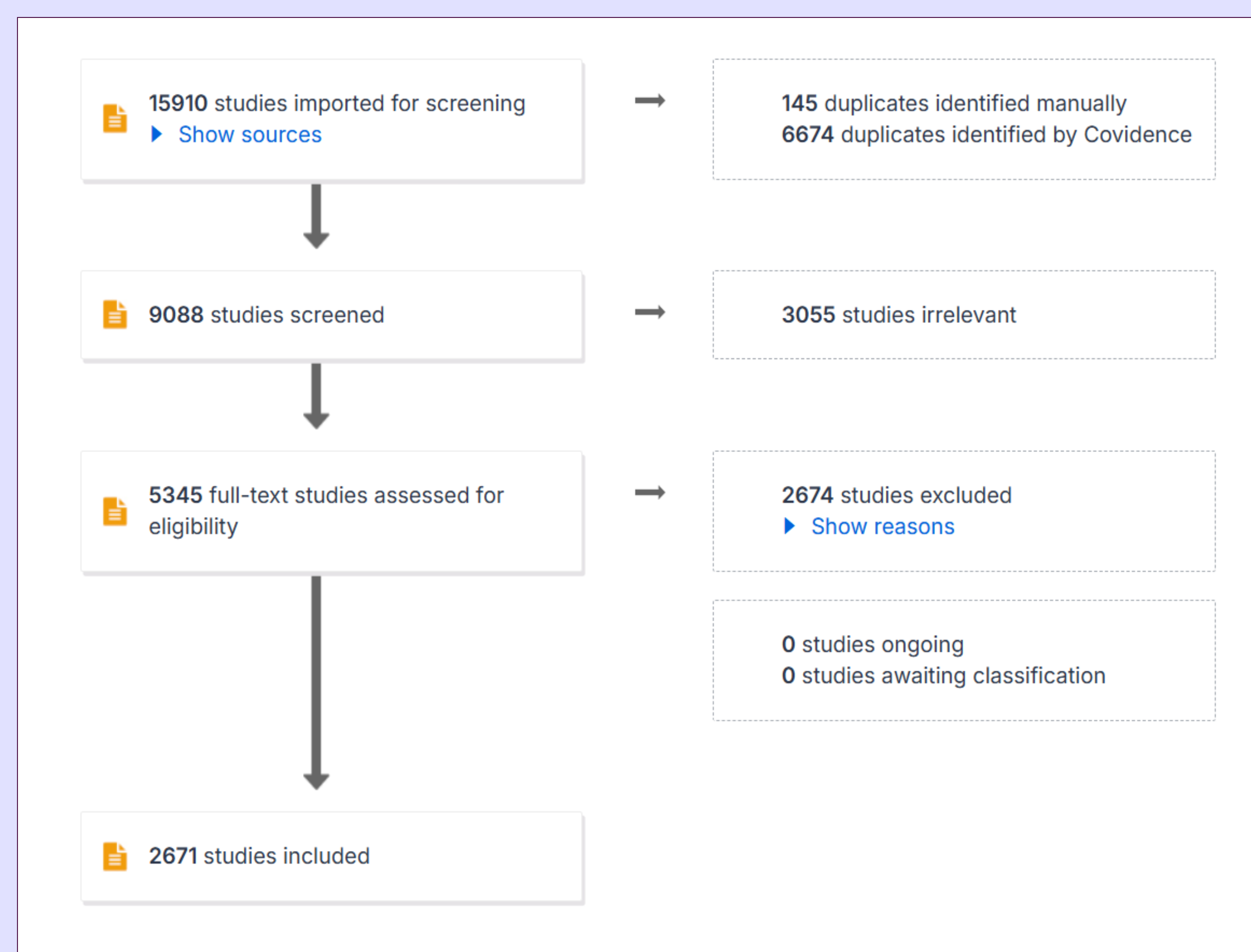


Figure A – PRISMA Chart: Phase 1, Article Screening



Figure B – PRISMA Chart: Phase 2, Group Differences

Results/Conclusion

The study is currently ongoing; therefore, the only results available are from the pilot study done previous and preliminary results. As seen within the pilot study most studies determined three large factors which contribute to an effective criteria for dyslexia. The first being family history, one of the largest predictors of this disorder. A statistic found that having a family member who has dyslexia increases an individual's chance of having it by 4 times. Secondly, phonological processing abilities are extremely relevant to dyslexia symptoms, with the primary defects in this cognitive function being difficulty reading and word-recognition. When studying phonological processing abilities, researchers usually test rapid naming and phonological memory or ability. Finally, an individual's ability to properly adhere to instructions relevant to reading or writing is indicative of if they have dyslexia or not. All three of these predictors are expected to be common themes amongst the final criteria, as many papers typically examine one of these three predictors. The largest limitation of our current study is the lack of causation found amongst the data. The nature of a meta-analysis is to examine large-scale trends, mimicking correlation between dyslexia and its predictors. However, without an experimental component there is no causation amongst these items. Once this research is published many other organizations or researchers may base their experiment on our proposed criteria. Additionally, our criteria could be adopted on a clinical front, alongside experimental.

References

- Cheung, M. W.-L. (2021). Meta-analytic structural equation modeling. Oxford Research Encyclopedia of Business and Management. <https://doi.org/10.1093/acrefore/9780190224851.013.225>
- Thompson, P., Hulme, C., Nash, H. M., Gooch, D., Hayiou-Thomas, E., & Snowling, M. J. (2015, April 2). "Developmental dyslexia: Predicting individual risk." *Journal of Child Psychology and Psychiatry*. <https://doi.org/10.1111/jcpp.12412>
- Alrubaian, A. (2025, April 30). "Exploring and identifying key factors in predicting dyslexia in children: Advanced machine learning algorithms from screening to diagnosis." *Clinical Psychology & Psychotherapy*. <https://onlinelibrary.wiley.com/doi/10.1002/cpp.70077>
- Alrubaian, A. (2025, April 30). "Exploring and identifying key factors in predicting dyslexia in children: Advanced machine learning algorithms from screening to diagnosis." *Clinical Psychology & Psychotherapy*. <https://onlinelibrary.wiley.com/doi/10.1002/cpp.70077>
- Peterson, R. L., & Pennington, B. F. (2015, January 14). "Developmental dyslexia." *Annual Review of Clinical Psychology*. <https://doi.org/10.1146/annurev-clinpsy-032814-112842>
- Pennington, B. F., Santerre-Lemmon, L., Rosenberg, J., MacDonald, B., Boada, R., Friend, A., Leopold, D. R., Olson, R. K., Samuelsson, S., Byrne, B., & Willcutt, E. G. (2011, August 9). Individual Prediction of Dyslexia by Single Versus Multiple Deficit Models. *American Psychological Association*. <https://doi.org/10.1037/a0025823>
- Wagner, R., Zirps F., Wood S., (13 May, 2022) "Developmental Dyslexia – Chapter 19 (pg. 416-438)" *The Science of Reading: A Handbook, Second Edition*. https://onlinelibrary.wiley.com/doi/10.1002/9781119705116.ch19?utm_source=researchgate.net&utm_medium=article