**Broader Impacts Statement**

- Unveiling Procedural Learning Profiles in Dyslexia and Neurotypicals Using a Novel Largescale Online Psychological Testing Platform

Dr. Yafit Gabay, University of Haifa

Dr. Lori L. Holt, Carnegie Mellon University

Developmental dyslexia (DD) is characterized by difficulties in accurate or fluent reading despite adequate instruction, normal intelligence, and intact sensory abilities. DD affects as many as 5-12% of the population, and the resultant low literacy is associated with widespread socioeconomic problems, including lower labor force participation, greater reliance on public assistance, lower civic involvement, and lower earnings. Therefore, there is an urgent need to understand the mechanisms involved in DD etiology. A major conceptual framework suggests that Developmental Dyslexia (DD) arises from a selective disruption to procedural learning and memory systems. Despite an accumulating body of research supporting this notion, results are mixed. Aside from methodological differences, it is possible that the multifaceted nature of procedural memory contributes to inconsistencies across studies. Just as importantly, the fact that sample sizes are relatively small, and that the reliability of some procedural learning tasks remains unclear, further complicates our ability to identify systematic aspects of procedural learning that are likely to be affected in DD. The proposed project will lay the necessary scientific groundwork to advance theories of procedural memory as a cognitive construct. The project’s broader focus on discovering the connection between perceptual representations, phonetic development, and language skills will have direct implications for literacy and language education. The project’s broader impact is enhanced by its implications for developmental dyslexia, which is one of the most common developmental disorders. A broader aim of the project is to establish a comprehensive online procedural learning test battery that will be available to researchers and could promote open and reproducible research. We will use this online test battery to conduct a large scale study in which we examine multiple, within-participant measures of procedural learning, in both DD and neurotypicals, accompanied by an assessment of reading and language-related abilities. The findings from this project will fill theoretical gaps in our understanding of procedural learning as a cognitive construct and procedural learning functions of people with DD. At the clinical level our research will pave the way towards developing better diagnostics (e.g., streamlined diagnostics that do not rely on reading and could be administered earlier in development) and may lead to the discovery of subclasses of dyslexia, potentially paving the way for more targeted intervention programs informed by basic science research.