Dyslexics may fail to automatize the distinction of mirror image letters

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Abstract. Intensive research over more than a century has made important discoveries regarding the major brain systems and mechanisms involved in reading and the putative changes related to dyslexia. However we still lack a comprehensive explanation of this disorder, which is evident in the heterogeneity of theories, empirical findings and contradictory conclusions. In this article we briefly review some of these important findings in the language and visual domains. Considering that reading is an intensive visual activity that requires specific adaptations of the visual system, including the disappearance of *mirror invariance*, we argue that examining mirror image processing in struggling readers is one interesting way to explore the existence of learning deficits in the visual domain. We address the potential methodological differences and shortcomings of prior studies and revisit the findings from our work with preliterates, first graders, dyslexics and controls, as well as the existing evidence on mirror discrimination abilities of adult illiterates, ex-illiterates and literates on mirror discrimination. We conclude that a failure in automatizing mirror image processing may be among the possible causes of dyslexia that *per se* or in interaction with language problems hampers reading acquisition.

Keywords: literacy, dyslexia, mirror invariance, mirror image discrimination, visual processing.

1. Introduction

Developmental dyslexia (henceforth, *dyslexia*) is a neurodevelopmental disorder characterized by slow and inaccurate word recognition and spelling, despite intact sensory and general learning abilities as well as educational experiences[1,2.]

Intensive and systematic research conducted over more than a century has made important discoveries regarding the major brain systems "recycled" for reading[3] and the abnormal pattern of activation in left hemisphere reading/language networks associated with dislexia[4-6]. Considerable scientific progress has also been built on the mechanisms involved in reading and the putative changes related to reading deficits. However, a consensus regarding the cause(s) of this disorder is still lacking. The absence of a comprehensive ex