

Chapter 9

Investigating the Role of Cognitive Factors in Recognition of Paradox and Fiction Illusions in Children With Intellectual Disability and Down Syndrome

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ABSTRACT

This study explored the relationship between cognitive factors and the recognition of visual illusions, particularly paradox and fiction illusions, in children with intellectual disabilities (ID) and Down syndrome (DS). The purpose of this chapter was to provide a comprehensive analysis of how children with ID and DS engage with such illusions, as well as to uncover any distinct patterns or challenges they face in comparison to typically developing (TD) children. The research drew on cognitive theories of intellectual and developmental disabilities to interpret its findings and to address key concerns regarding the perceptual and cognitive abilities of children with ID and DS. This chapter also aims to contribute valuable insights to the understanding of these populations, highlighting both their strengths and challenges in perception and cognition. Additionally, the findings have implications for developing more tailored educational interventions and enhancing the overall cognitive development of children with ID and DS.

INTRODUCTION

Visual illusions are perceptual phenomena where the brain's interpretation of visual stimuli deviates from objective reality. These illusions provide a unique lens for studying cognitive processes such as visual perception, attention, memory, and spatial awareness (Wincza et al., 2024; Zavagno, 2023). Gregory (1997) has differentiated between illusions as ambiguities, paradoxes, fictions, and distortions.

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Paradox illusions involve contradictory or impossible elements that the mind tries to resolve, while fiction illusions create imaginary elements that do not exist.

Although there are currently numerous theoretical interpretations of visual illusions from the fields of cognitive neuroscience and perception, it is generally believed that the accumulated experience and expectations of the individual, as well as the deficient functioning of the “corrective” and “compensatory” mechanisms of the human mind, are the most scientifically powerful positions to explain visual illusions (Solso, 1995). As has been further demonstrated, humans can acquire perceptual experiences in cases in which there are deficit elements of stimuli or no elements at all, and vice versa. In other words, there is what we call non-conscious perception (i.e., perception that occurs even when the stimulus is below the level or threshold of conscious awareness) (Merikle et al., 2001). Interestingly, when sensory stimuli for an object provide incomplete, ambiguous, or ambivalent information about the visual object, the human mind makes an incorrect interpretation and distorts the object. Moreover, it may not gain any perceptual experience at all, even though the prerequisites of all stimuli are available in full form (Gordon, 2004).

While the study of visual illusion perception is quite widespread in the field of cognitive psychology, we know very little about when and how this perception develops in children with different types of intellectual disability. Only a few past studies have examined how adolescents and adults with intellectual disabilities, living in institutions, perceive primarily ambiguous figures and some visual illusions (e.g., Poggendorff and Opper-Kundt perceptual stability distortion illusions) (Shinkfield et al., 1997; Spitz et al., 1970). Data from these studies reported that individuals with intellectual disabilities performed lower on ambiguous figure tasks requiring parallel retention of multiple representations of shapes and showed greater cognitive rigidity compared to typically developing individuals of the same chronological age. However, when they were able to recognize the illusions, this was done more slowly and with a significant difference compared to typically developing children.

Also, individuals with intellectual disabilities, equated in terms of chronological age with typically developing individuals, appear to systematically show lower performance and slower reaction rates on tasks requiring automated detection and retrieval of visual stimuli, even after a period of practice. They thus have difficulty acquiring more flexible ways of responding to these tasks (Merrill et al., 1994; Merrill & O'Dekirk, 1994). However, recent evidence (Li-Tsang & Wong, 2009) suggests that the performance of individuals with intellectual disabilities on visual search tasks can be improved by using salient target stimuli when the complexity of the computer screen task increases. These data are important for learning new tasks requiring visual search skills.

Many questions remain unanswered in the realm of perception of visual illusions in the context of intellectual disability. Of particular interest, however, are some individual studies, which have been carried out on people with mainly neurodevelopmental disorders, trying to investigate the relationship between the ability to recognize visual illusions and the specific cognitive and other social characteristics of these disorders (Ishida et al., 2009; Makris et al., 2021; Palomares et al., 2009; Sobel et al., 2005; Walter et al., 2008). Although many initial studies of autism spectrum disorder were based on the hypothesis that this disorder may be associated with reduced sensitivity to visual illusion recognition due to a lack of central coherence (Happé, 1996), experimental data, however, have been contradictory. In fact, in one study, Reed and Peterson (1990) found that children and adolescents with autism spectrum disorder do as well as children with intellectual disabilities and typically developing children in drawing inferences from visual perception.

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