Chapter 1
An Overview of Pediatric Neuropsychology

Evangelia Stanitsa
https://orcid.org/0000-0001-5448-3675
1st Department of Neurology, Eginiteio, National and Kapodistrian University of Athens, Greece

Akyllina Despoti
Clinical Ergospirometry, Exercise and Rehabilitation Lab, National and Kapodistrian University of Athens, Greece

ABSTRACT

Pediatric neuropsychology is a specialized subfield of neuropsychology about cognitive functions and behavior in children and adolescents. This chapter attempts to provide an overview of the conceptual framework of pediatric neuropsychological assessment and intervention, referring to frequent neurodevelopmental disorders, and congenital or acquired neurological conditions. Emphasis is put on differentiating atypical from neurotypical development, understanding cultural, familial and academic context influences, as well as the ethical challenges that are frequent when working with pediatric populations. The chapter attempts to synthesize research, theory, and current clinical practices, by integrating findings from scientific studies to provide a general framework for practitioners, trainees, and researchers. The main goal is to highlight how neuropsychological assessment, interventions, and longitudinal monitoring through re-evaluation can optimize the intervention outcomes for children and adolescents facing neurodevelopmental challenges.

INTRODUCTION

Pediatric neuropsychology is a specialized subfield of neuropsychology about cognitive functions and behavior in children and adolescents (Beauchamp & Peterson, 2021). It focuses on the understanding of how neurodevelopmental and acquired brain conditions might impact cognition, learning, social behavior, and emotional expression. Pediatric neuropsychologists explore how development in children and adolescents plays a crucial role for an individual's ongoing development and adaptability across the lifespan (Baron, 2018). For this exploration, the neural plasticity of the developing brain, the complex

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relationship of genetic and epigenetic factors, and the potential for critical periods (during which specific functions are most sensitive to intervention) are considered (Anderson et al., 2017).

Historically, pediatric neuropsychology began as a subfield of adult neuropsychology, since children's brains are different quantitatively and qualitatively from adult brains (Semrud-Clikeman & Ellison, 2009). Although adult neuropsychological assessment could be used to gain partial insight into childhood cognitive functioning, it was soon clear that a developmental perspective was crucial for valid interpretation of test results and the design of interventions. According to Lezak (2012), children's cognitive functions are dynamic, based on the interaction between nature and nurture, or in other words, genetics and epigenetics that unfold over time.

Through the developmental lens, pediatric neuropsychologists tried to move beyond static measurements of cognition to investigate how the brain changes across childhood and adolescence (Beauchamp & Peterson, 2021). For instance, consider a child with a traumatic brain injury (TBI) at an early age: the immediate motor or language disorders might not fully indicate the long-term impact on cognitive functions, such as executive functions, which are still developing (Yeates et al., 2012). Consequently, for pediatric neuropsychology it is crucial to put emphasis on longitudinal monitoring, recognizing that impairments at an early age, if they remain untreated, can affect academic and social development. But, if suitable interventions take place timely, plastic reorganization of the brain and/or compensatory strategies in the maturing brain could help avoid developmental derailing (Anderson et al., 2017).

Pediatric neuropsychologists in the clinical setting approach children with a wide variety of presenting concerns. During the clinical assessment various aspects are evaluated: genetic syndromes (e.g., Down syndrome), epilepsy, specific learning disorders, perinatal risk factors (e.g., premature birth), and other medical conditions that disrupt normal brain maturation (Baron, 2018; Semrud-Clikeman & Ellison, 2009). Both congenital and acquired etiologies are evaluated. For instance, congenital etiologies might be genetic disorders associated with specific syndromes, while acquired etiologies might be injuries, infections or metabolic conditions (Beauchamp & Peterson, 2021). However, although recognizing the cause is crucial, the fundamental goal is to understand how the child's neurodevelopmental profile is functioning towards environmental demands (Lezak et al., 2012). This would allow professionals to enhance recovery and/or design a personalized rehabilitation plan to increase functionality of daily living within each developmental stage.

Children's developing brains are very sensitive to environmental influences, either negative or positive (Diamond, 2013). By enriching the environment of a child, resilience can be built, while by adversities, such as chronic-stress or socio-economic disadvantage, vulnerability could be increased (Farah, 2017). For this reason, an ecologically valid perspective should be used during the neuropsychological evaluation of a child or adolescent with the contribution of a pediatric neuropsychologist. In other words, the behavior of the patient should be understood within the context of the systems around it, namely family, school, other experienced communities - smaller or broader (Achenbach & Ruffle, 2000).

Pediatric neuropsychology uses standardized tests to evaluate patients' cognition in an objective way. However, these tests, although they are based on normative data, are not accurately capturing the individual within the systems it exists, meaning they might lack ecological validity. This is one of the most important challenges in pediatric neuropsychology and might partly affect individualization (Reynolds & Kamphaus, 2015). As a result, pharmaceutical and non-pharmaceutical intervention protocols supported by robust evidence might not always account for idiosyncratic or situational factors, calling for a flexible, integrative approach that marries science with clinical expertise (Baron, 2018).