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Assessment and relevance of neuropsychology in the school-aged child

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Abstract

Pediatric neuropsychology provides a clinical and educational framework to understand the relationship between brain development and the cognitive, behavioral, and academic performance of school-aged children. During this period, consolidation of executive functions, attention, memory, language, and visuospatial skills directly influences learning, socioemotional adaptation, and responses to increasing school demands. This narrative review synthesizes contemporary evidence on key constructs, assessment approaches, and the usefulness of neuropsychological findings for differential diagnosis (e.g., ADHD, specific learning difficulties) and for planning individualized interventions in coordination with the school and family. Frequently used instruments, ecological validity considerations, cultural adaptation, and ethical aspects are discussed. Overall, neuropsychological assessment in school age is relevant for identifying cognitive strengths and weaknesses, guiding pedagogical and therapeutic supports, and monitoring trajectories in medical or neurodevelopmental conditions.

Keywords: Pediatric Neuropsychology; Neuropsychological Assessment; School Age; Executive Functions; Learning; ADHD.

1. Introduction

School age (approximately 6 to 12 years) represents a critical stage in which academic demands require self-regulation, sustained attention, working memory, cognitive flexibility, and complex language skills. These capacities are linked to neurobiological processes of cortical maturation and functional connectivity, which helps explain why cognitive and behavioral difficulties often become more evident at the start of schooling. In this context, pediatric neuropsychology offers methods to evaluate cognitive functioning and its impact on academic and adaptive performance, integrating information from the child, the family, and the school environment.

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Objective

To analyze neuropsychological assessment in school-aged children and its clinical and educational relevance, describing key domains, commonly used tools, methodological considerations, and applications for intervention.

2. Methodology

A narrative literature review with a clinical-educational approach was conducted. Reviews, practice guidelines, and high-impact articles on executive functions, pediatric neuropsychological assessment, ADHD, and specific learning difficulties were prioritized, as well as technical documents on test adaptation and ethical use. The synthesis was organized by cognitive domains relevant to school performance and by practical aspects of assessment.

2.1. Foundations of Neuropsychology in School Age

Pediatric neuropsychology studies how changes in the developing nervous system relate to cognition, behavior, and learning. In school age, developmental heterogeneity is expected; therefore, interpretation should consider chronological age, schooling, educational opportunities, sociocultural context, medical history, and emotional conditions. Assessment is not limited to describing scores; rather, it seeks to explain performance patterns through hypotheses about underlying processes, identifying profiles of strengths and weaknesses that are useful for clinical and educational decision-making.

2.2. Key Cognitive Domains and Their Relationship to Learning

2.2.1. Executive Functions and Self-Regulation

Executive functions (EF) comprise a set of cognitive control processes—such as inhibition, working memory, and flexibility—that enable goal-directed behavior, emotion regulation, and problem-solving in novel situations. In the classroom, EF are associated with following instructions, organization, task planning, impulse control, and persistence. Evidence suggests that EF are linked to multiple components of academic performance, including mathematics and reading skills, through their role in attention, reasoning, and strategy selection.

2.2.2. Attention and Processing Speed

Attentional systems (alerting, orienting, executive control) support learning in environments with multiple distractors. Attentional difficulties may manifest as variability in performance, omission/commission errors, and problems completing tasks within time limits. Processing speed modulates the efficiency with which children manage academic demands, especially in reading fluency, calculation, and copying/writing.

2.2.3. Memory and Learning

Working memory supports the maintenance and manipulation of information during problem solving and reading comprehension, whereas long-term memory enables consolidation of knowledge and automatization of skills. Assessment of verbal and visual memory provides information to differentiate specific difficulties (e.g., encoding versus retrieval problems) and to propose study strategies and classroom supports.

2.2.4. Language, Literacy, and Visuospatial Skills

Language (comprehension, naming, verbal fluency) is a cross-cutting axis of learning. In literacy, phonological processing, word recognition, and automatization of decoding are critical; alterations in these processes are related to dyslexia and other learning difficulties. Visuospatial and visuoconstructive skills influence geometry, spatial organization on the page, figure copying, and visuomotor coordination; assessing them is useful in cases with suspected nonverbal difficulties or neurodevelopmental disorders.

2.2.5. Neuropsychological Assessment in the School-Aged Child

Neuropsychological assessment integrates clinical interview, history review, child observation, and the administration of standardized tests and ecological measures (parent/teacher reports). Instrument selection should respond to specific clinical questions (e.g., “Which cognitive factors are contributing to low academic performance?”) and consider the balance between broad batteries and targeted tests. Interpretation should integrate performance validity, internal consistency of the profile, and concordance with contextual information.

2.2.6. Frequently Used Instruments

Commonly used instruments include intelligence scales to estimate general reasoning and index profiles (e.g., WISC-V), developmental neuropsychological batteries (e.g., NEPSY-II), EF-oriented tests (e.g., D-KEFS), and questionnaires of executive functioning in natural contexts (e.g., BRIEF-2). In practice, these tools are combined with measures of academic achievement, language, attention, and memory, tailoring the battery to age, diagnostic hypothesis, and available time.

2.2.7. Ecological Validity and Multimodal Assessment

A recurring challenge is that some laboratory-based scores do not fully reflect everyday functioning. Therefore, a multimodal assessment is recommended: standardized tasks for specific processes, behavioral questionnaires (parents/teachers), and, when possible, objective school information (notebooks, grades, observation). This triangulation strengthens ecological validity and improves the formulation of implementable recommendations.

2.2.8. Clinical and Educational Relevance

Neuropsychological assessment in school age adds value in at least four areas: (1) differential diagnosis, distinguishing profiles consistent with ADHD, learning disorders, language disorders, or other conditions; (2) intervention planning, translating findings into school accommodations and therapeutic strategies; (3) monitoring over time, useful in medical conditions affecting cognition (e.g., oncology treatments or brain injuries); and (4) guidance to families and teachers, reducing inaccurate attributions (e.g., "lack of effort") and promoting evidence-based supports.

2.3. Common Applications

In ADHD, meta-analytic evidence suggests EF deficits of moderate magnitude, especially in inhibition and working memory, although with considerable variability; this supports combined interventions including skills training, behavioral management, and pedagogical adjustments. In dyslexia and other learning difficulties, assessment of linguistic and cognitive processes helps identify underlying mechanisms and select intervention approaches (e.g., explicit phonological instruction, fluency supports, testing accommodations).

3. Ethical, Cultural, and Psychometric Quality Considerations

Testing in children requires professional competence, informed consent, and an understandable feedback process. Cultural and linguistic adaptation is essential to avoid measurement bias. International guidelines for test translation and adaptation propose systematic procedures (double translation, expert committee, equivalence studies) and recommend documenting changes and validity evidence. Practice guidelines in neuropsychology also emphasize integrating multiple information sources, communicating limitations, and using appropriate norms for the assessed population.

Recommendations for Practice in the School Context

- Define specific clinical and educational questions before selecting tests.
- Combine performance measures (tests) with ecological measures (parent/teacher reports) to improve validity.
- Interpret results considering development, schooling, and sociocultural context; avoid conclusions based on a single score.
- Translate findings into operational recommendations: classroom accommodations, study strategies, assessment supports, and measurable goals.
- Establish a follow-up plan to monitor changes and adjust interventions.

4. Conclusions

Neuropsychology in the school-aged child is a key component for understanding academic and behavioral performance from a developmental perspective. Neuropsychological assessment, when performed in a multimodal, culturally informed, and decision-oriented manner, allows the identification of relevant cognitive profiles, contributes to differential diagnosis, and generates concrete recommendations for intervention. Its integration with school and health teams facilitates timely and personalized support, with potential positive impact on the child's learning and adaptation.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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