

Neuropsychological Profile in a Young Patient with Möbius Syndrome and Executive Dysfunction: A Case Study with a Diagnostic Hypothesis of ADHD

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Abstract: Möbius Syndrome is a rare congenital neurological condition characterized by paralysis of the seventh cranial nerve, which may affect facial expressivity and socioemotional adjustment. Although widely described from a motor perspective, its neuropsychological implications remain poorly explored. The present study describes the neuropsychological profile of an 18-year-old male with a diagnosis of Möbius Syndrome who was referred for investigation of a neurodevelopmental disorder. Standardized measures of intelligence, attention, executive functions, memory, language, and academic performance were administered. The results indicated average-to-above-average intellectual functioning, with preserved abstract reasoning, working memory, and academic skills. However, significant impairments were identified in selective attention and inhibitory control, associated with impulsivity and difficulties in behavioral self-regulation. The observed pattern suggests focal executive dysfunction in the inhibitory component, consistent with a subprofile described in the literature on Attention-Deficit/Hyperactivity Disorder (ADHD). These findings reinforce the importance of neuropsychological assessment in characterizing heterogeneous executive profiles and in guiding individualized intervention planning.

Keywords: Möbius Syndrome; Attention-Deficit/Hyperactivity Disorder; Executive Function; Inhibitory Control; Neuropsychological Tests.

1. Introduction

Möbius Syndrome (MS) is a rare congenital neurological condition classified among cranial nerve innervation disorders, characterized by non-progressive paralysis of the seventh cranial nerve and, in some cases, involvement of the sixth cranial nerve [1]. The limitation of facial mimicry compromises emotional expressivity and nonverbal communication, potentially impacting social interactions and processes of affective self-regulation [2]. Although traditionally described from a motor perspective, recent evidence suggests possible psychosocial and developmental repercussions associated with expressive limitations [10]. The absence of facial feedback may influence emotional recognition processes and autonomic modulation, potentially contributing to adaptive vulnerabilities.

In parallel, Attention-Deficit/Hyperactivity Disorder (ADHD) is characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity associated with functional impairment [3]. Contemporary models support the neuropsychological heterogeneity of the disorder, highlighting subgroups with predominant impairment in inhibitory

control and behavioral self-regulation, even in the presence of preserved intellectual functioning [4,5].

From a neurobiological perspective, tasks that require suppression of automatic responses recruit frontostriatal circuits, involving the dorsolateral prefrontal cortex, anterior cingulate cortex, and connections with the striatum, modulated by catecholamines, particularly dopamine and norepinephrine [6–8]. Dysfunctions in these systems have been consistently associated with the pathophysiology of ADHD. In this context, neuropsychological assessment enables a detailed characterization of the individual cognitive profile, contributing to diagnostic hypotheses and therapeutic planning.

2. Case Report

The patient is a 16-year-old male with a medical diagnosis of Möbius Syndrome, referred for neuropsychological evaluation with the objective of investigating a possible neurodevelopmental disorder and characterizing his cognitive–behavioral profile. During the clinical interview, difficulties related to organization, persistence in prolonged tasks, and behavioral impulsivity were reported. In the assessment setting, he was cooperative and demonstrated good understanding of instructions; however, he showed mild motor restlessness and a tendency toward impulsive responses in tasks requiring inhibitory control.

2.1 Instruments Used

Standardized instruments were administered to assess global intelligence, attention, executive functions, episodic verbal memory, language, academic performance, and behavioral symptomatology. Intellectual functioning was evaluated using the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV). Attention was assessed through the Psychological Battery of Attention (BPA). Executive functions were examined using the Wisconsin Card Sorting Test (WCST), the Hayling Sentence Completion Test, and the Five Digits Test (FDT). Episodic verbal memory was evaluated with the Rey Auditory Verbal Learning Test (RAVLT). Language abilities were analyzed through Verbal Fluency tasks and Oral Narrative Discourse. Academic performance was assessed using the School Performance Test – Second Edition (TDE-II), and behavioral symptoms were screened using the SNAP-IV questionnaire.

2.2 Intellectual Functioning

The Full-Scale IQ was 114, placing the patient within the high-average range. The main index scores are presented in table 1.

Table 1. Intellectual Performance (WISC-IV).

| Index | Score | Interpretation |
|-------------------------|-------|----------------|
| Verbal Comprehension | 110 | High Average |
| Perceptual Organization | 114 | High Average |
| Working Memory | 115 | High Average |
| Processing Speed | 108 | Average |

These results indicate preserved abstract reasoning, working memory, and overall cognitive efficiency.

2.3 Attention

On the Psychological Battery of Attention (BPA), the following pattern was observed in table 2. The lower performance in selective attention was characterized by a high number of omissions, suggesting difficulty maintaining focus in the presence of competing stimuli.

Table 2. Attentional Performance (BPA).

| Component | Percentile | Interpretation |
|-----------------------|------------|----------------|
| Selective Attention | 20 | Low |
| Alternating Attention | 50 | Average |
| Divided Attention | — | Not completed |

2.4 Executive Functions

On the WCST, cognitive flexibility and concept formation were preserved. However, on the Hayling Test, a high frequency of errors was observed in Part B (Percentile <5), indicating impairment in verbal inhibitory control. In the Five Digits Test (FDT), automatic processes were preserved, but an increased number of errors was observed in the choice condition (Percentile 25), reinforcing the presence of inhibitory control vulnerability. Overall, these findings suggest focal executive dysfunction, predominantly affecting the inhibitory control component.

2.5 Memory and Language

In the RAVLT, verbal learning and retention were within the average range, with mild vulnerability to proactive interference. In Verbal Fluency tasks, repetitions and impulsive responses were observed, consistent with difficulties in executive monitoring. Oral Narrative Discourse demonstrated preserved comprehension, with high performance in inferential tasks.

2.6 Academic Performance

On the TDE-II, reading, writing, and arithmetic scores were above average, ruling out the hypothesis of a specific learning disorder.

3. Discussion

The profile revealed a dissociation between preserved global intellectual functioning and specific executive impairment. The deficit in inhibitory control is consistent with alterations described in frontostriatal circuits implicated in Attention-Deficit/Hyperactivity Disorder (ADHD) [6–8]. The dopaminergic modulation of these networks is essential for maintaining attentional stability and suppressing impulsive responses. Dysfunctions in this system may result in impulsivity, premature response errors, and difficulty persisting in tasks, patterns observed in the present case.

Contemporary studies reinforce that ADHD presents neuropsychological heterogeneity, making it possible to identify subgroups with predominant inhibitory deficits even in the presence of preserved academic performance [4,5]. The profile identified here approximates this subtype. Within the context of Möbius Syndrome, recent investigations suggest that expressive limitations may influence autonomic responses and emotional regulation [10], potentially interacting with executive vulnerabilities and amplifying functional impact.

This study has limitations inherent to its single-case design, which restricts the generalizability of the findings to broader populations. Additionally, the use of an assessment instrument originally developed for a pediatric population in an older participant requires caution in normative interpretation, and the results should therefore be considered primarily within an exploratory and clinical context.

4. Conclusion

The case demonstrates preserved intellectual functioning associated with focal executive dysfunction in inhibitory control. The profile is compatible with a diagnostic hy-

pothesis of Attention-Deficit/Hyperactivity Disorder (ADHD) with predominant inhibitory deficit. Neuropsychological assessment proved essential for characterizing the cognitive pattern and guiding targeted interventions.

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Conflicts of Interest: All other authors declare no conflicts of interest.

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