

The relationship between cognition and ESSENCE in childhood

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i hörsal Arvid Carlsson, Medicinargatan 3, den 28 September, klockan 13.00.

av Maria Marinopoulou

Fakultetsopponent:

Astri J. Lundervold, Professor, Universitetet i Bergen, Norge

Avhandlingen baseras på följande delarbeten

- I. Marinopoulou, M., Billstedt, E., Lin, P. I., Hallerbäck, M., & Bornehag, C. G. (2021). Number of words at age 2.5 years is associated with intellectual functioning at age 7 years in the SELMA study. *Acta Paediatrica*, 110(7), 2134–2141.
- II. Marinopoulou, M., Unenge Hallerbäck, M., Bornehag, C. G., & Billstedt, E. (2023). Is WISC-IV Working Memory Index associated with ADHD symptoms in 7-8-year-olds? *Applied Neuropsychology: Child*, 1–10. Online ahead of print.
- III. Marinopoulou, M., Billstedt, E., Wessman, C., Bornehag, C. G., & Hallerbäck, M. U. (2023). Association between intellectual functioning and autistic traits in the general population of children. *Child Psychiatry and Human Development*. Online ahead of print.
- IV. Marinopoulou, M., Åsberg Johnels, J., Bornehag, C. G., Unenge Hallerbäck, M., & Billstedt, E. (2023). Do Wechsler intelligence scales predict academic achievement in children with ADHD or autism? A systematic review and meta-analysis. *Manuscript*.

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR NEUROVETENSKAP OCH
FYSIOLOGI**



The relationship between cognition and ESSENCE in childhood

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Abstract

Aims: To examine the relationship between cognition and ESSENCE (Early Symptomatic Syndromes Eliciting Neurodevelopmental Clinical Examinations) features in children, ages 7-8 years. To investigate the importance of intellectual functioning for academic achievement in Attention-Deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD). **Methods:** Studies I-III included children from the general population longitudinal SELMA study. The cohort was tested with the Wechsler Intelligence Scale for Children (WISC-IV). The assessment included parental questionnaires and interviews. Data on expressive language at age 2.5 years language screening were collected. Study IV (systematic review and meta-analysis) investigated the relationship between Wechsler intelligence scales' results and academic achievement in 6-16-year-olds with ADHD or ASD. **Results:** Vocabulary of ≤ 50 words at age 2.5 years was associated with lower general intellectual functioning, verbal comprehension, perceptual reasoning, and working memory at age 7-8 years (study I). Twenty-two percent of the 7-8-year-olds displayed working memory deficits but only 4% of the total study group had additional behavioural regulation and/or hyperactivity/inattention problems (study II). Distribution of autistic traits in the study group was continuous. General intellectual functioning, verbal comprehension, and verbal working memory were negatively associated with autistic traits (study III). Correlations between IQ and academic achievement, and between processing speed and academic achievement were moderate in ADHD, in line with the narrative analysis (study IV). **Conclusions:** Limited use of spoken words at age 2.5 years increases the risk of cognitive deficits at age 7-8 years. Working memory deficits measured with WISC-IV at age 7-8-years do coexist with ADHD symptoms in a small subgroup, but also exist without additional ADHD symptoms. Prosocial behaviour might play a role in this. Elevated level of autistic traits is accompanied with a risk of difficulties in verbal comprehension and verbal working memory. General intellectual functioning is associated with reading, written language, and mathematics achievement in ADHD. The studies highlight the need for clinical follow-up in children with early ESSENCE features and awareness regarding the ESSENCE dimensionality demanding a broad assessment.

Keywords: intellectual functioning, working memory, Wechsler scales, general population, ESSENCE, neurodevelopmental disorders

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