

# Head circumference and child ADHD symptoms and cognitive functioning: results from a large population-based cohort study

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## Abstract

The aim of this study is to understand the association between prenatal, newborn and postnatal head circumference (HC) and preschool neurodevelopment in a large population-based birth cohort. The INMA project followed 1795 children from 12 weeks of pregnancy to preschool years. HC measurements were carried out prospectively, and following a standardized protocol during pregnancy (12, 20 and 34 weeks), birth, and child ages of 1–1.5 and 4 years old; and z-scores were further estimated. Prenatal head growth was assessed using conditional z-scores between weeks 12–20 and 20–34. Several neuropsychological tests [MSCA (cognition), CPT (attention)] and behavioral rating scales [DSM-IV-ADHD, CAST (autism), CPSCS (social competence)] were carried out during the last follow-up (5 years old). Multivariable models adjusted for family and child characteristics were applied to analyze associations between HC and neurodevelopment. In fully adjusted models, prenatal HC and head growth showed little or no associations with the neurodevelopment outcomes. Independent associations were observed between HC z-scores at birth, 1–1.5 years and 4 years and MSCA global cognitive scores and DSM-IV inattention symptoms. Specifically, z-score at birth was positively associated with general cognitive scores [ $\beta$  1.22, 95% confidence interval (CI) 0.59, 1.85], and we observed a protective association with ADHD-DSM-IV total symptoms, mean ratio (MR) 0.85 (0.75, 0.96). Prenatal HC and head growth measurements gave little information about child cognitive abilities and behavior at preschool years. However, HC at birth and early childhood was positively associated with a range of neuropsychological outcomes, including protective associations with ADHD symptoms.