

# HYDROCEPHALUS IN CHILDREN

## Cognition and behaviour

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av

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This thesis is based on the following papers:

- I. Lindquist, B., Carlsson G., Persson, E-K., Uvebrant, P.  
Learning disabilities in a population-based group of children with hydrocephalus.  
*Acta Paediatrica 2005;94:726- 732*
- II. Lindquist, B., Carlsson, G., Persson, E-K., Uvebrant, P.  
Behavioural problems and autism in children with hydrocephalus – a population-based study.  
*European Child and Adolescent Psychiatry 2006; 15:214-219*
- III. Lindquist, B., Persson, E-K., Uvebrant, P., Carlsson, G.  
Learning, memory and executive functions in children with hydrocephalus  
*Child Neuropsychology, 2006, submitted*
- IV. Lindquist, B., Uvebrant, P., Rehn, E., Carlsson, G.  
Cognitive functions in children with myelomeningocele without hydrocephalus  
*Child Neuropsychology, 2006, submitted.*



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**Aims:** The main objective of this thesis was to explore the cognitive and behavioural consequences of hydrocephalus in children born at term and preterm, with or without myelomeningocele (MMC) and with or without concomitant neurological impairments, such as cerebral palsy (CP), epilepsy or learning disabilities.

**Material and methods:** From a population-based cohort of all 107 children with hydrocephalus born in 1989-1993, 73 of the surviving children were assessed with intelligence tests and most of them also using behavioural and autism rating scales. Thirty-six of 47 (77%) children with an IQ of  $\geq 70$  and eight children with MMC but no hydrocephalus were assessed with a neuropsychological test battery (NIMES) and compared with age- and gender-matched controls.

**Results:** One-third of the children were normally gifted (IQ > 85), another 30% had a low-average IQ of 70-84 and 37% had learning disabilities (IQ < 70). An IQ of < 70 was found in 42% of children without MMC and in 29% of those with MMC. Children born preterm had a lower IQ than those born at term. Children with CP and/or epilepsy had significantly lower IQ scores than those without these impairments. Parents rated 67% and teachers 39% of the children as having behavioural problems. Learning disabilities increased the risk significantly. Almost all the children with CP and/or epilepsy had behavioural problems. Learning disabilities, CP and epilepsy significantly increased the risk of autistic symptoms, which were present in 13 %, in 4 % of those with MMC and in 20 % of those without MMC..

Children with hydrocephalus both with and without MMC and with an IQ of > 70 performed significantly less well than controls on learning, memory and executive functions but not on registration skills. There were no differences between children with hydrocephalus in combination with MMC and those without MMC, whereas children with MMC but no hydrocephalus and normal intelligence performed as well as controls on all the neuropsychological functions.

**Conclusions:** The majority of children with hydrocephalus had learning disabilities or a low-average IQ, as well as behavioural problems, and some had autistic symptoms. Despite average or slightly below average intelligence, children with hydrocephalus had major difficulties with learning and memory and with executive functions, regardless of the aetiology of the hydrocephalus. Only MMC did not appear to influence cognitive and neuropsychological outcome as much as the brain lesion causing or caused by the hydrocephalus.