

COGNITION, BEHAVIOUR AND AUTISM in children with hydrocephalus



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Hydrocephalus



- 0,8 per 1000 live births
- Increase in cerebrospinal fluid (CSF)
- ...caused by disturbance of production, circulation or resorption of the CSF...
- ...secondary to some other pathological event or structural anomaly

*Children born at term:

Prenatal aetiology dominates (70%) in the form of malformations and infections in the CNS

*Children born preterm:

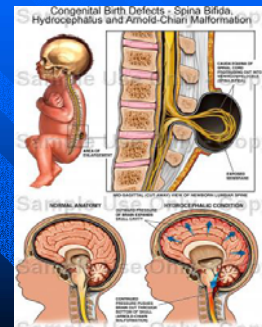
Perinatal causes dominate (60%), mainly in the form of intraventricular haemorrhage



Myelomeningocele (MMC)



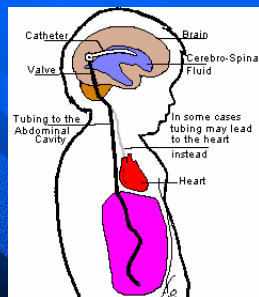
- Early neural tube defect (14th to 28th day)
- 0,3 per 1000 live births
- 80% hydrocephalus
- Arnold Chiari malformation



Treatment



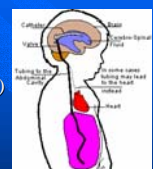
- Shunt treatment (since 1960s)
- Ventriculostomy (since 1990s)



Aim:



- * To explore cognitive functions in a population-based group of children with hydrocephalus
- * To analyze differences in children
 - with and without myelomeningocele (MMC)
 - born term or preterm
 - with hydrocephalus present at birth or developed first year of life
 - with or without cerebral palsy and/or epilepsy
- * To see whether learning disabilities, MMC, cerebral palsy, epilepsy or preterm birth increased the risk of behavioural problems and autism



Subjects



Study one, Learning disabilities:

103 children born in the South West region of Sweden 1989-1993
 6 had died, 8 moved out of the region, 16 unwilling to participate
 73 children, 28 with MMC (38%), 45 without MMC (62%)

Study two, Behavioural problems and autism:

Four children added = 107
 67 participated in assessment of behaviour, 53 in assessment of autism

Methods



Measures of intelligence:

- WISC-III (6-16 years)
- WPPSI-R (3-7 years)
- Griffith Developmental Scales



Measures of behaviour



Conners' Parents
 Rating Scales, 48 items

Conners' Teachers
 Rating Scales, 28 items

- | | |
|------------------------|----------------------|
| *conduct problems | *conduct problems |
| *learning problems | *hyperactivity |
| *psychosomatic | *inattentive-passive |
| *impulsive/hyperactive | *hyperactivity index |
| *anxiety | |
| *hyperactivity index | |

Measures of autism



Childhood Autism Rating Scale (CARS)
 15 items:

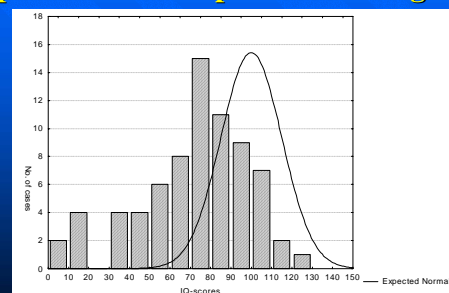
- | | |
|-----------------------|---|
| *relating to people | *taste, smell and touch response |
| *emotional response | *fear or nervousness |
| *body use | *verbal communication |
| *object use | *non-verbal communication |
| *adaptation to change | *activity level |
| *visual response | *level and consistency of intelligence response |
| *listening response | *general impression |

Results Intelligence



- 24 children (33%) - normal IQ (>85)
- 22 children (30%) - low average IQ (70-84)
- 27 children (37%) - learning disabilities IQ (<70)

IQ in 73 children with hydrocephalus compared with an expected normal group



Verbal and Performance IQ



58 children were able to complete the whole test (WPPSI-R or WISC-III)

- Median IQ=81
 - Median Verbal IQ=89
 - Median Performance IQ=76
- ($p < 0.001$)

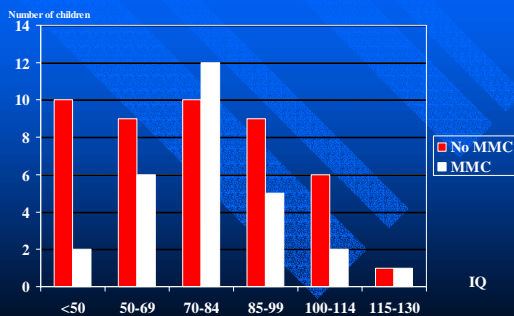
Performance IQ: Tests of visual perception and visual construction

Mean scores on WISC-III subtests (n=40)



*Information	11.45	*Picture Completion	8.05
*Similarities	9.33	*Picture arrangement	6.80
*Arithmetic	8.05	*Block design	7.40
*Vocabulary	10.08	*Object Assembly	6.48
*Comprehension	8.63	*Coding	5.56
*Digit span	7.15		

Intelligence in 45 children without MMC and 28 children with associated MMC



Intelligence related to gestational age



- * 21 children (29%) born preterm: IQ 68
 - of which 9 had post-haemorrhagic hydrocephalus: IQ 57
- * 52 children born at full term: IQ 76

IQ in children with hydrocephalus present at birth or developed during first year of life



Hydrocephalus at birth *Hydrocephalus first year of life*

	n	median IQ		n	median IQ
All children	28	IQ 71		45	IQ 77
MMC	10	IQ 77		18	IQ 73
IH	18	IQ 60		27	IQ 84

IQ in children with Cerebral Palsy and/or Epilepsy



- 22 (30%) had CP and/or epilepsy – median IQ 66
 - 9 of those with both CP and EP –IQ 58
- 51 without these complications – median IQ 78

$p < 0.01$

Results, behavioural problems:

Conners' Rating Scales (67 children)



Problems much above average (t-score > 65 = 2sd)

	PARENTS (66)	TEACHERS (57)
In one or more subscales	67%	39%
Hyperactivity Index	32%	21%
Conduct problem	17%	11%
Inattentive/passive	-	30%

(behavioural problems in normal population of children: about 7%)

Behavioural problems in relation to IQ



IQ PARENTS' RATES TEACHERS' RATES

<70	91% (20/22)	75% (15/20)
>69	55% (24/44)	19% (7/37)

p=0.01

p=0.001

Behavioural problems in relation to cerebral palsy and/or epilepsy



CP and/or Epilepsy	PARENTS' RATES	TEACHERS' RATES
YES	89% (16/18)	44% (7/16)
NO	58% (28/48)	37% (15/41)

p=0.02

.....to hydrocephalus with or without MMC, and gestational age at birth



Parents' rates:

Slightly more hyperactivity among children without MMC

Teachers' rates:

More conduct and hyperactivity problems among children without MMC

Children with MMC somewhat more inactive

*

No significant differences between children born at term and those born preterm

Results, Autism



- * Nine of 67 children (13%) had autism
- * Autism was significantly more frequent in children with learning disabilities (p=0.03), and in children with CP and/or epilepsy (p<0.01)
- * One of 26 children with MMC had autism and eight of 41 (20%) children with infantile hydrocephalus without MMC

Current rate autism spectrum disorders: 0.3-0.6%

CONCLUSIONS....



- About 30% had average intelligence
- About 30% had low average intelligence
- 37% had learning disabilities
- Stronger verbal abilities than performance
- Risk factors of importance for poor cognitive outcome:

gestational age at birth, presence of hydrocephalus at birth, associated impairments (CP, epilepsy)



- A very high frequency of behavioural problems and autism compared with normal population
- Behavioural problems and autism were much more frequent among children with learning disabilities as well as in children with CP and/or epilepsy



- It is thus **important** to assess every aspect of **cognition, neuropsychological functioning and behaviour** in order to **understand** the child and to **support** and **guide** caregivers and teachers in their efforts to **minimise disability and enhance participation** for the child.