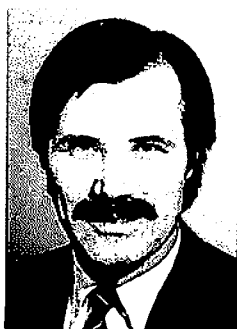


**Division for  
Speech and Hearing Sciences**



*Principles of Brain Function  
in Neuropsychological  
Development of Hydrocephalics*

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In contrast to diverse and controversial findings reported in previous studies based primarily on psychometric testing of undifferentiated hydrocephalic populations, detailed analyses of the results of comprehensive neuropsychological studies of 279 hydrocephalics and 149 normal controls (ages 5-25) revealed that outcome varied systematically and significantly according to etiology, socio-economic status, sex, age and time, cerebral thickness in infancy and later life, shunting and shunt revisions, seizures, and other intra- and extra-cranial factors that effect the condition of the brain as a whole.

The findings of this study have important practical and theoretical implications with respect to assessment, treatment and outcome in hydrocephalus. First, tacit assumptions in previous studies that undifferentiated hydrocephalics constitute a homogeneous clinical subgroup are clearly unwarranted. The 97 congenital hydrocephalics showed significantly higher development of overall cerebral functions than the 139 myelomeningocele hydrocephalics. Moreover the incidence and influence of other factors determining outcome also differed significantly as a function of etiology, indicating the importance of differentiating hydrocephalic populations according to specific determinant factors.

Second, our findings are incompatible with previous reports citing more limited development of nonverbal than verbal cognitive capacities as evidence of visual-motor and/or specific right hemisphere deficit. The overall findings in this study of greater attenuation of nonverbal than verbal reasoning and memory function in conjunction with bilateral manual motor deficits are consistent with and similar to neuropsychological profiles of patients with diverse types of diffuse cerebral lesions tested with the same neuropsychological battery and are also consistent with bilateral findings reported in histopathological studies of hydrocephalic brains.

Third, development of superior adult reasoning abilities in hydrocephalic patients despite drastic reduction in neuroanatomic economy at an early age is consonant with findings in patients with hemispherectomy for infantile hemiplegia. The consistent findings in these two unique clinical populations illustrate the remarkable versatility of the young brain and its capacity for spontaneous reorganization.

Finally, and of perhaps greatest importance, our findings are strikingly consistent with and illustrate earlier reported principles underlying the organization, disorganization and reorganization of cerebral function described by Jackson, von Monakow, Smith, and others.

Aaron Smith, Chair