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M. Jenkins, P. Malloy, S. Salloway, R. Neepser, J. Penn & K. Chang. Neuropsychological performance among adults with history of childhood ADHD. Dept. of Psychology, Butler Hospital, 345 Blackstone Blvd., Providence, RI 02906.

Demographic and neuropsychologic test data are presented from 29 adults referred for difficulties with attention and concentration. 15 patients met DSM-IV criteria for childhood ADHD (ADHD), while 14 did not (non-ADHD). The groups did not differ in age or Full Scale IQ. Differences in attentional functioning were seen on the Digit Span subtest and the PASAT-R. Subtle learning and memory deficits were also noted in the ADHD group on the California Verbal Learning Test. Group differences were also noted on some tests of "frontal lobe" functioning, but not on others; the ADHD group performed worse on Controlled Oral Word Association and Luria's reciprocal motor coordination tasks than the non-ADHD group, but not on alternating figures or the Wisconsin Card Sorting Test.

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Evidence for the persistence of attention deficit hyperactivity disorder into adult life has accumulated in recent years. It has been estimated that 30% to 70% of children who are diagnosed as having ADHD will continue to show symptoms of the condition as adults (Bellak & Black, 1992). This is reflected in the inclusion of an adult diagnosis of ADHD, Residual Type in the diagnostic nomenclature. However, the residual cognitive effects of childhood Attention Deficit Hyperactivity Disorder (ADHD) in adults are not well understood.

A primary characteristic of ADHD is an inability to establish and maintain sustained attention, which is speculated to reflect frontal lobe involvement. Numerous authors have suggested frontal lobe involvement in the pathogenesis of ADHD, based on neurobehavioral observations (Benson, 1991) as well as both neuropsychological test results (Shue & Douglas, 1992; Barkley, Grodzinsky & DuPaul, 1992; Koziol & Stout, 1992) and structural imaging analysis (Hynd et al., 1991) in children with ADHD.

We hypothesized that adults who had suffered from childhood ADHD would show not only impaired attention and decreased performance on learning tasks, but also decreased performance on measures of frontal/executive functioning relative to adults not meeting criteria for childhood ADHD.

Subjects.

Data were collected on 29 subjects referred to an Outpatient Neuropsychology Clinic for difficulties with attention and concentration. Based on retrospective self report (structured interview), 15 met DSM-IV criteria for childhood ADHD (ADHD), while 14 did not (non-ADHD). The groups did not differ in age (mean age = 33). Males were more likely than females to report symptoms of childhood ADHD; the ADHD group was 60% male, while the non-ADHD group was 21% male [Chi Square = 4.44 ($p = .04$)]. The two groups did not differ on WAIS-R Full Scale IQ or Performance IQ, but the ADHD group had lower Verbal IQ scores than the non-ADHD group ($p = .05$).

Methods.

Retrospective self report of symptoms of attentional disturbance and hyperactivity was gathered using a structured interview. All subjects also completed a comprehensive battery of neuropsychological tests (see Results).

Results.

With regard to attentional functioning, WAIS-R Digit Span subtest scores were lower in the ADHD group; Digits Backward, but not Digits Forward, was significantly different between the groups. There was also a trend toward group differences on the WAIS-R Digit Symbol subtest. The Paced Auditory Serial Addition Test-Revised (PASAT-R) differed between groups at the fastest presentation rate.

	ADHD		non-ADHD		T (27)	1 tailed p value
	Mean	St. Dev.	Mean	St. Dev.		
Digit Span	13.93	2.43	16.38	3.95	2.01	.03
Digits Forward	7.80	1.70	8.54	1.98	1.06	NS
Digits Backward	6.13	1.46	7.85	2.64	2.16	.02
Digit Symbol	52.47	12.73	59.23	8.10	1.65	.06
PASAT 1.2 second ISI	15.80	3.19	17.79	3.07	1.71	.05

With regard to learning and memory, subtle group differences were noted on the California Verbal Learning Test (CVLT): The ADHD group had learned fewer items by the final learning trial, and recalled fewer items on all subsequent recall trials than the non-ADHD group.

	ADHD		non-ADHD		T (27)	1 tailed p value
	Mean	St. Dev.	Mean	St. Dev.		
CVLT trials 1-5	53.67	8.03	60.14	10.04	1.92	.03
CVLT trial 5	13.00	1.96	14.14	1.70	1.67	.05
Short Delay Free	10.13	3.25	13.28	1.98	3.13	.002
Short Delay Cued	12.13	1.88	13.57	2.17	1.91	.03
Long Delay Free	10.60	2.77	13.36	2.95	2.59	.007
Long Delay Cued	11.93	2.40	13.93	2.67	2.12	.02

Group differences were also noted on some tests of "frontal lobe" functioning, but not on others; the ADHD group performed worse on Controlled Oral Word Association and Luria's reciprocal motor coordination tasks than the non-ADHD group, but not on alternating figures. Also, no significant differences were seen on the Wisconsin Card Sorting Test (WCST).

	ADHD		non-ADHD		T (27)	1 tailed p value
	Mean	St. Dev.	Mean	St. Dev.		
COWAT	28.13	7.21	38.43	9.24	3.36	.001
Recip.Coord.(errors)	2.27	3.28	.46	1.20	1.87	.04
Alt.Figures (errors)	.533	1.60	.615	2.22	.113	NS
WCST Categories	5.92	.29	5.73	.65	.92	NS
WCST Persev Resp.	8.00	3.08	11.18	6.88	1.45	NS
WCST Errors	16.08	8.96	18.73	12.65	.58	NS

The neuropsychological battery also included the Wide Range Achievement Test, Western Aphasia Battery, Boston Naming Test, and Hooper Visual Organization Test; no between-groups differences were found on these measures.

With regard to diagnosis, 53% of the ADHD group was diagnosed with current ADHD, RT. Persistent learning disorders were diagnosed in an additional 33%. For the remaining patients, it was felt that alcohol abuse (13%) or depression (7%) was the primary problem. Of those without childhood ADHD, the most common diagnosis was depression (29%), followed by substance abuse (21%), anxiety disorders (14%), learning disability (7%), mild TBI (7%), Bipolar disorder (7%), and personality factors (7%).

Discussion.

Although ADHD group is diagnostically heterogeneous, it does appear that childhood ADHD sufferers are, as a group, predisposed to attentional, learning, and possibly executive deficits as adults. Further research is needed to examine differences between childhood ADHD sufferers who do and do not go on to have attentional problems in adulthood. The current study relied on retrospective self-report to establish the diagnosis of childhood ADHD; longitudinal studies are also needed to overcome the problems associated with this methodology.

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