

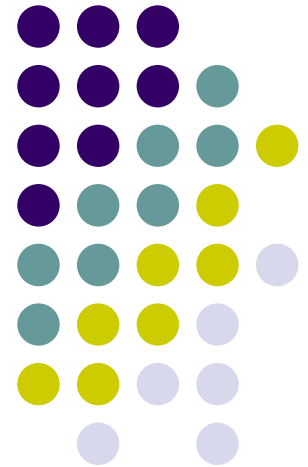
Comorbidity of Auditory Processing Disorders In Children With Attention Deficit/Hyperactivity Disorder

Ewa Dynda, M.A.

Donna Geffner, Ph.D.

Nancy Martin, Ph.D.

St. John's University, Queens, NY





- Manifestations of AD/HD and CAPD overlap, including inattention, poor listening skills, and distractibility.”

Attention Deficit/Hyperactivity Disorder



- Characteristics of:
 - inattention
 - hyperactivity
 - Impulsivity
- It is the most prevalent mental health disorder of childhood
- It affects between 9% of school aged children



AD/HD: Inattention

Children who are inattentive experience:

- Difficulty with keeping their minds on one task, or completing an activity
- Become bored with an activity very quickly
- Distractibility,
- Frequent loss of items
- Difficulty with organization

AD/HD: Hyperactivity

Children who are hyperactive always seem:

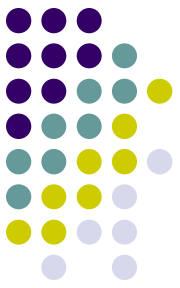
- To be “on the go,” in constant motion
- Fidgety
- To talk excessively

AD/HD: Impulsivity

Children who are inattentive seem:

- To have immediate reactions
- To blurt out inappropriate comments
- To display their emotions without restraint
- To be interruptive

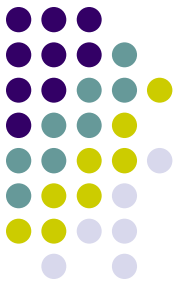
Central Auditory Processing Disorder (CAPD)



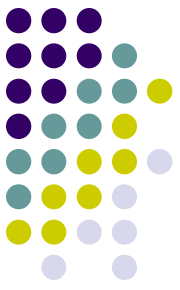
(Central) auditory processing disorder refers to difficulties in:

- processing of auditory information in the central nervous system (CNS)
- sound localization and lateralization
- auditory discrimination
- auditory pattern recognition
- auditory performance with degraded acoustic signals
- temporal aspects of audition, including:
 - temporal integration
 - temporal discrimination
 - temporal ordering
 - temporal masking
- auditory performance in competing acoustic signals

AD/HD & CAPD Overlap



- difficulty listening and discriminating in noisy environments
- difficulty retaining information heard
- poor attention and concentration
- difficulty with organization and planning
- poor listening skills
- distractibility
- fidgeting
- memory
- following directions
- social skills
- cognitive skills
- academic difficulties
- listening deficits



- There is a high rate of co-occurrence between AD/HD and CAPD. (DiMaggio and Geffner, 2003).
Their research showed that 84% of children with CAPD had confirmed or suspected AD/HD. Co-occurrence between AD/HD and CAPD is 41% for children with confirmed diagnosis of AD/HD, and 43% for children suspected of having AD/HD.

Purpose of the Study



- The aim of this study was to investigate the prevalence (frequency of occurrence) of auditory processing deficits and temporal integration deficits in the population of children with AD/HD.

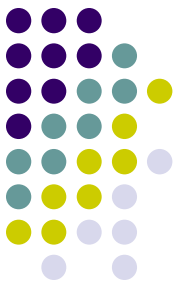
Hypothesis

- It is hypothesized that children with AD/HD present with compromised auditory processing deficits, such as auditory attention, poor discrimination in noise, and inadequate temporal processing.

Participants



- Retrospective study
- 100 participants who were tested for Central Auditory Processing Disorder
- Ages ranged from 6-16
- Those children who presented with other confirmed diagnoses were excluded from this study.



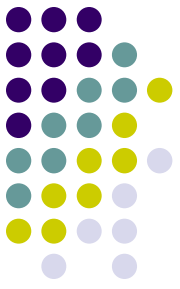
- Participants were divided into 3 groups:
 - Group Likely - sample of children that exhibited similar behavior to AD/HD.
 - Group Positive - sample of children that were identified as having AD/HD.
 - Combined Group (Likely & Positive) – sample of children who exhibited behavior and those that were identified as having AD/HD.

Tests Utilized



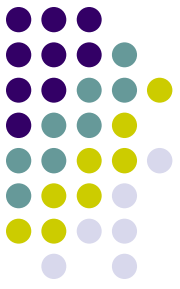
- (a) *SCAN – A: A Test for Auditory Processing in Adolescents and Adults*, ages 11+ (Keith, 1994) - identifies adolescents/adults who are at risk for (C)APD.
- (b) *SCAN – C: A Test for Auditory Processing in Children*, ages 5-11 (Keith, 2000a) - identifies children at risk for (C)APD.
- (c) *Phonemic Synthesis (PS) Test*, ages 5-21 (Katz & Fletcher, 1998) - is used to evaluate auditory processing skills. It is used to assess phonemic decoding ability which is associated with speech and language development, reading and spelling skills.
- (d) *The Random Gap Detection Test (RGDT)*, ages 6-adult (Keith, 2000b) - “identifies and quantifies disorders of timing in the auditory system (temporal processing disorders) in children and adults.

Data Analysis



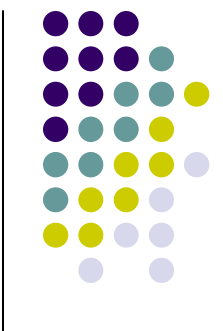
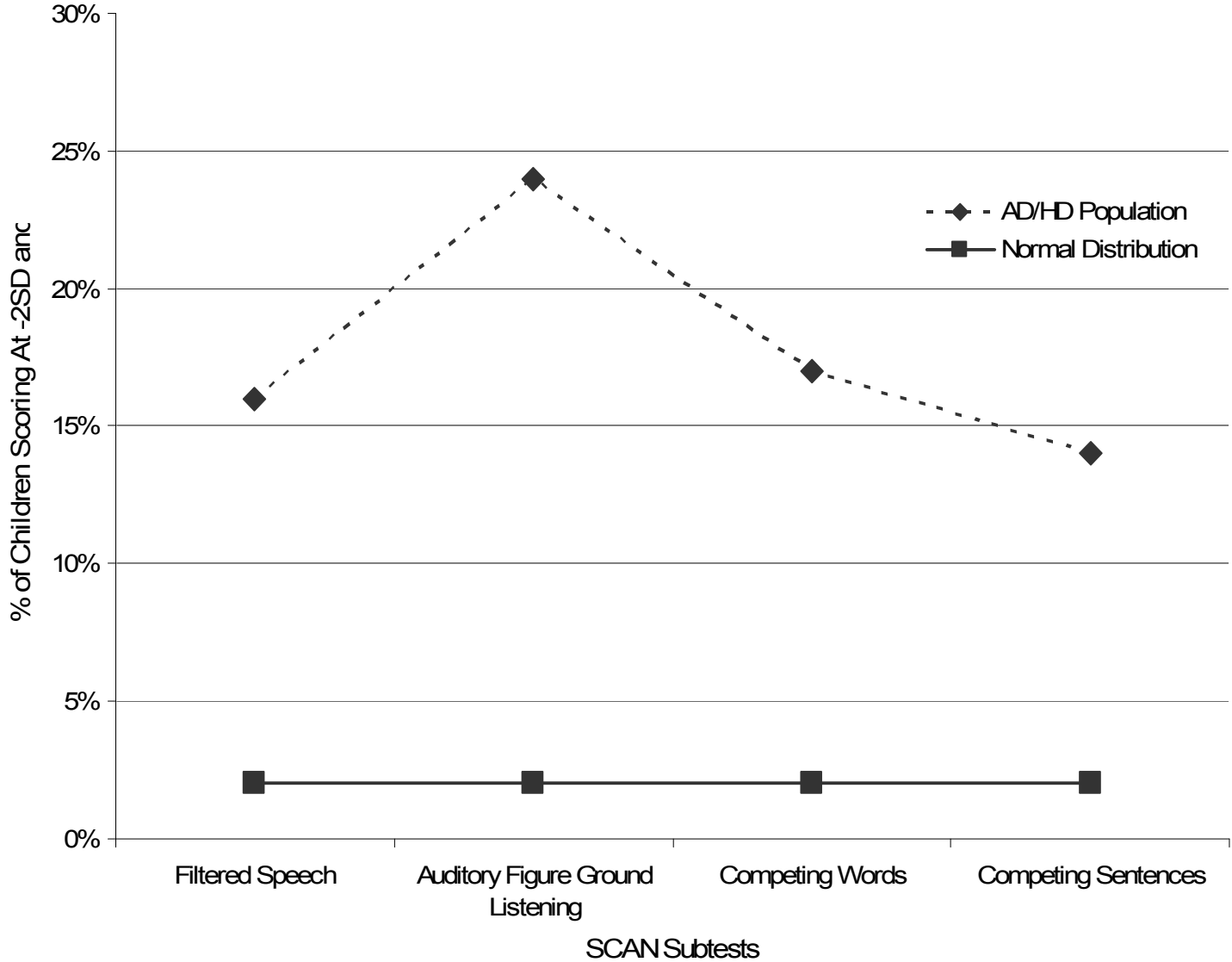
- Descriptive statistics were utilized to obtain the frequency of occurrence of the scores for the SCAN – A, SCAN – C, The Phonemic Synthesis Test, and The Random Gap Detection Test.
- The two group t-test analysis was used for The Phonemic Synthesis Test.
- A Chi Square analysis was used for The Random Gap Detection Test.

Results

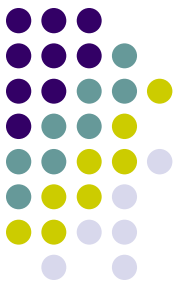


- Results from the SCAN C and A reveal that the proportion of children scoring at $-2SD$ and below ranged from 14 to 24%.
- Following the bell curve for $-2SD$, the results are much greater (up to 12 times greater) than that expected from the normal population (2.14%).
- Results shown in Figure 1

Figure 1

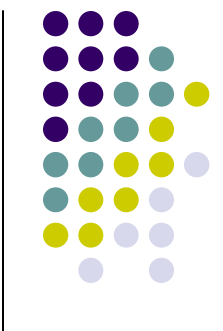
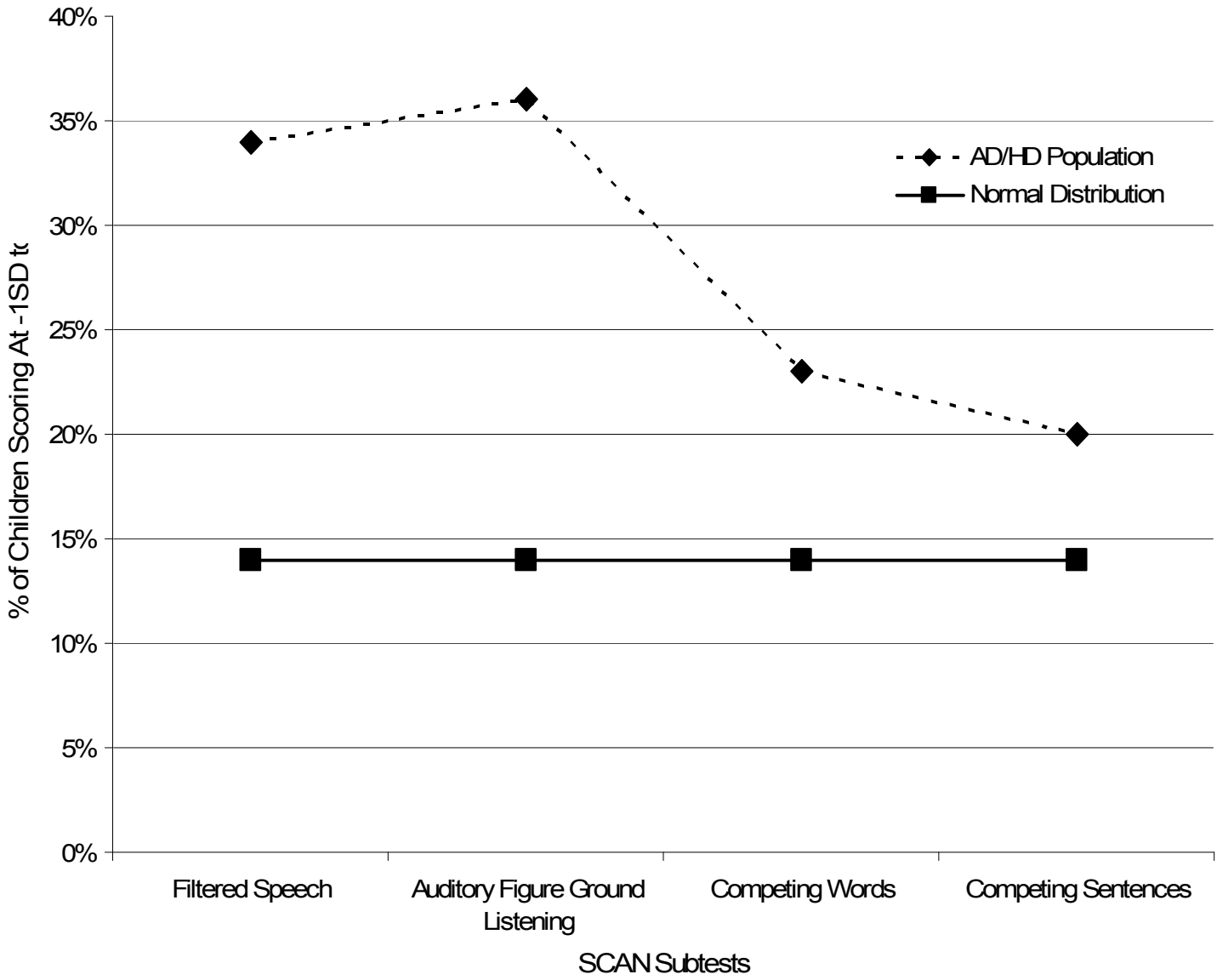


Composite of Scores from the SCAN C and A Subtests Comparing the Combined AD/HD Sample with the Normal Population (2%)

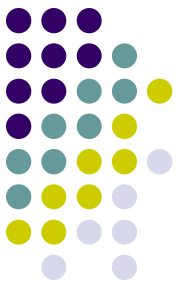


- The proportion of children scoring at $-1SD$ to $-2SD$ ranged from 20 to 36%.
- Following the bell curve for $-1SD$, the results are much greater (up to 3 times greater) than that expected from the normal population (13.59%).
- Results shown in Figure 2

Figure 2

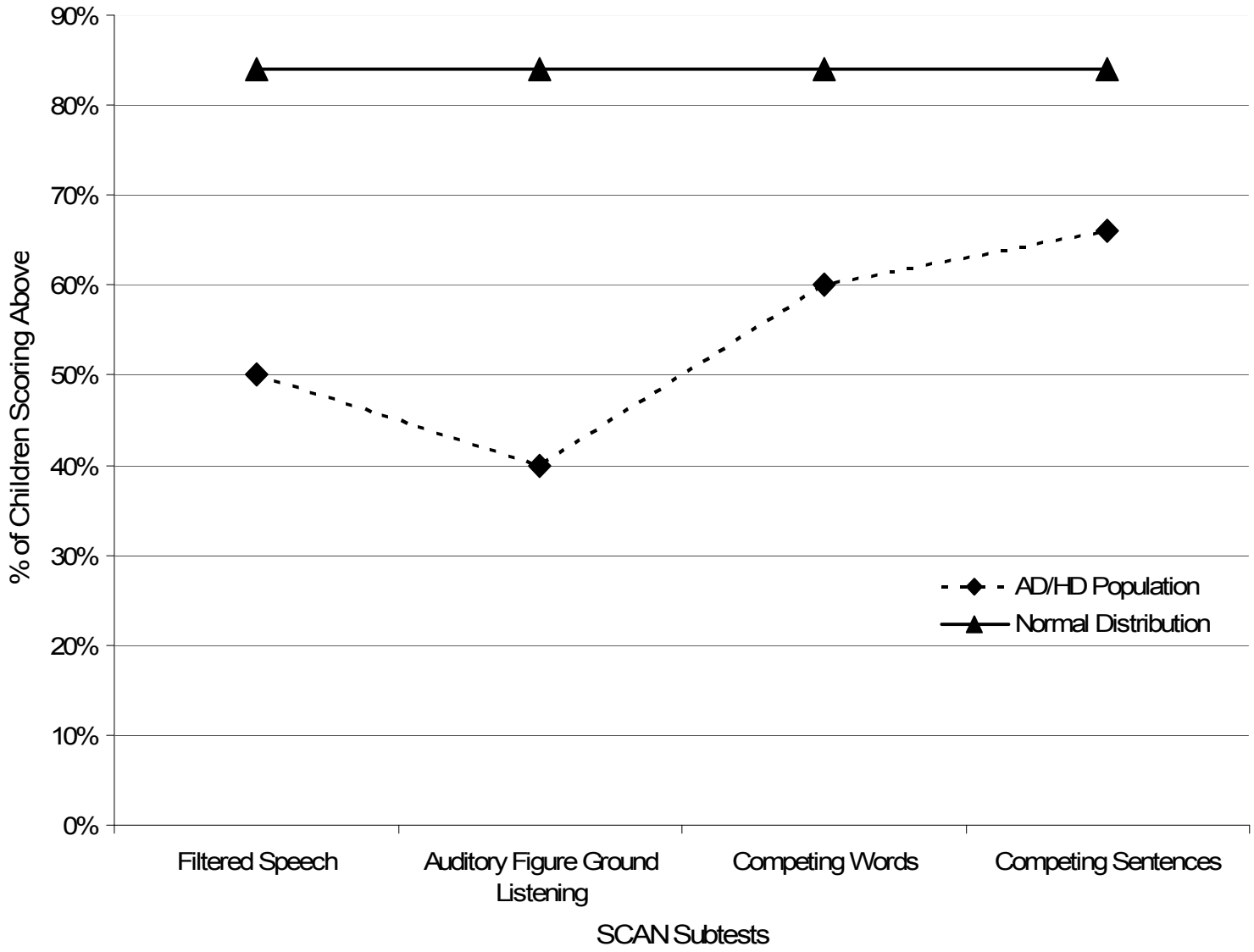


Composite of Scores from the SCAN C and A Subtests Comparing the Combined AD/HD Sample with the Normal Population (14%)



- The proportion of children scoring above $-1SD$ (into the normal range) ranged from 40 to 66%.
- Following the bell curve, the results are much lower than expected from the normal population (84.27%).
- Fewer children with AD/HD scored within the normal range.
- Results shown in Figure 3

Figure 3



Composite of Scores from the SCAN C and A Subtests Comparing the Combined AD/HD Sample with the Normal Population (84%)

Frequency of Occurrence in Filtered Speech Subtest: Combined Sample on SCAN C & A



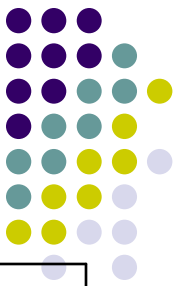
Standard Deviation	% of Norms	% of AD/HD Sample	Frequency of Occurrence
-2SD	2%	16%	8x
-1SD	14%	34%	2x
Above -1SD	84%	50%	

Frequency of Occurrence in Auditory Figure Ground Listening Subtest: Combined Sample on SCAN C & A

Standard Deviation	% of Norms	% of AD/HD Sample	Frequency of Occurrence
-2SD	2%	24%	12x
-1SD	14%	36%	2x
Above -1SD	84%	40%	

Frequency of Occurrence in Competing Words

Subtest: Combined Sample on SCAN C & A



Standard Deviation	% of Norms	% of AD/HD Sample	Frequency of Occurrence
-2SD	2%	17%	8x
-1SD	14%	23%	2x
Above -1SD	84%	60%	

Frequency of Occurrence in Competing Sentences

Subtest: Combined Sample on SCAN C & A

Standard Deviation	% of Norms	% of AD/HD Sample	Frequency of Occurrence
-2SD	2%	14%	7x
-1SD	14%	20%	2x
Above -1SD	84%	64%	

Phonemic Synthesis Test (Katz)



As a whole, 50% of the combined population fell below the criterion, suggesting that half of this population is at risk for a reading deficit.

	# PS	% PS
PS "-"	50	50%
PS "+"	50	50%
N	100	100%

PS "-" = # who can discriminate

PS "+" = # who can't discriminate

Random Gap Detection Test (Keith)



Results from the RGDT for the combined AD/HD Sample revealed that 81% of the sample could not perform adequately on this measure, indicating a deficit in temporal processing.

	O	E
Gap "-"	17	45
Gap "+"	73	45
N	90	90
Chi sq. = 34.84444		
p < 0.005		

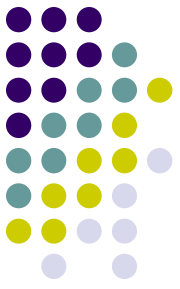
Gap = Random Gap Detection Test

Gap "-" = # who can discriminate

Gap "+" = # who can't discriminate

O = Observed; E = Expected by chance

Summary



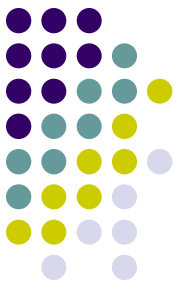
Results indicate that children with AD/HD have a high prevalence of:

- discrimination deficits
- figure ground listening problems
- difficulty with closure skills
- difficulty in competing conditions
- difficulty with phonemic synthesis
- temporal integration deficits



- These findings support the works that indicate an overlap of behavior between AD/HD and CAPD (Keller 1992, 1998; Chermak, Somers, & Seikel, 1998; and Chermak, Tucker, & Seikel 2002). Our data indicate that all children showed difficulties on all tasks that required sustained attention, concentration, discrimination and temporal processing.

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