Adolescents and Adults with CAPD in Educational Settings

Teri James Bellis, Ph.D., CCC-A, FAAA, F-ASHA
Department of Communication Sciences and Disorders
The University of South Dakota
and
Division of Basic Biomedical Sciences
Sanford School of Medicine
Vermillion, SD

- Topics to be covered in this presentation
  - Current definition of CAPD (ASHA, 2005; AAA, 2010)
  - Brain organization and neurobiological bases of CAPD
  - Prevalence of CAPD in adolescents and adults
  - Presenting symptoms/special challenges of CAPD in school and work
  - Methods of diagnosing and treating CAPD in adolescents and adults

Current Definitions of CAPD

CAPD (ASHA, 2005; AAA, 1010):

- is a deficit in the perceptual processing of auditory stimuli, *and the neurobiological activity* underlying that processing
- may lead to or be associated with difficulties in higher-order language, learning, and communication function
- cannot be *attributed to* higher-order language, cognitive, or related confounds

- Affects the perceptual and neural processes in CNS underlying:
  - Localization/lateralization
  - Discrimination
  - Auditory pattern recognition
  - Temporal processing
  - Performance with competing/degraded acoustic signals

Neurobiological Bases of CAPD

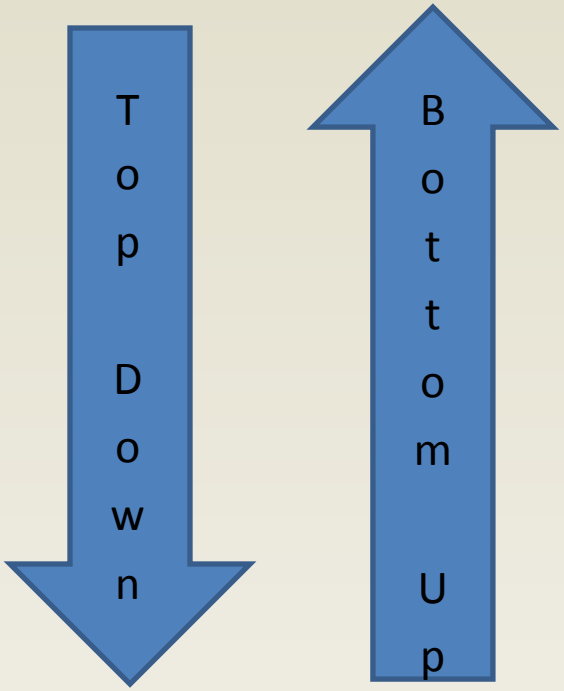
Fundamentals of Brain Organization

- Few, if any, entirely compartmentalized areas of the brain responsible for a single sensory modality – the whole brain works together!

- Resource allocation plays a huge role in listening, remembering, and understanding!

- Multimodality influences affect even the most basic neural encoding and manipulation of sensory stimuli

ATTENTION, COGNITION, MEMORY, LANGUAGE, EXECUTIVE FUNCTION



AUDITORY PROCESSING

Auditory processing is BOTH bottom-up and top-down. The relative influence of top-down or bottom-up processing is influenced by changing listening demands (resource allocation).

- Evidence supporting neurobiological bases of CAPD
  - Abnormal neurophysiologic representation of both speech and nonspeech signals
  - Atypical interhemispheric transfer
  - Atypical timing in system
  - Atypical hemispheric asymmetries
  - Neuromorphological abnormalities
  - Other

Brain organization underlies comorbidity of CAPD with other disorders, e.g.:

- ADHD
- Learning Disability
- Phonological Disorder
- Language Disorder
- Others

- This is why so many individuals with CAPD may also exhibit problems with auditory working memory, phonological awareness, language comprehension, and other “higher-order” abilities, as indicated in the German definition of CAPD.

Prevalence of CAPD in Adolescents and Adults

- No specific data relative to adolescents/young adults
- In school-aged children:
  - 2-3% of all school-aged children (Chermak & Musiek, 1997)
  - ~43% of children with learning disabilities (Iladau et al, 2009)
  - ~25% - 45% of children with reading disorders (Iladau et al, 2009; Banai et al, 2007)
  - Everyone with phonological-based reading disorders? (Billiet & Bellis, 2011)
- Up to 75% of older adults (Bellis & Wilber, 2001; Cooper & Gates, 1991)

- Males appear to be affected more than females (2:1)
- Childhood CAPD can persist into adolescence and adulthood, or CAPD can occur as part of the natural aging process
- The time course and nature of adult-onset CAPD differs by gender and point of time in the lifespan (Bellis & Wilber, 2001)
  - Males: Early adulthood; interhemispheric dysfunction
  - Females: Post-menopausal years; transient right-hemisphere dysfunction as well as interhemispheric dysfunction

Presenting Symptoms of CAPD

- **Red flags MAY include:**
  - Difficulty hearing in noise
  - Difficulty following multi-step directions
  - Difficulty perceiving (and perhaps producing) prosodic elements of speech
  - Reading and spelling difficulties
  - Requesting repetitions/mishearing words
  - Difficulty understanding degraded speech
  - History of early non-developmental speech production errors
  - History of chronic otitis media, neurological insult, or other pertinent medical history
  - And many others…

Special Challenges for Adolescents and Adults with CAPD

- Higher language levels in reading and listening
- Greater responsibility and independence expected at school/university, work, and at home
- Likely greater need to “multi-task”
- Less outside assistance (aides, etc.) to understand and perform tasks
- Learned passivity and possible destructive “coping” mechanisms
- The degree to which CAPD affects work performance is highly dependent on environment (e.g., noisy trades, need to multi-task, reliance on auditory skills, employer-employee relationships, etc.)

Methods of Diagnosing CAPD in Adolescents and Adults

- Diagnosis of CAPD in adolescents and adults is through the SAME process as diagnosis of the disorder in younger children

- It is NEVER too late to diagnose (and treat) CAPD!!!

Diagnosing CAPD

- Purpose of Diagnostic Testing: To identify presence and delineate characteristics/nature of central auditory deficit

- Requires diagnostic tests of central auditory function that have been shown to be sensitive/specific for identification of disorders of the CANS

- Provides information regarding integrity of left-hemisphere, right-hemisphere, interhemispheric, and brainstem auditory structures

- May include psychophysical and/or neuro(electro)physiologic tests of central auditory integrity

- Leads directly to development of *deficit-specific* treatment and management plans

Test Battery Interpretation

- Norm-referenced criteria
- Using the patient as his/her own control (inter- and intra-test pattern analysis using neurophysiologic tenets)

- A diagnosis of (C)APD is enabled only when performance on ≥ 2 tests is abnormal AND the pattern of findings is consistent with underlying neuroscience tenets (ASHA, 2005; AAA, 2010)

- Lack of a pattern (e.g., poor performance on all measures, inconsistent findings across tests) argues for more global or motivational deficit, not (C)APD

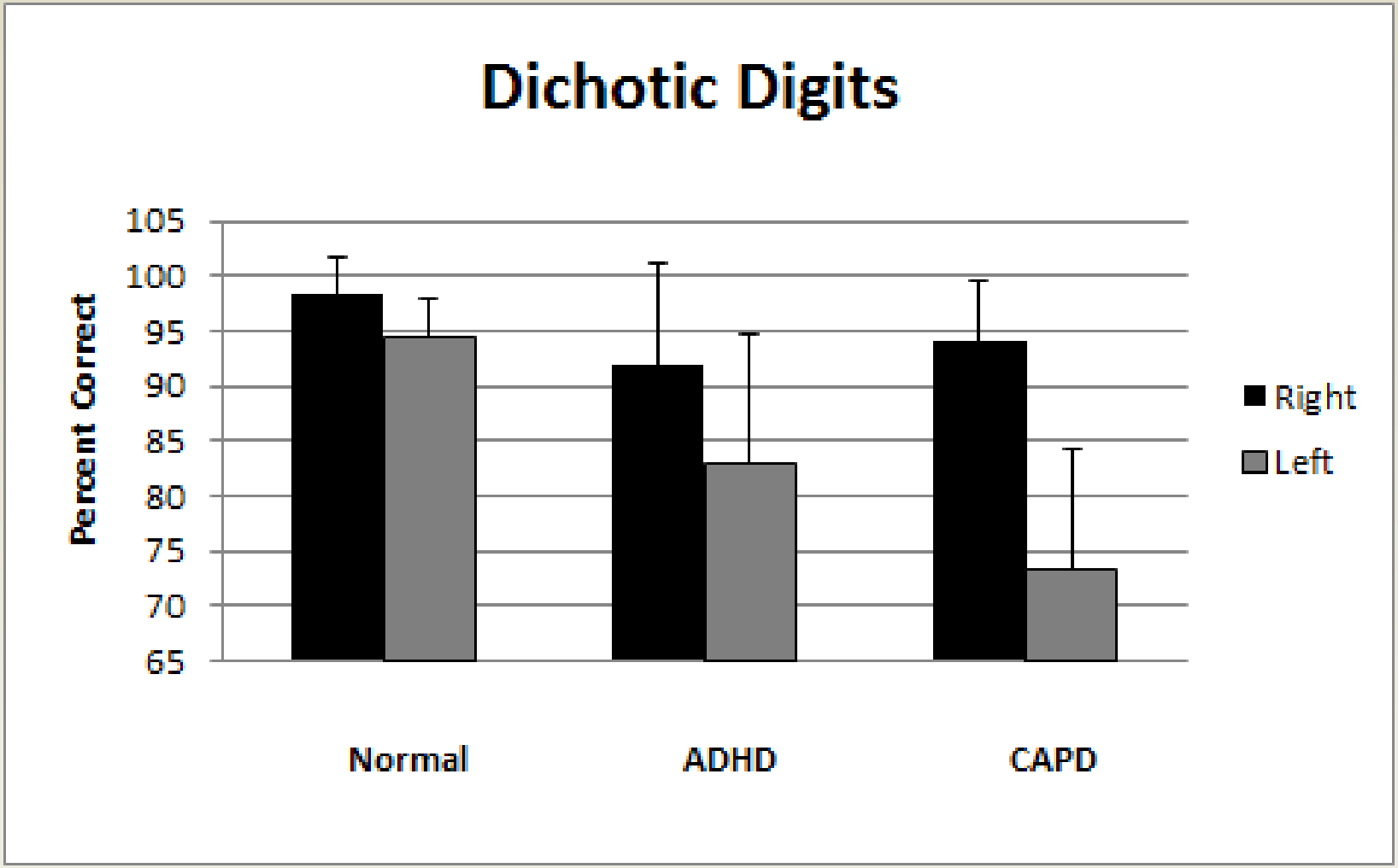
- Differential diagnosis requires administration of sensitized tests of central auditory function and multidisciplinary input to evaluate functioning across domains

- CAPD should never be diagnosed or treated "in a vacuum;" focus should always be on the whole person

Patients with other, more global disorders (e.g., ADHD) typically:

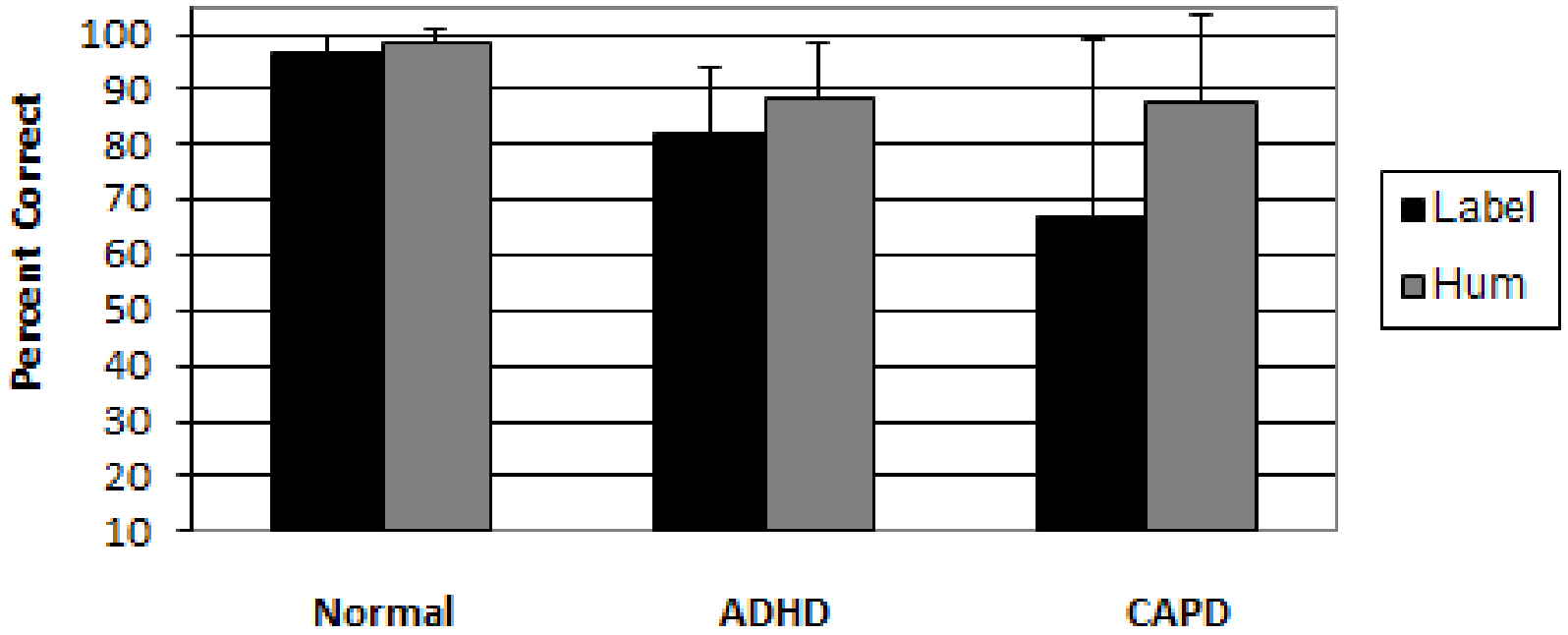
- Exhibit no clear auditory pattern (all normal or uniformly depressed; inconsistency in test performance)
- Exhibit poor performance on vigilance tasks (auditory and visual)
- Often report that their complaints are improved or ameliorated by medication

- When overall performance is considered, individuals with ADHD may perform more poorly (and similarly to individuals with CAPD) on behavioral tests of central auditory function than typically developing individuals.



Bellis, Billiet, & Ross, 2011

Frequency Patterns



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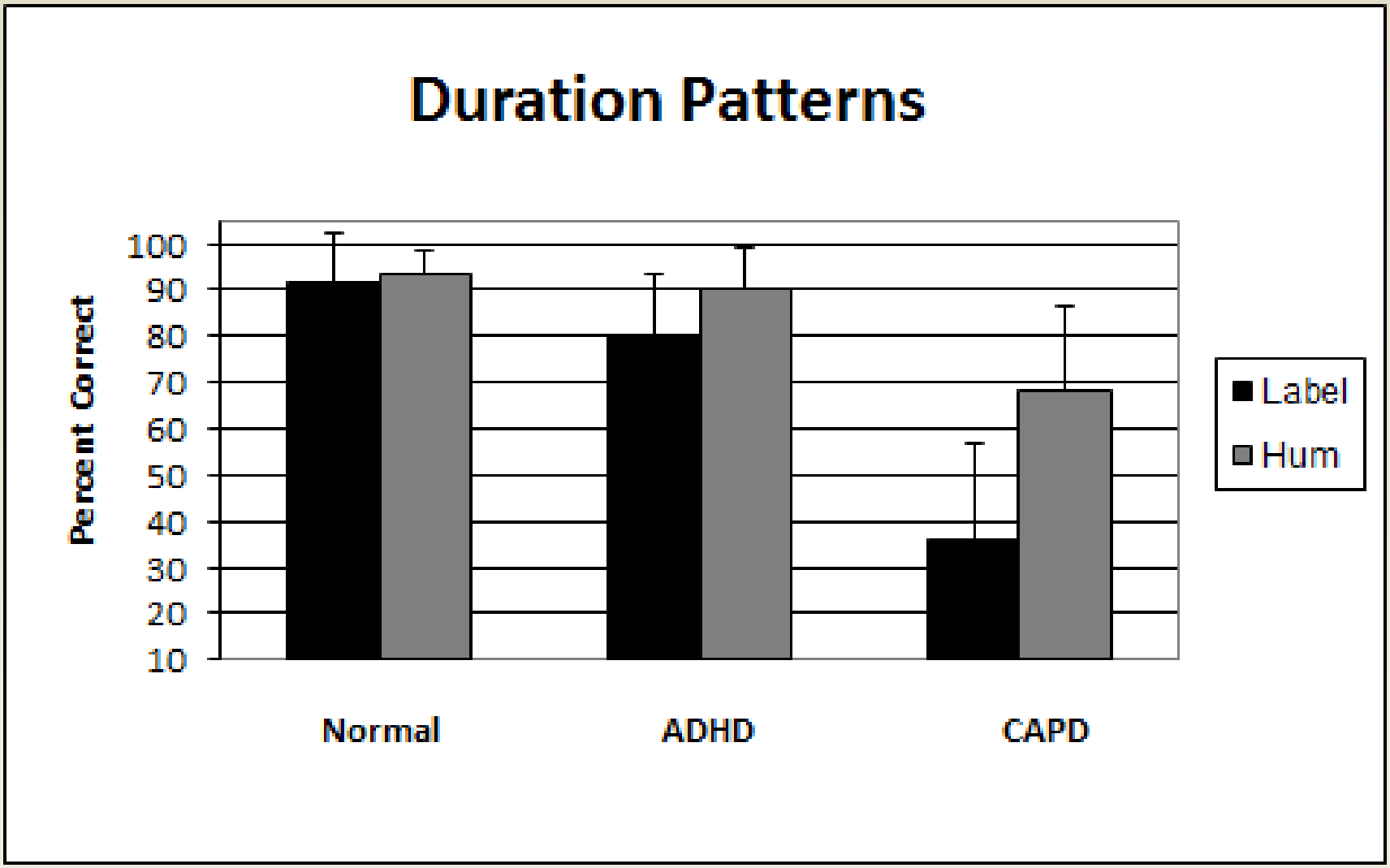
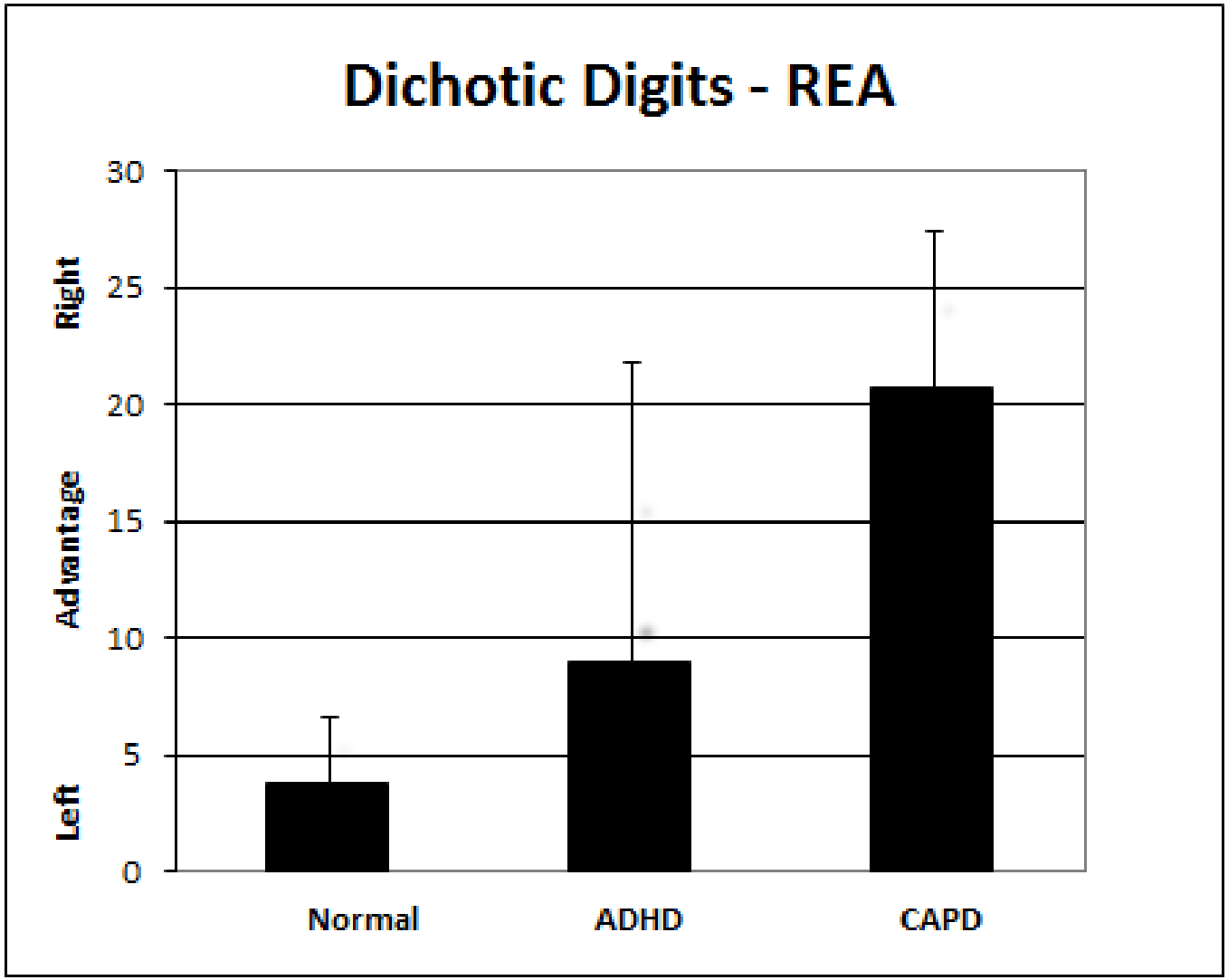


Bellis, Billiet, & Ross, 2011

- However, when intra-test analyses are carried out (ear differences, response condition differences), behavioral tests of central auditory function are sufficient to differentiate those with CAPD from those with ADHD and from typically developing individuals



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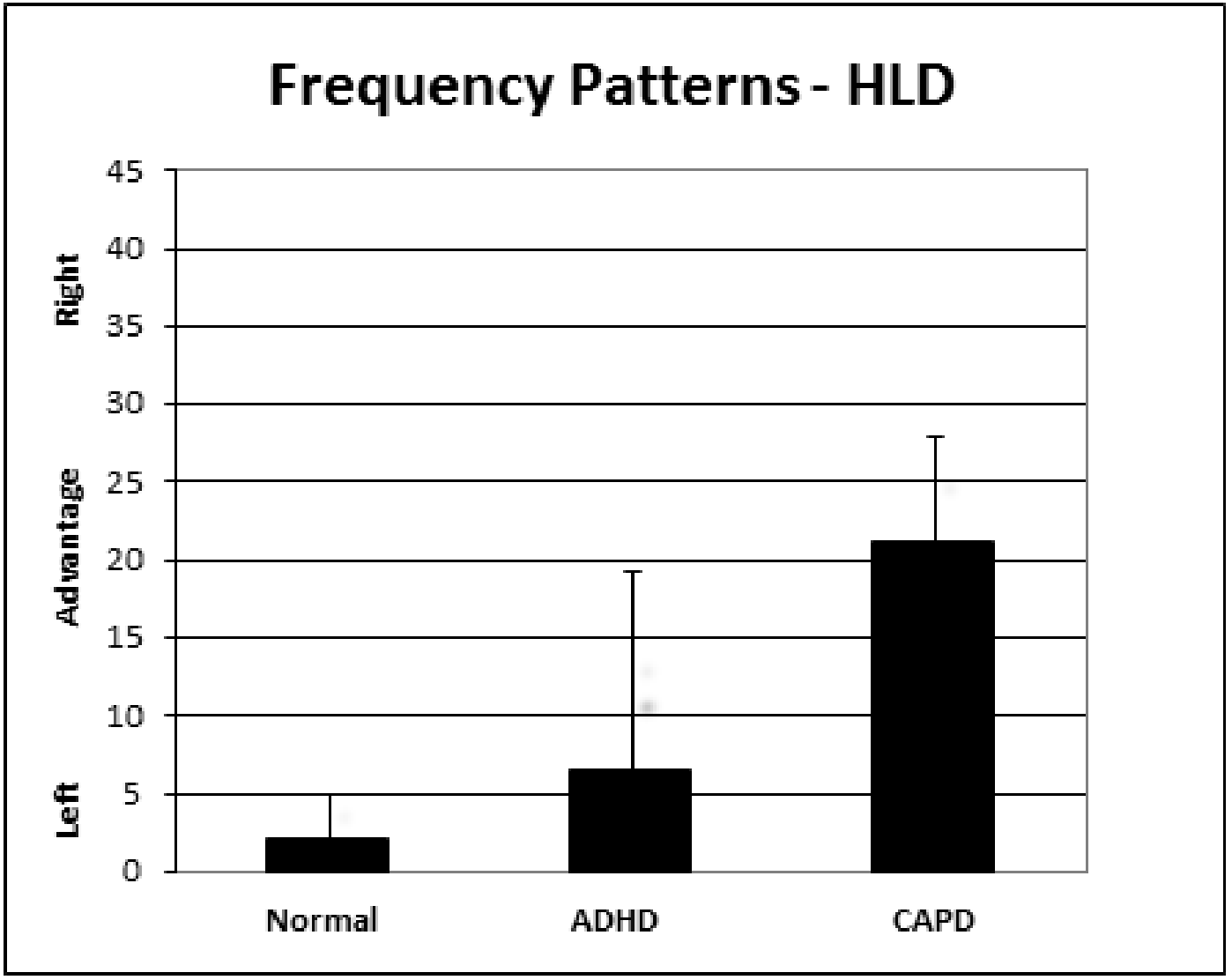

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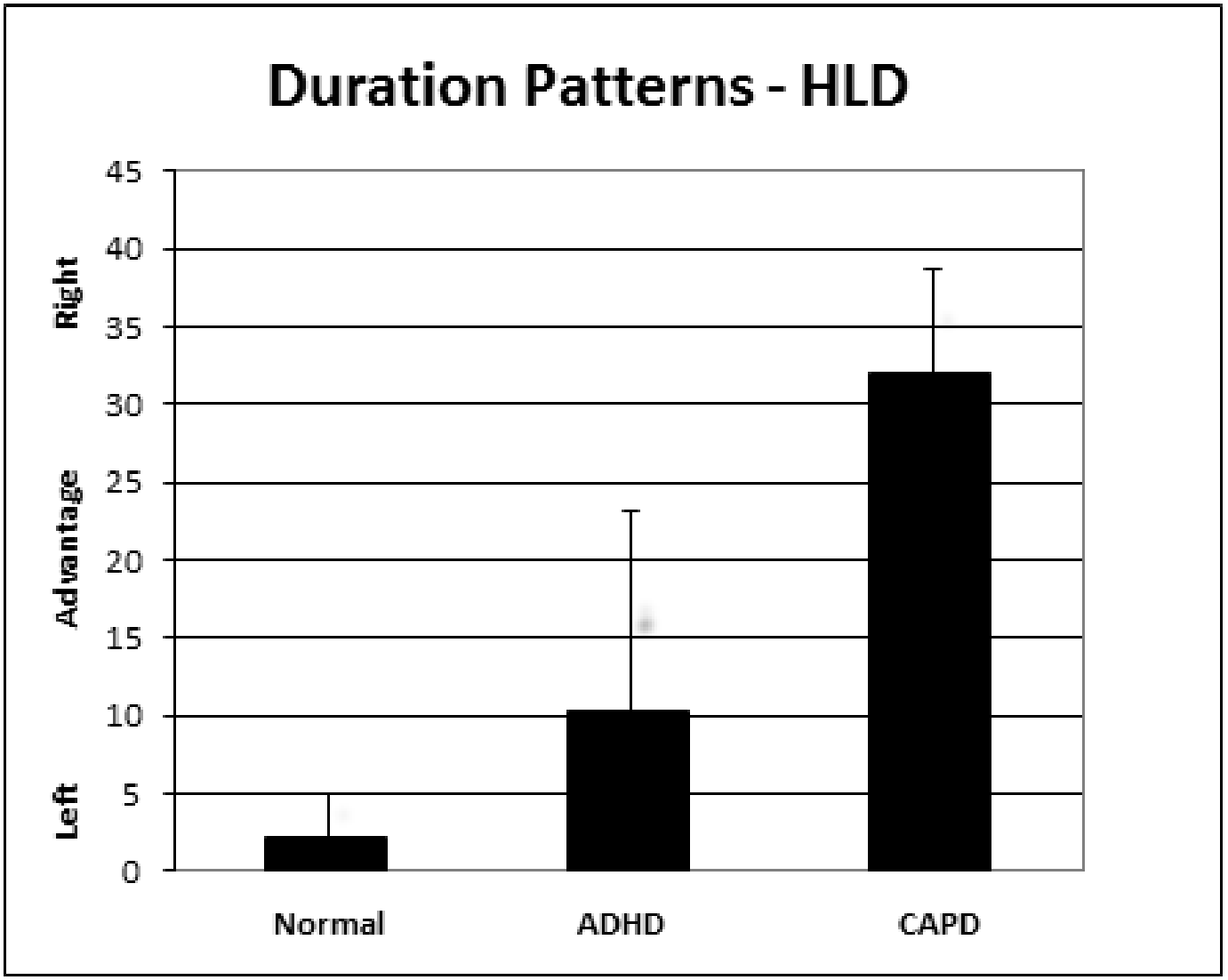


Bellis, Billiet, & Ross, 2011

- Therefore, analysis of inter- and intra-test patterns of performance is CRITICAL for differential diagnosis of CAPD and ADHD

- It should always be remembered that CAPD may (and often does) co-exist with other disorders; therefore, a multidisciplinary team approach is needed!

Intervention for CAPD in Adolescents and Adults

Three critical components of comprehensive intervention for CAPD:

1. Environmental Modifications (bottom-up and top-down)
2. Central Resources Training (top-down)
3. Intensive Auditory Training (bottom-up)

- Note: The following suggestions are examples ONLY. The most effective interventions can only be determined via appropriate diagnosis and multidisplinary team input, along with analysis of the individual's unique situation and difficulties. There is NO one-size-fits-all approach to intervention for CAPD.

Environmental Modifications

- Preferential seating and/or hearing assistive technology
- Provide instructions/information in writing
- Make frequent checks for understanding by observing performance
- Make appropriate use of multimodal cues
- Giving instructions one step at a time

- Make generous use of organizational aids (agendas, notepads, whiteboards, etc.)
- Be concrete; avoid hints
- Repeat rather than rephrase, unless language level is a concern
- Ensure a good listening environment and maximize attention

Central Resources Training

- Attribution Training – encouraging the person to take responsibility for his/her own listening success:
  - Attribute successes and failures to factors under his/her control
  - Encourage paraphrasing of instructions to clarify misunderstandings
  - Teach advance problem-solving techniques

- Engage metalinguistic and metacognitive skills
  - Metalinguistic: Involves intentional “thinking about language”
  - Metacognitive: Involves intentional “thinking about thinking.” Also includes metamemory activities.

Direct Remediation

- Addresses specific auditory deficits via intensive auditory training
- To maximize neuroplasticity, auditory training activities must be:
  - Frequent
  - Intense
  - Challenging
  - Involve active participation and salient reinforcement

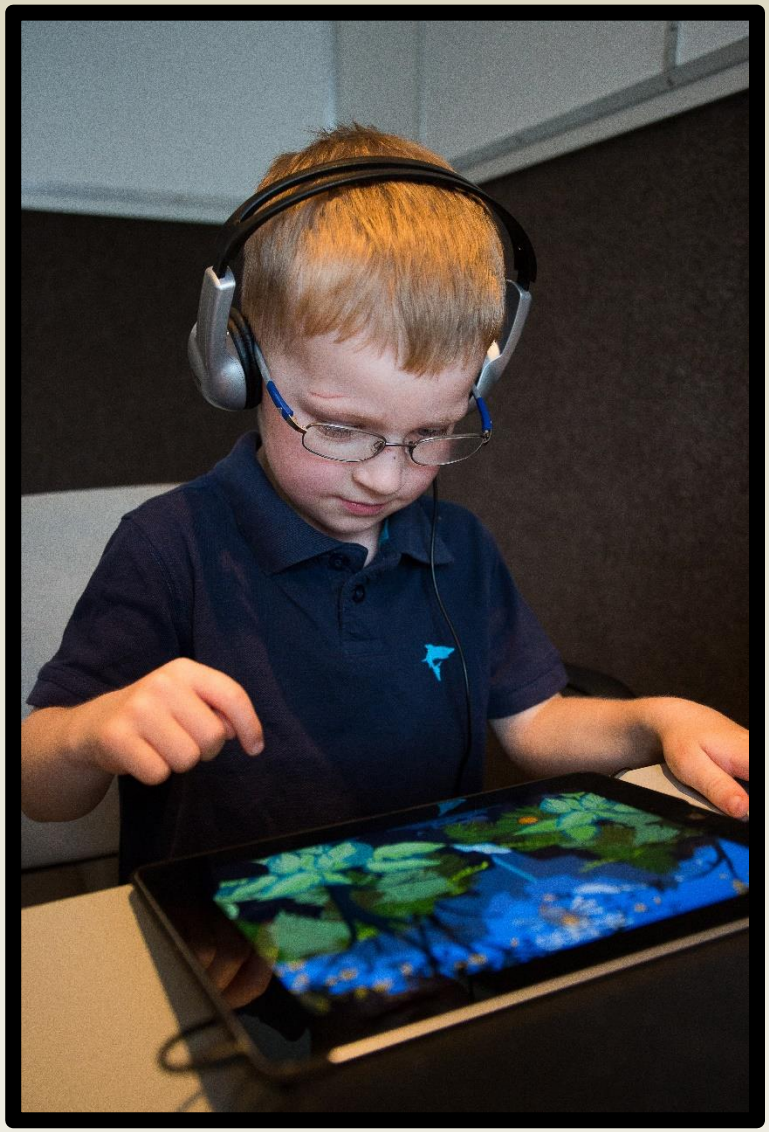
- Skills trained often generalizes to other, non-trained areas, including non-auditory skills such as reading comprehension!

- Remember: The ultimate goal of CAPD intervention is to treat the disorder, and it is NEVER too late to do so!

- One form of auditory training: Dichotic Listening Training (DLT)

- Recent research has shown that training in dichotic listening improves speech-in-noise and related skills, and also generalizes to other areas of difficulty (e.g., auditory closure, reading comprehension, spelling, social communication skills) (Bellis, Barker, & Johnson, 2015)

iPod-based DLT



tablet/computer-based DLT

EFFECTIVENESS OF IPOD-BASED DLT IN CHILDREN AND ADULTS WITH CAPD

Hinweis

Frau Bellis wird die im Vortrag dargebotenen Inhalte und Daten zur Effektivität der Trainingsmethoden erst noch veröffentlichen.

Sie finden deshalb keine Folien dazu in dieser Vortragsdokumentation, sie wurden herausgenommen.

BBW Leipzig, August 2016

References

- AAA. (2010). Diagnosis, treatment, and management of children and adults with central auditory processing disorder. Available: http://www.audiology.org/resources/documentlibrary/Documents/CAPD%20Guidelines%208-2010.pdf
- ASHA.(2005). Position Statement and Technical Report on CAPD. Available: www.asha.org.
- Banai, K., Nicol, T., Zecker, S. G., & Kraus, N. (2005). Brainstem timing: Implications for cortical processing and literacy. *Journal of Neuroscience, 25*(43), 9850-9857.
- Bellis, T. J. (2003). *Assessment and management of central auditory processing disorders in the educational setting: From science to practice* (2nd ed.) Clifton Park, NY: Delmar Learning.
- Bellis TJ, & Wilber LA. (2001). Effects of aging and gender on interhemispheric function. *Journal of Speech Language Hearing Research,* (44), 246-263.

- Bellis, T.J., Billiet, C., & Ross, J. (2011). The utility of visual analogs of central auditory tests in the differential diagnosis of (central) auditory processing disorder and attention deficit hyperactivity disorder. *Journal of the American Academy of Audiology, 22,* 501-514.
- Bellis, T.J., Barker, M., & Johnson, M. (2015, November). The who, what, when, why, and how of dichotic listening training. *American Speech-Language-Hearing Association,* Denver, CO.
- Billiet, C. R., & Bellis, T. J. (2011). The relationship between brainstem temporal processing and performance on tests of central auditory function in children with reading disorders. *Journal of Speech, Language, and Hearing Research, 54,* 228-242.
- Cooper JC, & Gates GA. (1991) Hearing in the elderly – the Framingham cohort, 1983-1985. Part II. Prevalence of central auditory processing disorders. *Ear and Hearing,* (12), 304-311.