

Everyone is a Stranger: Face Blindness in Children with Autism Spectrum Disorders

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Amgen, Inc. ♦ Johnson & Johnson, Inc. ♦ Teva Pharmaceuticals, ADR

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Objectives

- Examine the latest research on Face Blindness, also known as Developmental Prosopagnosia, and how it can affect children with Autism Spectrum Disorders
- Describe the symptoms and methods of screening
- Discuss the neuroanatomy of Developmental Prosopagnosia
- Identify methods of accommodating children with Developmental Prosopagnosia in the classroom
- Outline evidence-based techniques and describe technologies that can aid in treatment

Case Study of a Dyslexic



- Male college student
- 21 years old
- 3.8 GPA in Electrical Engineering
- 145 Full Scale IQ
- Excellent social and conversational skills
- Dresses and acts age appropriate
- Mildly depressed (Dx: Dysthymic Disorder)
- Severe Reading Disorder/Dyslexia

Case Study of a Dyslexic



- “I don’t recognize my own face!”
- ***Developmental Prosopagnosia***

Problems Remembering Faces

–Prosopagnosia: Inability to recognize faces, even one's own face (p. 1168).

Taber's (1981). Taber's Cyclopedic Medical Dictionary. Philadelphia, PA: F.A. Davis

–Joaachim Bodamer, M.D. 1947: German soldiers with brain injuries who could no longer see faces. Coined term “*Prosopon*” meaning face + “*agnosia*” meaning nonrecognition from Greek.

Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68-73.

Subtypes of Prosopagnosia

- **Acquired Prosopagnosia:** Caused by insult to the brain; what Bodamer wrote about in 1947
- **Developmental Prosopagnosia:** “...characterized by severely impaired face recognition. Individuals with this disorder, which runs in families, have no history of brain damage and intact early visual systems.” (p. 166)

Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68-73.
Duchaine, B.C. and Nakayama, K. (2006). Developmental Prosopagnosia: A Window to Content – Specific Face Processing. Current Opinion in Neurobiology, 16, 166-173.

What is a Developmental Disorder?

- A disorder characterized by a significant delay in the rate a normal human trait develops in an individual
- It takes the individual longer to develop this trait than their age peers

Barkley, R.A. (2006). Attention-Deficit Hyperactivity Disorder, Third Edition. New York, NY: Guilford, pp. 92-93.

Subtypes of Prosopagnosia

•Possible Associated Conditions:

- Problems with recognition of facial expression of emotion
- Problems with gender of face discrimination
- Problems with age of face discrimination
- Problems with **TOPOGRAPHAGNOSIA**: difficulty with personal navigation; getting lost easily
- Asperger's Disorder

Galaburda, A.M. and Duchaine, B.C. (2003). Developmental Disorders of Vision. Neurologic Clinics, 21 (3), 687-707.

Subtypes of Prosopagnosia

- Possible Associated Conditions:
 - Central Auditory Processing Disorder (CAPD):
“The inability to understand spoken language in a meaningful way in the absence of what is commonly considered a hearing loss.” (Sineps and Hunter, 1997)

Duchaine, B.C. (2000). Developmental Prosopagnosia with Normal Configural Processing. Cognitive Neuroscience and Neuropsychology. 11 (1), 79-82.

Choisser, B. (August, 14, 2007). Face Blind! From website: www.choisser.com/faceblind/about.html, p. 7 of 10.

Sineps, D. and Hunter, L. (1997). I Can Hear But...When Auditory Perception and Listening Break Down: Implications For Language and Reading. Paper presented at the International Dyslexia Association Annual Conference, Minneapolis, MN, November 13, 1997, Session T-45.

Prosopagnosia



- Remembering Faces:

- This is an important ability for survival

- It lets you know “friends and foes”
 - It helps you maintain relationships
 - It helps you remember the social status of others

Ratey, J.J. (2001). A User's Guide to the Brain: Perception, Attention and the Four Theaters of the Brain. New York, NY: Vintage.

Developmental Prosopagnosia



- Affects 2 to 3 percent of the population
- That equates to 6,000,000 Americans!
- Those affected often know something is wrong, but they don't know exactly what

Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68-73.

Symptoms of Prosopagnosia

- Extreme difficulty recognizing faces. Even with a person who is well known by the sufferer (i.e., a parent, spouse, best friend, etc.)
- Appears aloof/arrogant, does not respond to people they “know” when they see them
- Often complain they cannot follow movies or TV shows because they cannot remember the identity of characters
- They tend to recognize people by hair, gait, clothing, voice, context, or other information

Author (August 14, 2007). www.faceblind.org/research, p. 1 of 3.

Additional Symptoms of Prosopagnosia Found in Children

- It may take months to recognize their classmates
- School transition may be a problem
- Extreme separation anxiety and stranger wariness
- Changes in people's appearance (i.e., new glasses, new hair style, etc.) may be a problem
- Feelings of frustration, isolation and embarrassment may be present

Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68 73.

Face Perception

- The right Fusiform Gyrus typically does not respond to objects
- This area reorganizes faces into wholes
- The fusiform gyrus helps to differentiate between visually similar stimuli
- Greebles-novices treat them as objects while experts treat them in a holistic manner

Gauthier, I. (November 3, 2004). Face Processing: Is It Hard-wired or Learned? Evidence from Brain Imaging Studies. Paper presented at the 55th Annual International Conference seminar, *The Neural Basis of Reading and Other Forms of Skill Acquisition*, Philadelphia, PA, Session: W-1.

Face Perception

“Our results show that a man with severe prosopagnosia performed normally throughout the standard greeble training procedure. These findings indicate face recognition and greeble recognition rely on separate mechanisms.”
(Duchaine, et.al., August, 2004)

Duchaine, B.C., Dingle, K., Butterworth, E. and Nakayama, K. (August, 2004). Normal Greeble Learning in a Severe Case of Developmental Prosopagnosia. Neuron, 43 (4), 469-473 (From abstract).

Developmental Prosopagnosia

- “The hereditary type of prosopagnosia has an autosomal dominant type of inheritance. This means that men and women are affected in equal numbers. In our experience women are more willing to talk about their face recognition problems.” (Thomas Grueter, M.D.)
- If one parent has Prosopagnosia their child has a 50% chance of having it

Grueter, T. (August 14, 2007). Personal Communication.

Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68-73.

Kennerknerht, I., Grueter, T., Wellinh, B., Wentzek, S., Horst, J., Edwards, S. and Gueter, M. (June, 2006). First Report of Prevalence of Non-Syndromic Hereditary Prosopagnosia. American Journal of Medical Genetics, Part A, 140A (15), 1617-1622 (From abstract).

Bradley Duchaine on Dyslexia Prosopagnosia



- There is little data regarding the co-occurrence of developmental prosopagnosia and LD, AD/HD, and NVLD
- Most people he has evaluated with Asperger's Disorder have face processing problems

Duchaine, B. (June 23, 2010). Personal Communication.

Slower face Processing in ASD



“These data provide evidence for slowed face processing impairments in autism and highlight the role of processing speed in face processing impairments in autism.

McPartland, J., Dawson, G., Webb, S.J., Panagiotides, H., and Carver, L.J. (2004). Event-related Brain Potentials Reveal Anomalies in Temporal Processing of Faces in Autism Spectrum Disorder. Journal of Child Psychology and Psychiatry, 45(7), 1235-1245.

Autism Spectrum Disorders in DSM-5

“New name for category, autism spectrum disorder, which includes autistic disorder (autism), Asperger’s disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified.”

Author (2010). DSM-5 Development A 09 Autism Spectrum Disorder. Washington, DC: American Psychiatric Association:
www.dsm5.org/ProposedRevision/Pages/proposedrevision.aspx?rid=94#

DSM-5 and ASD

- “A single spectrum disorder is a better reflection of the current state of knowledge about pathology and clinical presentation; previously the criteria were equivalent to trying to ‘cleave meatloaf at the joints’.”(p. 1 of 1)
- Three domains become two:
 - Social/communication deficits
 - Fixed interests and repetitive behaviors

Author (2010). DSM-5 Development A 09 Autism Spectrum Disorder. Washington, DC: American Psychiatric Association: www.dsm5.org/ProposedRevision/Pages/proposedrevision.aspx?rid=94#

DSM-5 and ASD

- “...Deficits in nonverbal communicative behaviors used for social interaction; range from poorly integrated-verbal and nonverbal communication, through abnormalities in eye contact and body-language, or deficits in understanding and use of nonverbal communication, to total lack of facial expression or gestures.” (p 1 of 1)

Author (2010). DSM-5 Development A 09 Autism Spectrum Disorder. Washington, DC: American Psychiatric Association: www.dsm5.org/ProposedRevision/Pages/proposedrevision.aspx?rid=94#

Face Perception in ASD

- The Fusiform Face Area (FFA) responds much more to faces than to other objects
- Nine different labs have found that those with Autism Spectrum Disorders have hypoactivation of the FFA when viewing faces
- Developmental Prosopagnosia and Developmental Agnosia are separate disorders

Schultz, R.T. (2005). Developmental Deficits in Social Perception in Autism: The Role of the Amygdala and Fusiform Face Area. International Journal of Developmental Neuroscience, 23, 125-141.

Duchaine, B., and Nakayama, K. (2005). Dissociations of Face and Object Recognition in Development Prosopagnosia. Journal of Cognitive Neuroscience, 17, 249-261 (From Abstract).

Prosopagnosia and Autism Spectrum Disorders

“Thus, these data argue for the role of the FFA-amygdala system in social cognition more generally, and retrieval of specific social knowledge about what constitutes a friendly social interaction, or not. Collectively these data suggest the amygdala-FFA system and its failure to strongly activate during face perception tasks points to a causal mechanism involved in autism...” (p. 137)

Schultz, R.T. (2005). Developmental Deficits in Social Perception in Autism: The Role of the Amygdala and Fusiform Face Area. International Journal of Developmental Neuroscience, 23, 125-141.

How to Assess Developmental Prosopagnosia

- Cambridge Face Memory Test
- Test My Face Recognition- Internet test

Duchaine, B. and Nakayama, K. (2006). The Cambridge Face Memory Test: Results for Neurologically Intact and an Investigation of It's Validity Using Inverted Face Stimuli and Prosopagnosic Participants. Neuropsychologia, 44, 576-585. From web site:

www.faceblind.org/social_perception/papers/duchaine06neuropsychologia.

Test My Face Recognition (From web site): www.faceblind.org/facetests/index.php.

Treatment of Prosopagnosia: “Are you my Mother?”



- Encourage the person to look at people's faces when socializing
- Introduce new people slowly and emphasize their characteristics: “Say hi to Billy with the red hair and freckles”
- Have children meet teachers long before school starts and have the child meet with them often
- Have teachers keep their appearance stable
- Play introduction games
- Post photos of teachers, friends, parents on wall

Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68-73.

Treatment of Prosopagnosia



- “Prosopagnosics cannot be cured, but they can and do learn ways to recognize people.” (p. 70)



Grueter, T. (August/September, 2007). Forgetting Faces. Scientific American: Mind, 18 (4), 68-73.

Computer Programs to Treat Prosopagnosia



- “Let’s Face It!” – Face Recognition Program and workbook for children with Autism Spectrum Disorders (University of Victoria Brain and Cognition Lab & the Yale Child Study Center)
- Teaches facial recognition and emotion recognition in 20 hours!
- It is **FREE!**

From:

<http://web.uvic.ca/~letsface/letsfaceit/?q=home>

Mnemonic Techniques to Remember Faces



- Lucas, J. (2000). Names and Faces Made Easy: The Fun Way To Remember People.
- www.jerrylucas.com

Facial Expression Training Autism



- “Even when people with autism spectrum disorders can figure out what someone’s eyes or face conveys, they do so in a different way than everyone else, which may be less efficient or take more time.” (p. 62)
- The non-disabled use the temporal lobe and fusiform gyrus to decode facial expressions

Ozonoff, S., Dawson, G., and McPartland, J. (2002). A Parent’s Guide to Asperger Syndrome & High – Functioning Autism. New York, NY: Guilford.

Facial Expression Training Autism

- Looking at pictures of eyes and deciphering the emotion they conveyed activated the non-disabled amygdalas and frontal lobes
- Those with Asperger's used the frontal lobes far less and did not activate the amygdala. They used other areas of the brain not designed for such tasks
- Those with Asperger's may use voice, touch, etc. to recognize others, not their face

Ozonoff, S., Dawson, G. and McPartland, J. (2002). A Parent's Guide to Asperger Syndrome & High – Functioning Autism. New York, NY: Guilford.

Prosopagnosia of Facial Expressions



Prosopagnosia of Facial Expressions

“Face perception can be subdivided into two general types – recognition of person identity via the structures of the face, and recognition of internal affective state on the shape of individual features and changes in their relative distance from one another during the expression.” (p. 128)

Schultz, R.T. (2005). Developmental Deficits in Social Perception in Autism: The Role of the Amygdala and Fusiform Face Area. International Journal of Developmental Neuroscience, 23, 125-141.

Recognizing Emotional Facial Expressions



Emotional Facial Expression Recognition:

- Does this mean we come into the world expecting to see human faces and ready to respond with our own prewired facial expressions? Yes! (Ratey, 2001, p. 300)

Ratey, J. J. (2001). A User's Guide to the Brain: Perception, Attention, and the Four Theaters of the Brain. New York: NY: Vintage.

Decoding Skill and Facial Expression



- Positive emotions are the easiest to decode.
- Negative emotions are the most difficult
- Poor interpreters of facial expression have less social acceptance and poorer adjustment



Semrud-Clikeman, M. (Spring, 2003). Executive Function and Social Communication Disorders. Perspectives, 29 (2), 20-22.

Semrud-Clikeman, M. (2007). Social Competence in Children. New York, NY: Springer.

Decoding Skill and Facial Expression

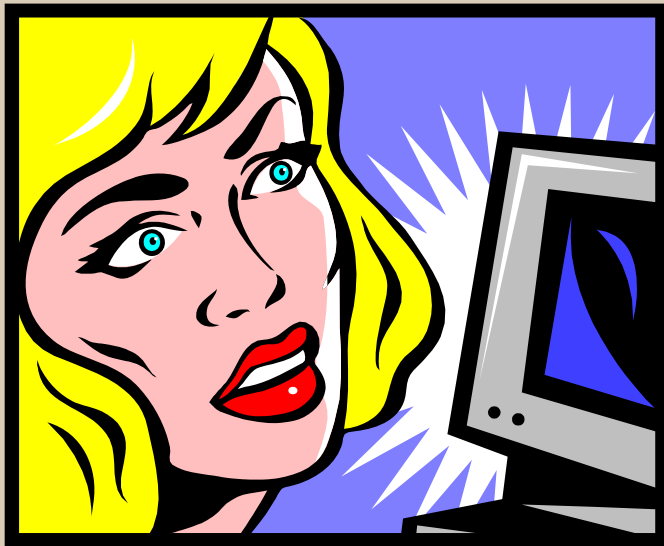


- Attwood (2007) stated those with Asperger's Disorder have great difficulty decoding faces.

Attwood, T. (2007). The Complete Guide to Asperger's Syndrome. Philadelphia, PA: Jessica Kingsley, p. 130.

Prosopagnosia and NVLD

Nonverbal Learning Disorders



“Hence, it appears that children with NLD have a specific deficit on immediate memory for faces. This facial memory deficit may be linked to a deficit in right hemisphere functioning which has already been implicated in facial processing and may also be linked with other disorders (e.g., autism spectrum disorder) in which similar facial processing deficits have been documented.”
(p. 1-2)

Liddell, G.A. and Rasmussen, C. (August, 2005). Memory Profile of Children with Nonverbal Learning Disability. Learning Disabilities Research and Practice, 20 (3), 137-141 (From abstract).

Prosopagnosia and Autism Spectrum Disorders

“Although not part of current diagnostic criteria, much evidence suggests that persons with ASD have marked deficits in face perception.” (p. 127)

Schultz, R.T. (2005). Developmental Deficits in Social Perception in Autism: The Role of the Amygdala and Fusiform Face Area. International Journal of Developmental Neuroscience, 23, 125-141.

Biomarker for ASD?

“Our findings suggest that an atypical implicit response to facial expression of emotion may form the basis of impaired emotional reactivity in autism and in the broader autism phenotype in relatives. These results demonstrate that the fMRI response to facial expression of emotion is a candidate neuroimaging endophenotype for autism, and may have far-reaching insights into the etiology of autism.” (p. 1)

Spencer, M.D., Holt, R.J., Chura, L.R., Suckling, J., Calder, A.J., Bullmore, E.T., and Baron-Cohen, S. (July 12, 2011). A Novel Functional Brain Imaging Endophenotype of Autism: The Neural Response to Facial Expression of Emotion. Translational Psychiatry, 1, e19;doi:10.1038/tp.2011.18; Published online 12 July 2011, p. 1-7.

Assessment for Face Perception

Simon Baron-Cohen's Tests:

- Faces Test
- Eyes Test (Adult)
- Eyes Test (Child)
- Cambridge Mindreading (CAM) Face-Voice Battery
- Empathy Quotient (EQ) (Adult)
- Empathy/Systemizing (EQ-SQ) (Child)
- And many others...

Downloadable from:

www.autismresearchcentre.com/arc_tests

Evaluating Nonverbal Behavior

- **Diagnostic Analysis of Nonverbal Behavior 2 (DANVA2)**
 - Adult faces and voices
 - Child faces and voices
 - African American faces and voices
 - Postures

Available from: Stephen Nowicki, PhD, Emory University – email: snowik@emory.edu

- **Comprehensive Affect Testing System (CATS)**

“This ensemble of tests enables clinical psychologists, neuropsychologists, neurologists, educators, speech therapists and other related disciplines to assess dysfunctional processing of affect expressed by the human face and voice.” (p. 1 of 4).

Froming, K., Levy, M. and Ekman, P. (2003).
www.psychologysoftware.com/CATS.htm.

FACIAL EXPRESSIONS CAN BE TAUGHT!

Volkmar, F. (April 23, 2003). Asperger Syndrome: Clinical Features, Assessment and Intervention Guidelines. Seminar presented by the New England Educational Institute, Phoenix, AZ.

Gauthier, I. and Tarr, M.J. (1997). Becoming a “Greeble” Expert: Exploring Mechanisms for Face Recognition. Vision Research, 37 (12), 1673-1682.

Computer Programs to Treat Prosopagnosia

- Baron-Cohen, S. (2003). Mind Reading: An Interactive Guide To Emotions. Philadelphia, PA: Jessica Kingsley.

“Harry Potter” teaches facial expressions

- Baron-Cohen, S., Drori, J., Harcup, C. (2009). The Transporters (USA Version). London, England: Changing Media Development: www.thetransporters.com

“Thomas the Tank-Engine” teaches faces

Computer Programs to Treat Prosopagnosia



- “Gaining Face”:
www.StoneMountainSoftware.com
- Paul Ekman, PhD (“**Lie to Me**”/SPOT – Surveying Passengers by Observational Techniques) CD-ROMS:
 - Micro Expression Training Tool (METT)
 - Subtle Expression Training Tool (SETT)
 - Repeated presentations of METT & SETT to those with Autism Spectrum Disorders
 - Available from: www.paulekman.com

Treating Problems Making Reading Facial Expressions

- Cognitive Affective Training-Faces and Feeling Words:
www.CAT-kit.com
- Student Handout: Emotions and Facial Expressions – From:
McAfee, J. (2002). [Navigating the Social World](#). Arlington, TX:
Future Horizons, pp 83-84.
- Ekman, P. & Friesen, W.M. (2003). [Unmasking The Face: A
Guide To Recognizing Emotions From Facial Cues](#). Cambridge,
MA: Malor Books.
- Ekman, P. (2003). [Emotions Revealed: Recognizing Faces and
Feelings to Improve Communication and Emotional Life](#). New
York, NY: Time Books.

Teaching Facial Affect Recognition

- Social Skills training by Mental Health Professionals and Speech-Language Pathologists (female teacher with small children)*
- 9/11 & Future Prosthetic Devices (Azar, 2000)
- Try an “Emotional Seeing Eye Dog” (Grandin, 1995)

Azar, B. (2000). Two Computer Programs Face Off. Monitor on Psychology, 31 (1), 48-49.

Grandin, T. (1995). Thinking in Pictures: And Other Reports From My Life with Autism. New York, NY: Vintage.

Grandin, T. (2006). Animals in Translation. New York, NY: Simon and Schuster.

Dimitrovski, L., Spector, H. and Levy-Dhiff, R. (2000). Stimulus Gender and Emotional Difficulty Level: Their Effect on Recognition of Facial Expressions in Children With and Without LD. Journal of Learning Disabilities, 33 (5), 410-416.*

Wearable Prosthetic



“We describe a novel wearable device that perceives and reports on social-emotional information in real-time human interaction. Using a wearable camera, combined with machine perception algorithms, the system records and analyzes the facial expressions and head movements of the person with whom the wearer is interacting. We propose the application of the social-emotional prosthetic to assist the growing number of individuals diagnosed with...

Wearable Prosthetic



Autism Spectrum Disorder (ASD) in perceiving communication in a natural rather than a structured environment, bootstrapping their ability to learn and develop in social settings..." (p. 1)

el Kaliouby, R., Teeters, A. and Picard, R.W. (MIT Media Lab) (No Date). An Exploratory Social-Emotional Prosthetic for Autism Spectrum Disorders. From website:

www.media.mit.edu/affect/pdfs/06.kaliouby-teeters-picard-bsn.pdf .

el Kalioby, R., Picard, R. and Baron-Cohen, S. (2006). Affective Computing and Autism. Annual of the New York Academy of Sciences, 1093, pp. 228-248.

Emotional Seeing Eye Dogs

- Dogs separated from wolves about 135,000 years ago.
- Dogs lived with humans for 100,000 years; even before we were “modern humans” (Homo Sapien Neanderthalensis, Homo Florensiensis, Archaic Homo Sapien Sapiens)
- Dog and humans co-evolved
- Humans learned to think and act like dogs
- Dogs allowed humans to hunt big game while they acted as guards and lookouts. Humans did more planning and organization activities
- 14,000 years ago humans domesticated dogs
- Homo Sapien Neantathalensis did not have dogs; they are extinct
- In the past 100,000 years the dog brain shrank by 10 to 30%; mostly in the forebrain while the human brain shrank by 10%; mostly in the midbrain sensory and smell areas
- Dogs have a symbiotic relationship with humans and have a genetic predisposition to understand human emotions

Grandin, T. (2005). Animals in Translation. New York, NY: Simon & Schuster.

Emotional Seeing Eye Dogs



- **4Paws For Ability**
253 Dayton Avenue
Xenia, OH 45385
- **Training Center:**
937-374-0385
- **Website:**
www.4pawsforability.org

Dogs may have a rudimentary mirror neuron system!

Blakeslee, S. (January 10, 2006). Cells That Read Minds. New York Times; From website:

www.nytimes.com/2006/01/10/science/10mirr.html?pagewanted=1&r=1.

Bibliography

- **Please see attachment**

Internet Resources

- **National Institute of Neurological Disorders and Stroke:**
www.ninds.nih.gov/disorders/prosopagnosia/Prosopagnosia.htm
- **Prosopagnosia Research Centers at Harvard and University College London:** www.faceblind.org
- **University of Minnesota, Yonas Visual Perception Lab:**
www.cehd.umn.edu/icd/yonaslab/prosopagnosia/html
- **Face Blind!:** www.choiser.com/faceblind/

Helpful Websites NVLD, Asperger's Disorder Autism Spectrum Disorders

- www.nldontheweb.org
- Nonverbal Learning Disability Association: www.nlda.org
- LD Online: www.ldonline.org
- MAAP Services for Autism and Asperger's Disorder: www.maapservices.org
- UC Davis M.I.N.D. Institute: www.ucdmc.ucdavis.edu/MINDInstitute
- Yale Child Study Center: www.med.yale.edu/chldstdy/autism/aspergers.html
- Autism Research Centre: www.autismresearchcentre.com
- Temple Grandin, PhD: www.templegrandin.com
- Future Horizons (Publisher): www.fhautism.com

Questions?

Thank You!

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- Kevin T. Blake, PhD, P.L.C. does
 - Live seminars for Cross Country Education
 - Social Difficulties of Learning, Attentional and Autism Spectrum Disorders: Screening and Treatment
 - Assessment and Treatment of Dyslexia in Adolescents and Adults: No Adults Left Behind
 - Webinars for Cross Country Education
 - Understanding Inattentive ADHD: Evidence-based Screening and Treatment Strategies
 - All are available from Cross Country Education:
www.crosscountryeducation.com

Thank You!

- Kevin T. Blake, PhD, P.L.C. also does
 - Workshops, staff training, program development, and seminars on his own
 - For more information contact
 - www.drkevintblake.com
 - 520-327-7002

End of Course

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