

A sunset landscape with silhouetted rock formations and a cloudy sky. The sun is low on the horizon, creating a bright glow and casting long shadows. The sky is filled with scattered clouds, some of which are illuminated by the setting sun. The foreground is dark, showing the silhouettes of grass and the ground.

Processing Faces & ADHD

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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*



Prosopagnosia Defined

“Prosopagnosia is a cognitive disorder characterized by a severe deficit in face recognition, which cannot be attributed to lower-level visual problems, higher-level semantic impairments or cognitive alterations such as mental confusion or amnesia. Prosopagnosics can normally recognize that a particular visual stimulus is a face, but they cannot discriminate between different faces, and hence cannot recognize faces of familiar people...”

Prosopagnosia Defined

“...This impairment is severe, and includes not only the faces of close friends and acquaintances, but also family members, siblings, spouses and, in some cases, even their own face. However, prosopagnosics can identify people using alternative cues to recognition, such as hairstyle, clothing, voice or gait. Importantly, this indicates that prosopagnosia is essentially a disorder of visual perception, and general semantic knowledge about familiar people remains intact and accessible from other modalities” (p. 59).

Bate, S. (2013). Face Recognition & Its Disorders. New York, NY: Palgrave Macmillan.

Problems Remembering Faces

- **Charot (1883) and Wilbrand (1892) first described patients that lost the ability to recognize faces in those with neurological disease.**

Hacaen, H. et al. (1962). Agnosia for Faces (Prosopagnosia). Achieves of Neurology. DOI: 10.1001/archneur.1962.04210020014002.



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).

Hacaen, H. et al. (1962). Agnosia for Faces (Prosopagnosia). Achieves of Neurology. DOI: 10.1001/archneur.1962.04210020014002.

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.

Types of Prosopagnosia

There are two types of prosopagnosia:

- **Acquired Prosopagnosia**
- **Developmental Prosopagnosia**

Bate, S. (2013). Face Recognition & Its Disorders. New York, NY: Palgrave Macmillan.

Developmental Prosopagnosia

- **Developmental prosopagnosia, “...can result from, impairments to different mechanisms in different cases” (p. 132).**

Bate, S. (2013). Face Recognition & Its Disorders. New York, NY: Palgrave Macmillan.

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, though” (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).



Developmental Prosopagnosia

- **Affects 2 to 3 percent of the population**
- **That equates to 9,900,000 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.

Hence, Two Types of Facial Processing Disorder

- 1. Developmental Prosopagnosia: Difficulty recognizing the identity of a face, but being able to recognize emotional facial expressions.**
- 2. Emotional Facial Expression Processing “Disorder”: Being able to recognize the identity of faces, but having difficulty properly identifying emotional facial expressions.**

Bate, S. (2013). Face Recognition & Its Disorders. New York, NY: Palgrave Macmillan.

Whose at Risk for Prosopagnosia?

- Those with Specific Learning Disorder,
- AD/HD, Nonverbal Learning Disorder
- Autism Spectrum Disorder



Roffman, A.J. (2000). Meeting The Challenge of Learning Disabilities In Adulthood. Baltimore, MD: Brookes.

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).

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

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.

Processing of Facial Expressions



Recognizing Emotional Facial Expressions

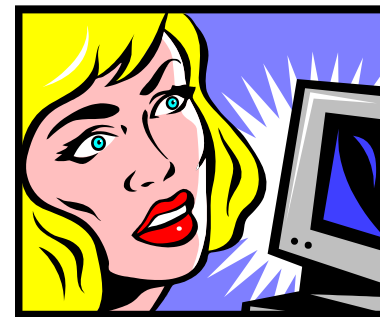


Emotional Facial Expression Recognition:

- “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.

Facial Expressions



- Remembering Expressions:
 - The non-disabled are “pre-wired” to find the human face and voice the most important stimuli in the world.
 - Those with Autism Spectrum Disorder (ASD) don’t look at the eyes they look at the mouth. Differentiated those with AD from non-disabled 100% of the time.

Klin, A. (October 11-12, 2001). Autism, Asperger’s and the PDD Spectrum. Seminar presented at the 33rd Annual Arizona Association of School Psychologists Conference, Mesa, AZ.

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

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

Universal Facial Expressions are “Genetic”

Ekman and Friesen (1971) wrote of universal facial expressions that had been demonstrated to be recognized by people in literate first world cultures. While researching in New Guinea they found that preliterate Neolithic cultures with little or no exposure to the Western World were able to recognize them too.

Ekman, P. et al. (1971). Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology*. DOI: [10.1037/h0030377](https://doi.org/10.1037/h0030377).

Ekman (2003) reported he never saw a facial expression in New Guinea he had never seen. If facial expressions were learned he would have seen unknown to him facial expressions. He never saw one there.

Ekman, P. (2003). *Emotions Revealed*. New York, NY: Henry Holt.

Seven Universal Facial Expressions

- Happiness
- Surprise
- Disgust
- Contempt

- Anger
- Fear
- Sadness

Ekman, P., and Keltner, D. (1997). Universal Facial Expressions of Emotions: Old Controversy and New Findings. In Segerstrale, U.C. and Molnar, P. (Eds.). Nonverbal Communication: Where Nature Meets Culture (pp.27-46). Mahwah, NJ: Lawrence Erlbaum. From website: <https://paulekmangroup.wordpress.com/wp-content/uploads/2013/07/Universal-Facial-Expressions-Of-Emotion.pdf>.

Facial Emotional Recognition and Neurodevelopmental Disorders

- **“Our research found that, in accordance with the literature, SLD and ADHD groups had poorer facial Emotional Recognition skills than their TD peers. No statistical significant differences were observed when comparing the SLD and ADHD groups with each other.”**
- **“In our study, a highly significant relationship was found between children’s literacy learning timing and their ability to recognize facial emotions. Evaluating the SLD, ADHD, and health control groups together, it was observed that children who learned to read and write late had poorer ER than those children who learned on time.”**
- **“Specific learning disorder comes with social and academic challenges, albeit at different levels, like ADHD and ASD from other neurodevelopmental diseases. In this study, we found that the concept of ER, which we think may be one of the mechanisms associated with social and academic difficulties, is statistically similar to ADHD in SLD children. Both groups had worse ER skills than their TD peers.”**

Albayrak, Z.S. et al. (November 1, 2022) Emotion Recognition Skill in Specific Learning Disorder and Attention-Deficit Hyperactivity Disorder. Alpha Psychiatry. DOI: [10.5152/alphapsychiatry.2022.22219](https://doi.org/10.5152/alphapsychiatry.2022.22219).

Decoding Skill and Facial Expression



- **Most and Greenbank (2000) stated LD children are less accurate in identifying emotional expressions than non-LD children.**
- **Brown (2001) indicated AD/HD children are less accurate in facial expression identification than their non-AD/HD peers.**
- **Attwood (2007) stated those with ASD have great difficulty decoding faces.**

Most, T. and Greenbank, A. (2000). Auditory, Visual, and Auditory—Visual Perception of Emotions by Adolescents With and Without Learning Disabilities, and Their Relationship to Social Skills. *Journal of Learning Disabilities*, 15 (4), 171-178.

Brown, T. E. (2001). Social Ineptness & “Emotional Intelligence” in ADHD. Paper Presented at the 13th Annual Children and Adults With Attention Deficit Disorders International Conference, October 18-20 2001, Anaheim CA.

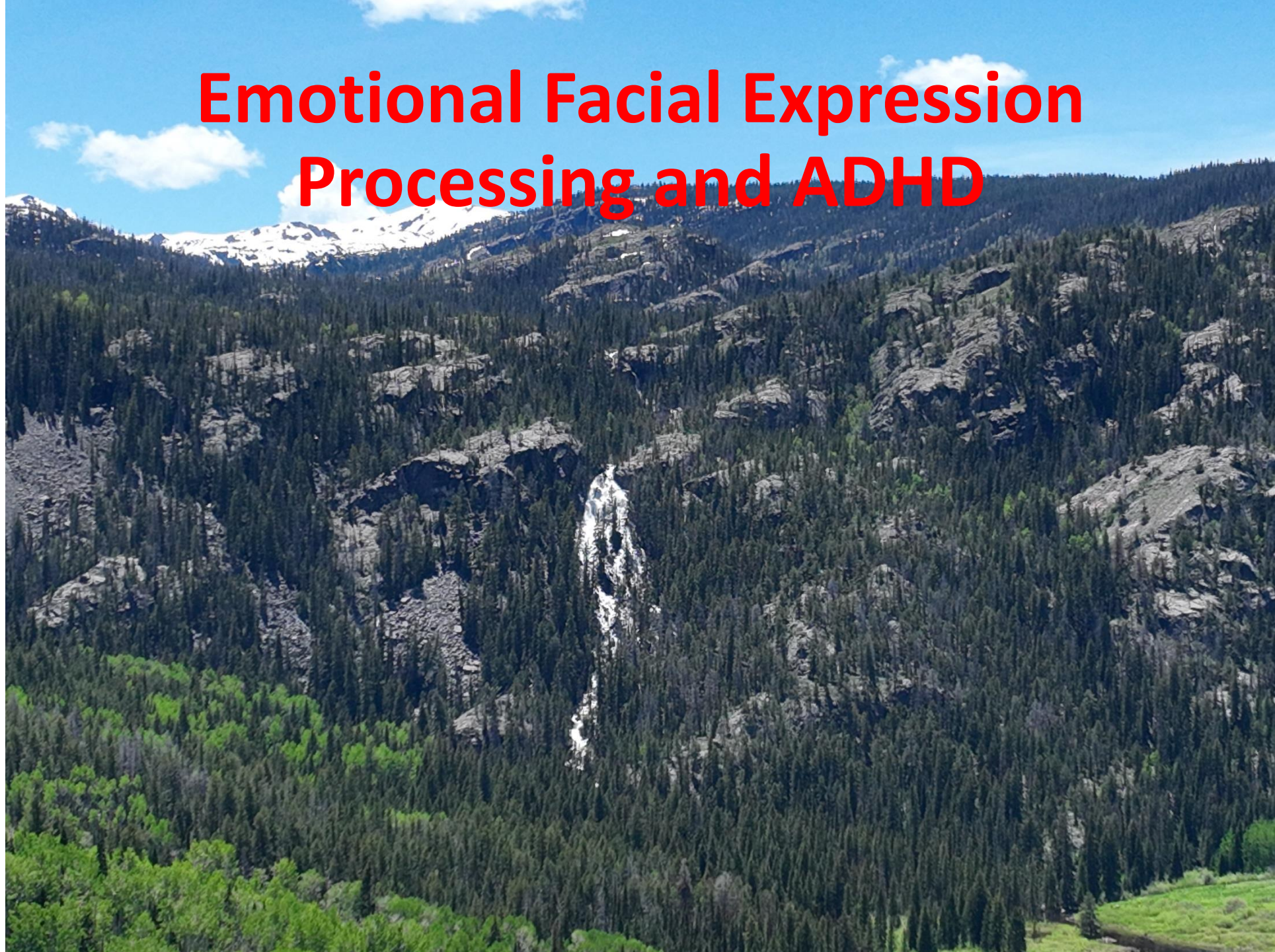
Attwood, T. (2007). *The Complete Guide to Asperger’s Syndrome*. Philadelphia, PA: Jessica Kingsley, p. 130.

Emotional Processing, ASD, ADHD, and Developmental Language Disorder

“Children with ASD, ADHD or DLD showed very similar emotion recognition skills and were also found to be significantly delayed in their development of these skills. Some predictive factors related to linguistic and cognitive skills were found for these difficulties. Information about impaired emotion recognition and underlying linguistic and cognitive skills helps to select intervention procedures. Without this information, therapy might unnecessarily focus on only symptoms.”

Loytomaki, J. et al. (July 3, 2019). The role of linguistic and cognitive factors in emotion recognition difficulties in children with ASD, ADHD or DLD. *International Journal of Language and Communication Disorders*. DOI: [10.1111/1460-6984.12514](https://doi.org/10.1111/1460-6984.12514). DLD = Developmental Language Disorder

Emotional Facial Expression Processing and ADHD



AD/HD and Facial Expressions



"Children with ADHD exhibited a general deficit in decoding emotional facial expressions, with specific deficit in identifying anger and sadness. Self-rating of the task difficulty revealed lack of awareness of decoding errors in the ADHD group as compared with control subjects. Within the ADHD group, there was a significant correlation between interpersonal problems and emotional facial expression decoding impairment, which was more marked for anger expressions" (p. 93).

Pelc, C., Kornreich, C., Foisy, M-L. and Dan, B. (2006). Recognition of Facial Expressions in Attention-Deficit Hyperactivity Disorder. Pediatric Neurology, 35 (2), pp.93-97.

Processing Facial Expressions & ADHD



"Importantly, findings of this study show that emotion processing difficulties in children with ADHD extend beyond facial emotion and also effect the recognition of emotions on the basis of contextual information. Our data thus indicate that children with ADHD have an overall emotion-processing deficit" (p. 111).

Da Fonseca, D., Sequier V., Santos, A., Poisno, F. and Deruelle, C. (March, 2009). Emotion Understanding in Children with ADHD. Child Psychiatry and Human Development. 40 (4), 111-121.

AD/HD and Facial Expressions



“Boys with ADHD may show poorer task performance because of general cognitive factors, but also show selective problems in matching facial expressions to situations” (p. 398).

Yuill, N., and Lyon, J. (2007). Selective Difficulty in Recognizing Facial Expressions in Boys with ADHD: General Performance Impairments or Specific Problems in Social Cognition? European, Child and Adolescent Psychiatry,16 (6), pp. 398-404.

AD/HD and Facial Expressions



“Attention deficits in boys with ADHD seemed to account for their difficulty in recognizing facial expressions of emotion. Effective treatment for attention deficits is expected to have a beneficial effect on facial emotion recognition in boys with ADHD”. (p. 323)

Shin, D.-w., Lee, S.J., Kim, B.-J., Park, Y., and Lim, S.-w. (2008). Visual Attention Deficits Contribute to Impaired Facial Emotion Recognition in Boys with Attention-deficit/Hyperactivity Disorder., Neuropediatrics,39 (6), pp. 323-327.

AD/HD and Facial Expressions



Research evidence indicates that emotional facial recognition difficulties in people with ADHD may be related to biological impairment of the medial prefrontal cortex and amygdala.

Marsh, P.J., and Williams, L.M. (2006). ADHD and Schizophrenia Phenomenology: Visual Scanpaths to Emotional Faces as a Potential Psychophysiological Marker? Neuroscience Biobehavior Review, 30 (5), pp. 651-665.

ADHD and Facial Expression Processing

“Studies of children and of adults with ADHD find deficiencies in the recognition of emotional facial expressions. However, this review shows that adolescents with ADHD perform comparably to their peers on accuracy and rate, although their neural processing is different. This suggests that the methodologies employed by the ADHD and typically-developing adolescents to assess facial expressions are different.”

Dan, O. (July, 2020). Recognition of emotional facial expressions in adolescents with attention deficit/hyperactivity disorder. *Journal of Adolescence*. DOI: [10.1016/j.adolescence.2020.04.010](https://doi.org/10.1016/j.adolescence.2020.04.010).

AD/HD and Facial Expressions



- **“These results suggest that affect recognition abilities may be impaired in adults with ADHD and affect abilities are more adversely affected by inattentive than hyperactive-impulsive symptoms” (p. 1)**
- **No difference between non-disabled and those with Combined Type AD/HD in facial expression recognition.**
- **Those with Inattentive AD/HD made more errors in recognizing expressions of fear.**

Miller, M., Hanford, R.B., Fassbender, C., Duke, M., and Schweitzer, J.B. (2010). Affect Recognition in Adults with ADHD. Journal of Attention Disorders, 20 (10), pp. 1-9.

AD/HD and Facial Expressions



Research indicates there may be altered neurological functioning of identifying affect anger and fear recognition in those with AD/HD that appear to be reduced by methylphenidate (Ritalin). Those with ADHD had left amygdala overactivation when viewing neutral faces.

Brotman, M.A., Guyer, A.E., Lunsford, J.R., Horsey, S.E., Reising, M.M....Leibenluft, E. (2010). Amygdala Activation During Emotion Processing of Neutral Faces in Children with Severe Mood Dysregulation versus ADHD or Bipolar Disorder. American Journal of Psychiatry, 167, pp. 61-69.

Making Facial Expressions with ADHD



Problems Making the Appropriate Facial Expression to Match How One Feels and What is Appropriate to The Situation

- **Unmedicated AD/HD, Combined Type people have difficulty making facial expressions to match how they feel. They tend to “over-emote” their facial expressions. (Kuehle, et.al., 2002).**
- **Attwood’s (2007) story of the boy with Asperger’s Disorder who saw his mother crying and asked, “What face do I make?” (p. 134)**

Kuehle, H.J., Hoch, C. and Jansen, F. (2002). Video Assisted Observation of Visual Attention, Facial Expression of the Individual Stimulant Dosage and Motor Behavior for the Diagnosis and for the Determination in Children with AD/HD. Obtained from: Kuehle, H. (October 17, 2002). Video Assisted Observation of Visual Attention and Motor Behavior for the Diagnosis and Determination of the Individual Stimulant Dosage in Children with AD/HD. Research Poster Session, 14th Annual CHADD International Conference, Miami Beach, FL.

Attwood, T. (2007). The Complete Guide to Asperger’s Syndrome. Philadelphia, PA: Jessica Kingsley, p. 135.

AD/HD and Making Facial Expressions



Regarding facial expressions in children and adults with AD/HD Kuhle, Hoch, Rautzenberg and Jansen (2001) concluded, “Altogether, ... the facial expressions, are uncontrolled and jerky and are often wrongly dimensioned in time and space.” (p. 6)

Kuhle, H.J., Hoch, C., Rautzenberg, P. and Jansen, F. (2001). Short-Term Video-Based Observation of Behavior with Special Reference to Eye-Contact, Facial Expression and Motor Activity in Diagnosis and Therapy of Attention Deficiency/ Hyperactivity Syndrome (ADHS). (First Published in): Praxis der Kinderpsychologie und Kinderpsychiatrie 50: 607-621. Obtained from: Kuehle, H. (October 17, 2002). Video Assisted Observation of Visual Attention and Motor Behavior for the Diagnosis and Determination of the Individual Stimulant Dosage in Children with AD/HD. Research Poster Session, 14th Annual CHADD International Conference, Miami Beach, FL.

Facial Expressions and AD/HD



- **AD/HD children smile abruptly.**
- **There is little or no transition between emotional states.**
- **Sometimes their facial expression bleeds over into the next emotional state.**
- **Expression of emotion often appears exaggerated. The quality of expression can be limited due to this.**
- **Even body movements are jerky and uncontrolled.**

Kuehle, H.J., Hoch, C. and Jansen, F. (2002). Video Assisted Observation of Visual Attention, Facial Expression of the Individual Stimulant Dosage and Motor Behavior for the Diagnosis and for the Determination in Children with AD/HD. Obtained from: Kuehle, H. (October 17, 2002). Video Assisted Observation of Visual Attention and Motor Behavior for the Diagnosis and Determination of the Individual Stimulant Dosage in Children with AD/HD. Research Poster Session, 14th Annual CHADD International Conference, Miami Beach, FL.

AD/HD and Making Facial Expressions



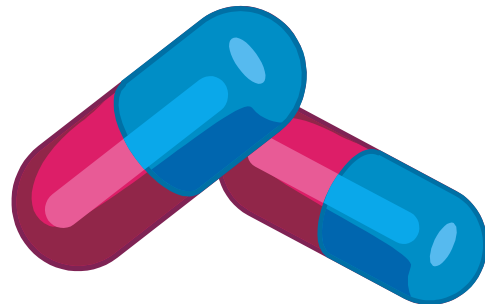
- **AD/HD childrens' eyes drift away from those they are in conversation with.**
- **This usually interrupts the flow and their comprehension of the conversation.**
- **Often parents feel rejected by AD/HD children when they do this.**

Kuehle, H.J., Hoch, C and Jansen, F. (2002). Video Assisted Observation of Visual Attention, Facial Expression of the Individual Stimulant Dosage and Motor Behavior for the Diagnosis and for the Determination in Children with AD/HD. Obtained from: Kuehle, H. (October 17, 2002). Video Assisted Observation of Visual Attention and Motor Behavior for the Diagnosis and Determination of the Individual Stimulant Dosage in Children with AD/HD. Research Poster Session, 14th Annual CHADD International Conference, Miami Beach, FL.

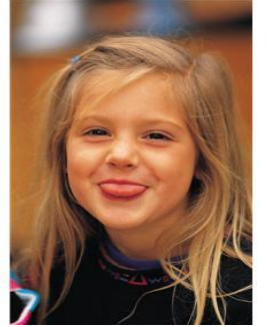
Possible Treatment for Emotional Working Memory Problems

- **Stimulant Medication?**
 - Lessens Hyperactivity and Impulsivity in AD/HD, Combined Type Individuals
 - Hundreds of Double Blind Studies to Support

Barkley, R.A. (2006). Attention Deficit Hyperactivity Disorder, 3rd Edition. New York, NY: Guilford.



Treating Problems Reading Facial Expressions



➤ 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.

Paul Ekman Group: <https://www.paulekman.com/professional-development-for-educators-and-academics/>

Computer Programs to Treat Facial Processing Difficulties



➤ Paul Ekman, Ph.D. (“**Lie to Me**”/SPOT – Surveying Passengers by Observational Techniques) online training tools

Micro Expression Training Tool (METT)

Subtle Expression Training Tool (SETT)

Repeated presentations of METT & SETT to those with Autism Spectrum Disorders

Available from Paul Ekman Group : www.paulekman.com

➤ **Training Tools Available From:** <https://www.paulekman.com/micro-expressions-training-tools/>

Computer Programs to Treat Face Processing Difficulties



- Baron-Cohen, S. (2003). Mind Reading: An Interactive Guide To Emotions. Six part bundle for \$75.00.
<https://resources.autismcentreofexcellence.org/p/mindreading-all-level-bundle>

“Harry Potter” teaches facial expressions.

- Baron-Cohen, S., Drori, J., Harcup, C. (2009). The Transporters (USA Version). Available for \$30.00 from:
<https://www.autismcentreofexcellence.org/transporters/>

“Thomas the Tank-Engine” teaches faces.