



# **Autism Spectrum Disorder, Oxytocin, Vasopressin, & Compassion**

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**Tucson, Arizona**



# Compassion

# ***Compassion***

- **Three things make humans behaviorally different from all other species:**
  - **Our capacity to delay our response to our environment (Bronowski, 1977).**
  - **Our capacity for compassion (Leakey, 1995).**
  - **Our capacity for long-term compassion (Grandin, 1995).**

Bronowski, J. (1977). Human and Animal Languages: In a Sense of Future. Cambridge, MA: MIT Press. pp. 104-131.

Leakey, R. (1995). Speech given to the National Press Club, Washington, DC, Played on National Public Radio.

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

# *Compassion*

- Does a toothless Homo Erectus skull found at Dmanisi that was over 1,800,000 years old show evidence of human compassion?



Fischman, J. (April, 2005). Family Ties: Dmanshi Find. National Geographic, 202 (4), 18-27.



# *Compassion*

**Yes, it is highly possible. The toothless individual was in his 60s and lived for 10 years without teeth. The only way that scientists can come up with how he survived is someone cared enough about him to chew his food for him, take the chewed food out of their mouth and give it to him to swallow.**

Fischman, J. (April, 2005). Family Ties: Dmansi Find. National Geographic, 202 (4), 18-27.



# ***Compassion***

- **“Functional imaging studies implicate medial and prefrontal cortex and posterior superior sulcus (STS)...(sic. The) STS is concerned with representing the actions of others through the detection of biological motion; medial prefrontal regions are concerned with explicit representation of the states of the self. These observations suggest that the ability to mentalize has evolved from a system for representing actions.”**

**Frith, C.D. and Frith, U. (1999). Intersecting Minds-A Biological Basis. Science, 286, 1692-1695.**



# Compassion

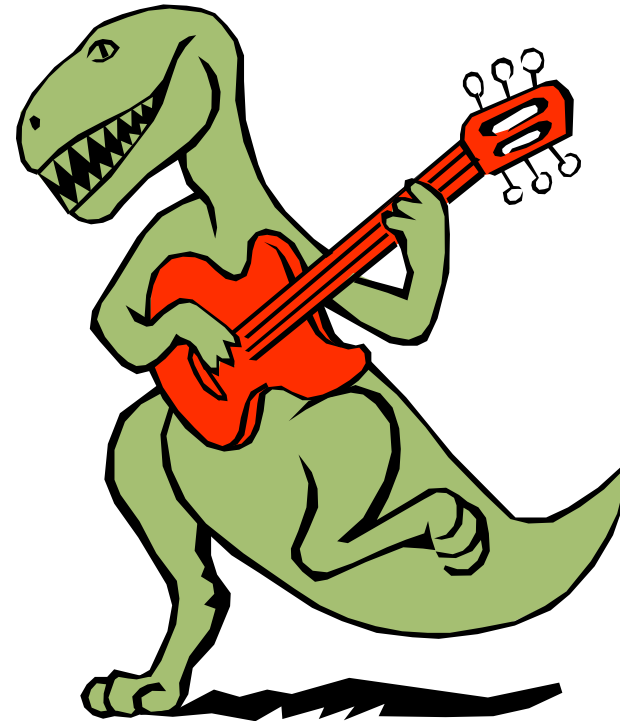
Lane wrote, “Several neuroimaging studies reveal that an area of the medial prefrontal cortex very close to that identified in our attention to emotional experience study has been implicated during the performance of theory of mind tasks...these findings suggest that the neural substrates of the mental representation of one’s own and other’s mental states are closely related” (p. 18) Lane continued that several studies of brain injured individuals when coupled with the above appeared to indicate, “...*that successful social adaptation requires the ‘dual task’ ability to stay in touch with the needs of others while paying due attention to one’s own needs.*” (p. 20)

Lane, R. (2000). Neural Correlates of Conscious Emotional Experience. In L.R. Lane, et. al. (Eds.), Cognitive Neuroscience of Emotion. New York, NY: Oxford University Press, pp. 345-370.

# *Kinder, Gentler, T-Rex*

- There is now evidence that some dinosaurs nested and raised offspring similar to modern birds. Hence, they had some capacity for compassion.

Smith, D. (No date). Dinosauria: Life History and Ecology. From Website:  
<http://www.ucmp.berkeley.edu/diapsids/dinolh.html>.





# Compassion

- “Scientists figured out decades ago that chimps are our nearest evolutionary cousins, roughly 98% to 99% identical to humans at the genetic level. When it comes to DNA, a human is closer to a chimp than a mouse to a rat” (pp. 25-26).

Lemonick, M.D., and Dorfman, A. (October 9, 2006). What makes Us Different? Time, 168 (15), pp. 44-53.



# Compassion

**“In the summer of 1982 Kat was newly pregnant, and Washoe doted over her belly, asking about her BABY. Unfortunately, Kat suffered a miscarriage. Knowing that Washoe had lost two of her own children, Kat decided to tell her the truth. MY BABY DIED, Kat signed to her. Washoe looked down to the ground. Then she looked into Kat’s eyes and signed CRY, touching her cheek just below the eye. When Kat had to leave that day, Washoe would not let her go. PLEASE PERSON HUG, she signed.”  
(Fouts, 1997; Edwards, 2000)**

Fouts, R. (1997). Next of Kin: My Conversations with Chimpanzees.  
New York, NY: William Morrow.

Edwards, M. (Spring, 2000). Book Review. The Harvard Brain. From website:  
[hcs.harvard.edu/~husn/BRAIN/vol7-spring2000/fouts.htm](http://hcs.harvard.edu/~husn/BRAIN/vol7-spring2000/fouts.htm).





# Compassion



- **Bonobo: Pan paniscus**
  - Shares 98% of its genetic profile with humans.
  - They have been compared to australopithecines
  - “In physique, a bonobo is as different from a chimpanzee as a Concorde is from a Boeing 747.” (p. 3 of 14)

De.Waal, F.B.M. (March 1995). Bonobo Sex and Society. Scientific American. pp. 82-88. From Website:  
<http://primates.combonobos/bonobosexsoc.html>.

# Compassion



- The dominate male bonobo at the Great Ape Trust in Iowa, Kanzi, can communicate by using 348 symbols and knows the meaning of up to 3000 words!

Raffaele, P. (November, 2006). The Smart and Swinging Bonobo. Scientific American. 37 (6), pp. 66-75.



# Compassion



- “Apparently as intelligent as chimpanzees, bonobos have, however, a far more sensitive temperament. During World War II bombing of Hellabrun, Germany, the bonobos all died of fright from the noise; the chimpanzees were unaffected.” (p. 4 of 14)

De.Waal, F.B.M. (March 1995). Bonobo Sex and Society. Scientific American. pp. 82-88. From Website:  
<http://primates.combonobos/bonobosexsoc.html>.

# Prairie and Montane Voles

- “Prairie voles are socially monogamous; males and females form long-term pair bonds, establish a nest site and rear their offspring together. In contrast, montane and meadow voles do not form a bond with a mate and only the females take part in rearing the young.”
- The only differences between the two species is the prairie voles have high levels of vasopressin and oxytocin in their brains that causes them to form stronger pair bonds.

Hammock, E.A.D. and Young, L.J. (December, 2006). Oxytocin, Vasopressin and Pair Bonding: Implications for Autism. Philosophical Transactions of the Royal Society of Biological Sciences, 361 (1476), pp. 2187-2198.  
From Website: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1764849>.

# Prairie Vole

<https://www.tn.gov/twra/wildlife/mammals/small/meadow-vole.html>



# Montane Vole

<https://observation.org/species/81886/>



# Vasopressin



**“Vasopressin – secretive, in the background, subtle aggressive male energies; brother to testosterone, brother to oxytocin (makes you want to contact in an active way, male way, as does oxytocin)” (p. XVI)**

Brizendine, L. (2006). The Female Brain. New York, NY: Morgan Road.



# Bonobos & Vasopressin



**“Interestingly, this same polymorphic microsatellite in the human *AVPR1A* that has been associated in autism is absent in the common chimpanzee, but present in the bonobo. Bonobos are known for high levels of psychosexual reciprocity and they appear to use sexuality to promote social reconciliation as well as social bonding within the group. Therefore, it is intriguing to consider that as in voles, variations in unstable microsatellite sequences in the promoters of the primate vasopressin receptor may contribute to species difference in expression and social behaviour, as well as to individual differences in social behaviour.” (p. 2195)**

Hammock, E.A.D. and Young, L.J. (December, 2006). Oxytocin, Vasopressin and Pair Bonding: Implications for Autism. *Philosophical Transactions of the Royal Society of Biological Sciences*, 361 (1476), pp. 2187-2198. From Website: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1764849>.

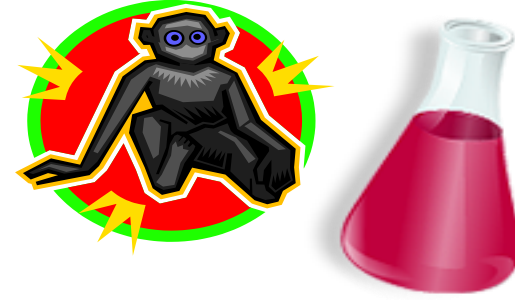
# Chimpanzee, Bonobos, Humans & Vasopressin



**“Similar genetic variation in the human *AVPR1A* may contribute to variations in human social behavior including extremes outside the normal range of behavior and those found in autism spectrum disorders.” (p. 2187)**

Hammock, E.A.D. and Young, L.J. (December, 2006). Oxytocin, Vasopressin and Pair Bonding: Implications for Autism. Philosophical Transactions of the Royal Society of Biological Sciences, **361** (1476), pp. 2187-2198. From Website: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1764849>

# *Chimpanzee, Bonobos, Humans & Vasopressin*



**“Our two closest primate cousins – chimpanzees and bonobos –also have different lengths of this gene, which match their social behaviors. Chimpanzees, who have the shorter gene, live in territorially based societies controlled by males who make frequent, fatal war raids on neighboring troupes. Bonobos are run by female hierarchies and seal every interaction with a bit of sexual rubbing...”**

# *Chimpanzee, Bonobos, Humans & Vasopressin*



**“...They are exceptionally social and have a long version of the gene. The human version of the gene is more like the bonobo gene. It would seem that those with the longer version of the gene are more socially responsive. For example, this gene is shorter in humans with autism...” (p. 74)**

Brizendine, L. (2006). The Female Brain. New York, NY: Morgan Road.



# Bonobo Vs. Chimpanzee

## Bonobo

**Go to this YouTube link to see a bonobo walking erect.**

**Chimpanzees cannot do this:**

➤ [https://youtu.be/ux-ir\\_1BrWg](https://youtu.be/ux-ir_1BrWg)

## Chimpanzee

**Go to this YouTube like to see how a Chimpanzee walks.**

**Bonobos walk more like Lucy:**

➤ <https://youtu.be/xT8Np0gl1dl>

# *Oxytocin in Autism*



**“There is modest, yet intriguing evidence linking oxytocin to autism. Oxytocin in blood levels of boys with autism was found to be lower than in a group of age–matched controls.” (p. 2194)**

Hammock, E.A.D. and Young, L.J. (December, 2006). Oxytocin, Vasopressin and Pair Bonding: Implications for Autism. Philosophical Transactions of the Royal Society of Biological Sciences, 361 (1476), pp. 2187-2198. From Website:  
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1764849>

# *Oxytocin & Vasopressin In Autism*



**“Oxytocin and vasopressin contribute to a wide variety of social behaviors, including social recognition, communication, parental care, territorial aggression and social bonding.” (p. 2187)**

Hammock, E.A.D. and Young, L.J. (December, 2006). Oxytocin, Vasopressin and Pair Bonding: Implications for Autism. Philosophical Transactions of the Royal Society of Biological Sciences, 361 (1476), pp. 2187-2198. From Website: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1764849>

# Compassion

**Bonobo: Pan Paniscus Vs.**

**Chimpanzee: Pan Troglodytes**

- Shares 98% of its genetic profile with humans.
- They have been compared to australopithecines
- “In physique, a bonobo is as different from a chimpanzee as a Concorde is from a Boeing 747.” (p. 3 of 14)

DeWaal, F.B.M. (March 1995). Bonobo Sex and Society. Scientific American. pp. 82-88. From Website: <http://primates.combonobos/bonobosexsoc.html>.

**“Similar genetic variation in the human *AVPR1A* may contribute to variations in human social behavior including extremes outside the normal range of behavior and those found in autism spectrum disorders.” (p. 2187)**

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# Humans Vs. Chimpanzees Vs. Bonobos



# Chimpanzee, Bonobos, Humans & Vasopressin

**“Our two closest primate cousins – chimpanzees and bonobos –also have different lengths of this gene, which match their social behaviors. Chimpanzees, who have the shorter gene, live in territorially based societies controlled by males who make frequent, fatal war raids on neighboring troops. Bonobos are run by female hierarchies and seal every interaction with a bit of sexual rubbing they are exceptionally social and have a long version of the gene. The human version of the gene is more like the bonobo gene...”**

**“...It would seem that those with the longer version of the gene are more socially responsive. For example, this gene is shorter in humans with autism...” (p. 74)**

Brizendine, L. (2006). The Female Brain. New York, NY: Morgan Road.

**Interactive touch between humans can produce more oxytocin in the brain. It can even increase one’s level of trust.**

Morhenn, V.B. et al. (November, 2008). Monetary sacrifice among strangers is mediated by endogenous oxytocin release after physical contact. Evolution and Human Behavior, 29(6), 375-383.



# Teco, The Autistic Bonobo Toddler

- Bonobo social brain closer to humans than chimps.
- 18 month old bonobo, Teco, male is autistic.
- Has repetitive movements
- Strict adherence to routines, or gets agitated
- Repetitive behaviors
- Likes objects, not bonobos

- Likes parts of objects
- No joint attention
- Avoids eye contact
- At two months nursing difficulties

Deweert, S. (April 15, 2011). An Ape With Autism. New York, NY: Simons Foundation, Autism Research Initiative (SFARI). From website: <https://sfari.org/about-sfari/contact-us> .

## Transgenic macaques show autistic symptoms.

Liu, Z. et al. (February 4, 2016). Autism-like behaviours and germline transmission in transgenic monkeys overexpressing MeCP2. Nature. DOI: 10.1038/nature16533.

# ASD Fruit Fly?



**Scientists at the University of Arizona have discovered a mutant fruit fly which constantly flies in circles and grooms itself. Other identical flies have been breed. In some ways it is genetically similar to those with ASD. They are trying to develop a medication that will change its behavior. In the future they hope to do the same with rats.**

Huonker, M. (April 10, 2012). University of Arizona Neuroscience professor and team are doing research with fruit flies to find drug for autism. Tucson, AZ: Arizona Public Media. YouTube video:

[http://www.youtube.com/watch?v=42PVK7TnhVg&list=PL212BA630A5E8E1B4&index=9&feature=plpp\\_video](http://www.youtube.com/watch?v=42PVK7TnhVg&list=PL212BA630A5E8E1B4&index=9&feature=plpp_video).



# Alexithymia



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# What is Alexithymia?

1. **Tends not to have fantasies, no feelings and have sharply limited emotional vocabularies.**
2. **They have colorless dreams.**
3. **They cannot tell bodily sensations from emotions and are baffled by them.**
4. **They have great difficulty making decisions because they lack “gut feelings.”**

**Goleman, D. (1995). Emotional Intelligence: Why It Can Matter More Than I.Q. New York, NY: Bantam.**



# Alexithymia

- Medial prefrontal areas explicit representations of the self
- Posterior superior sulcus detection of biological motion and representation of others
- Suggests the, "...ability to mentalize from a system for representing actions" (p. 1692).

Frith, C.D. and Frith, U. (1999). Intersecting Minds-A Biological Basis. Science, 286, 1692-1695.

- The medial prefrontal cortex allows for theory of mind
- *"...that successful social adaptation requires the 'dual task' ability to stay in touch with the needs of others while paying due attention to one's own needs." (p. 20)*

Lane, R. (2000). Neural Correlates of Conscious Emotional Experience. In L.R. Lane, et. al. (Eds.), Cognitive Neuroscience of Emotion. New York, NY: Oxford University Press, pp. 345-370.

# Macaque Monkey



- **Macaques from:**

- Luciano Fadiga discovered
- “mirror neurons” at the University of Parma in Italy in 1992.
- Rizzolatti, G., Fogassi, L. and Gallese, V. (November, 2006). Mirrors in The Mind.  
Scientific American, 296 (5), pp. 54-61.

# Macaque

**Go to this YouTube link and see a Macaque:**

➤ <https://youtu.be/fZn2Y9E6Ttl>

# *Mirror Neurons*

- Italian study of macaque monkeys in 1992
  - Known for years cells of premotor cortex fire just before movement.
  - Discovered that same cells fired in the same pattern when another primate was seen making the same movement!
  - Humans have these *MIRROR NEURONS* too.
  - They allow us to intuit others intentions and to feel their pain.

Rizzolatti, G., Fogassi, L. and Gallese, V. (November, 2006). Mirrors in The Mind.

Scientific American, 296 (5), pp. 54-61.

Lametti, D. (June 9, 2009). Mirroring Behavior. Scientific American, from website:

[www.scientificamerican.com/article.cfm?id=mirroring-behavior](http://www.scientificamerican.com/article.cfm?id=mirroring-behavior).



# Mirror Neurons

- **Mirror Neuron System:**
  - **Superior Temporal Sulcus**
  - **Inferior Frontal Cortex**
  - **Rostral Inferior Frontal Lobe**

--Goldstein, Naglieri, & Ozonoff, (2009).

- **Mirror Neurons:**
  - **Help us begin to generate appropriate social responses.**

Caggiano, V., Fogassi, L., Rizzolatti, G., Their, P., Casile, A. (April 2009). Mirror Neurons Differently Encode the Peripersonal and Extrapersonal Space of Monkeys. Science. 324 (5925), pp. 403-406; From website: [www.sciencemag.org/cgi/content/abstract/324/5925/403](http://www.sciencemag.org/cgi/content/abstract/324/5925/403).

**“Studies show that the capacity to imitate the actions of others is now virtually an instinct at the level of neuronal functioning...The mirror-neuronal system has been linked to theory of mind and to empathy, among other human attributes related to EF (Executive Functions, sic.)” (p. 117).**

Barkley, R.A. (2012). Executive Functions: What They Are, How they Work, and Why They Evolved. New York, NY: Guilford.

# Mirror Neurons



**“Single cell recordings and brain imaging have demonstrated that the primate brain contains pre-motor neurons which fire not only when an individual makes a goal-oriented action, but also when an individual simply observes somebody else making the same action. These neurons fire even in the dark, when for example an individual hears the sounds associated with particular actions. These neuronal properties have been called mirror properties which are considered now to have a bearing on the development of emotions.” (p. 1 of 2)**

**Author (Februray 19, 2005). American Association for the Advancement of Science Symposium to Take Place On Mirror Neurons. From website: [http://eurekaalert.org/pub\\_releases/2005-02/apa-ast021405.php](http://eurekaalert.org/pub_releases/2005-02/apa-ast021405.php).**

# **Mirror Neurons**



**“With knowledge of these neurons, you have the basis for understanding a host of enigmatic aspects of the human mind: ‘mind reading’ empathy, imitation learning, and even the evolution of language. Anytime you watch someone else doing something (or even starting to do something), the corresponding mirror neuron might fire in your brain, thereby allowing you to ‘read’ and understand another’s intentions, and thus develop a sophisticated *theory of other minds*.” (p. 2)**

**Ramachandran, V.S. (3/8/05). Mirror Neurons and Imitation Learning as the Driving Force Behind “The Great Leap Forward” in Human Evolution.  
[www.edge.org/3rd\\_culture/ramachandran/ramachandran\\_p2.html](http://www.edge.org/3rd_culture/ramachandran/ramachandran_p2.html), p. 2.**

# Mirror Neurons



- There are visual and audiovisual mirror neurons in the brain in several places.
- Areas involved in the brain:
  - Inferior Frontal Gyrus: guidance of movement/assessment of intentions
  - Anterior Cingulate Cortex: regulation of empathy
  - Angular Gyrus: semantic comprehension combining sensory input
  - Insula/Amygdala : pain & disgust

Rizzolatti, G., Fogassi, L. and Gallese, V. (November, 2006). Mirrors in The Mind. Scientific American, 296 (5), pp. 54-61.

Ramachandran, V.S. and Oberman, L.M. (November, 2006). Broken Mirrors. Scientific American, 296(5), pp. 62-69.

# Mirror Neurons



**How does the following relate to AD/HD?:**

**“If the mirror neuron system serves as a bridge in this process, then in addition to providing an understanding of other peoples intentions, it may have evolved to become an important component in the human capacity for observation-based learning and sophisticated cognitive skills.” (p. 61)**

Rizzolatti, G., Fogassi, L. and Gallese, V. (November, 2006). Mirrors in The Mind. Scientific American, 296 (5), pp. 54-61.

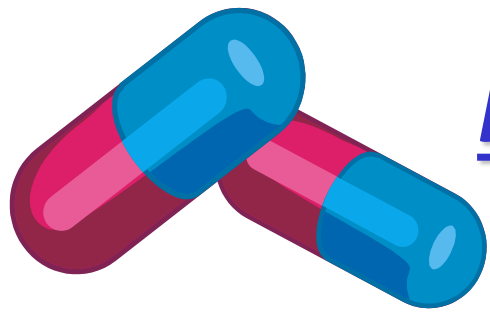
# Mirror Neurons

## How does this relate to ADHD?

**Barkley (2008) said that those with Combined Type AD/HD and comorbid Alexithymia typically have intact mirror neurons, they just do not use their mirror neurons due to their frontal lobe difficulties.**

**Barkley, R.A. (2008). Advances in ADHD: Theory, Diagnosis and Management. J & K Seminars, L.L.C., 1861 Wickersham Lane, Lancaster, PA 17603; 800-801-5415; [www.jkseminars.com](http://www.jkseminars.com).**





## **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.

# *Mirror Neurons*



**I spoke to Uta Frith about using the combination of her group's research on emotional working memory and the mirror neuron research as an explanation of autistic behavior. She said the combination of theories could not differentiate autistic behavior and antisocial behavior.**

**Frith, U. (November 1, 2007). Personal Communication. International Dyslexia Association 58<sup>th</sup> Annual Conference, Dallas, TX.**

# Mirror Neurons & Autism Spectrum Disorder

- “Broken mirror neurons” MAY explain isolation and lack of empathy.
- Those with autism spectrum disorder lack activity in many areas associated with mirror neurons.

Ramachandran, V.S. and Oberman, L.M. (November, 2006). Broken Mirrors. Scientific American, 296(5), pp. 62-69.

**Uta Frith: Question Can you combine emotional working memory finding with mirror neuron research to explain ASD?**

**Answer: How do you explain a sociopath?**

Frith, U. (November 1, 2007). Personal Communication. International Dyslexia Association 58<sup>th</sup> Annual Conference, Dallas, TX.



## ***Mirror Neurons***

**However, Blair wrote after reviewing the literature, “It is suggested from this literature that empathy is not a unitary system but rather a loose collection of partially dissociable systems. In particular, three divisions can be made: cognitive empathy (or Theory of Mind), motor empathy, and emotional empathy. The two main psychiatric disorders associated...**

# Mirror Neurons



**“...with empathic dysfunction are considered: autism and psychopathy. It is argued that individuals with autism show difficulties with cognitive and motor empathy but less clear difficulties with respect to emotional empathy. In contrast, individuals with psychopathy show clear difficulties with a specific form of emotional empathy but no indications of impairment with cognitive and motor empathy.” (p. 1 of 2)**

Blair, R.J.R. (December, 2005). Responding to the Emotions of Others: Dissociating Forms of Empathy Through the Study of Typical and Psychiatric Populations. Consciousness and Cognition, 14 (4), pp. 698-718. From Website: [www.sciencedirect.com/science?\\_ob=ArticleURL&\\_B6WD0-4H39727-2&\\_user](http://www.sciencedirect.com/science?_ob=ArticleURL&_B6WD0-4H39727-2&_user).

# The Three Types of Empathy

## ➤ Motor Empathy

## ➤ Cognitive Empathy

## ➤ Emotional Empathy

Blair, R.J.R. (December 2005). Responding to the emotions of others: dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition*. DOI: [10.1016/j.concog.2005.06.004](https://doi.org/10.1016/j.concog.2005.06.004) .

Baron-Cohen, S. (2011). The science of evil: On empathy and the origins of cruelty. New York, NY: Basic Books.

## ➤ Sociopaths:

- Excellent motor empathy
- Excellent Cognitive Empathy
- Poor Emotional Empathy

## ➤ ASD

- Poor Motor and Cognitive Empathy
- Better Emotional Empathy



# **Mirror Neurons**

**“Our results show that this ‘mirror system’ integrates observed actions of others with an individual’s personal motor repertoire and suggests the human brain understands actions by motor stimulation” (p. 1243).**

**Calvi-Merino, B., Glaser, D.E., Greeze, J., Passingham, R.E., and Haggard, P. (2005). Action Observation and Acquired Motor Skills: An fMRI Study with Expert Dancers. Cerebral Cortex, 15 (8), p. 1243-1249.**

# **Mirror Neurons**



- **Mirror Neurons and Environmental Experience?**
- **Daniel Glaser's dancers.**

Glaser, D. (January 2005). Mirror Neurons: Research Update.  
NOVAscienceNOW. Public Broadcasting System (PBS).  
[www.pbs.org/wgbh/nova/sciencenow/3204/01-resup.html](http://www.pbs.org/wgbh/nova/sciencenow/3204/01-resup.html), p. 1

# Alexithymia and ASD

**“...some individuals with ASD may experience characteristics of *alexithymia*, a diminished vocabulary to describe the different levels of emotional experience, especially the more subtle emotions” (p. 35).**

Attwood, T, White, S.W., and Scarpa, A. (2013). CBT for Children and Adolescents with High-Functioning Autism Spectrum Disorders. New York, NY: Guilford.

## Symptoms

- Difficulty identifying different types of feelings
- Difficulty distinguishing between emotional feelings and bodily feelings
- Limited understanding of what caused the feelings
- Difficulty verbalizing feelings
- Limited emotional content in the imagination
- Functional style of thinking
- Lack of enjoyment and pleasure-seeking
- Stiff, wooden posture

Author (January 23, 2003). The Alexithymia FAQ. From web site:  
[www.anglefire.com/al4/alexithymia/](http://www.anglefire.com/al4/alexithymia/)

# Emotional Salience Landscape Difficulties- Mirror Neurons

- Problems in the amygdala and lack of emotional salience landscape may account for sensory sensitivity.
- These problems are found in those with Autism Spectrum Disorders.
- Insula/Amygdala : pain & disgust

Ramachandran, V.S. and Oberman, L.M. (November, 2006). Broken Mirrors. Scientific American, 296(5), pp. 62-69.

**When the child with Autism Spectrum Disorder looks into another's eyes:**

1. The "...altered connection between the cortex and amygdala distorts (the) child's response.
2. (The) Amygdala triggers the autonomous nervous system, raising heart rate.
3. (As a result the) Child looks away to reduce stress." (p. 68)

# Treatment for Emotional Working Memory Difficulties

## Frontal Lobe Difficulties

- **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.

## Hormone Difficulties

**“Oxytocin and vasopressin contribute to a wide variety of social behaviors, including social recognition, communication, parental care, territorial aggression and social bonding.” (p. 2187)**

Hammock, E.A.D. and Young, L.J. (December, 2006). Oxytocin, Vasopressin and Pair Bonding: Implications for Autism. Philosophical Transactions of the Royal Society of Biological Sciences, 361 (1476), pp. 2187-2198. From Website: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1764849>



# Some Treatments For Mirror Neuron Difficulties

- Risperidone and MDMA (ecstasy):

To raise oxytocin levels

- Biofeedback:

To help control anxiety

- Oxytocin Nasal Spray

***THE ABOVE ARE EXPERIMENTAL TREATMENTS!!!!***

- Temple Grandin's "squeeze machine"

- Hirstein's "squeeze vest"  
Elmhurst College

- Risperidone or MDMA (ecstasy)

- Biofeedback

- Under Armor-- Compression underwear:

[www.underarmour.com](http://www.underarmour.com)

# Previous Slide References

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- Author (1997). Use of “Atypical” Neuroleptics in the Treatment of PDDs. MedScape Psychiatry & Mental Health e Journal, 2 (4): [www.medscape.com/viewarticle/430897\\_5](http://www.medscape.com/viewarticle/430897_5).

# ***Theory of Mind & Mirror Neuron “Software”***

**“Able individuals with autism spectrum disorders can with time and practice achieve awareness of mental states by compensatory learning.” (p. 977)**

Frith, U. (2001). Mind Blindness and the Brain in Autism. Neuron, 32, 969-979.

## **□ Possible Treatment Techniques**

- **Carol Gray – Social Stories**
- **Laurel Falvo- Social Response Pyramid:**
- **[www.thegraycenter.org](http://www.thegraycenter.org)**

# Therapy Dogs



# ASD & Dogs

**“When the therapy dog was present, the children (with ASD, sic.) were significantly more focused, more playful, and more aware of interactions than either of the other conditions (stuffed dog, or ball present)” (p. 185).**

**--Johnson, R.A. (2011)**

**“Our results indicate that concentrations of beta-endorphin, oxytocin, prolactin, beta-phenylethylamine, and dopamine increased in both species after positive interspecies interaction, while that of cortisol decreased in the humans only.” (p. 296)**

**--Odendaal, and Meintjes (2003)**

# ASD & Dogs

**Children with autism and pervasive developmental disorders are significantly more present, playful and aware of social interactions when a dog is present.**

Martin, F. et al. (2002). Animal-assisted therapy for children with pervasive developmental disorders. Journal of Nursing Research. DOI: [10.1177/019394502320555403](https://doi.org/10.1177/019394502320555403).

- **4Paws For Ability**
- **253 Dayton Avenue**
- **Xenia, OH 45385**
- **Training Center:**
  - **937-374-0385**

**Website:**  
[www.4pawsforability.org](http://www.4pawsforability.org)



# Risperidone, Autism Spectrum Disorders and Social Interaction



# Risperidone, Autism Spectrum Disorders and Social Interaction



**“...the results of multiple preliminary studies suggest that risperidone and other ‘atypical’ neuroleptics may be useful for reducing repetitive behaviors, aggression, and impulsivity and social relatedness in children, adolescents and adults with PDDs.”**

Author (1997). Use of “Atypical” Neuroleptics in the Treatment of PDDs. MedScape Psychiatry & Mental Health e Journal, 2 (4): [www.medscape.com/viewarticle/430897\\_5](http://www.medscape.com/viewarticle/430897_5) .

# Risperidone, Autism Spectrum Disorders and Social Interaction



- **Highly Effective and Risk of Side Effects are Rare.**
- **Side Effects: syncope, cardiac problems, weight gain, extrapyramidal problems, diabetes, increased prolactin and rarely galactorrhea and gynecomastia (Regularly screen for these prior to and while on this medication)**

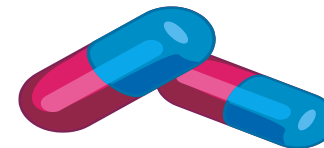
McCracken, J.T. (2005). Safety Issues With Drug Therapies For Autism Spectrum Disorders. Journal of Clinical Psychiatry (NIMH RUPP Autism Network), 66 (Sup 10), pp. 32-37.



# Risperidone, Autism Spectrum Disorders and Social Interaction

**“Risperidone led to significant improvements in restricted, repetitive, and stereotyped patterns of behavior interests, and activities in autistic children, but did not significantly change their deficit in social interaction and communication. Further research is nessessary to develop effective treatments for the core social and communicative impairments of autism” (p. 1).**

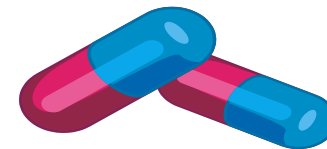
McDougle, C.J., Scahill, L., Amen, M.G., McCracken, J.T., Martin, A., Davies, M., Arnold, E., Posey, D.J., Swiezy, N.B., Gonzalez, N.M., Halloway, J., Koenig, K., McGough, J.J., Ritz, L., and Vitiello, B. (June, 2005). Risperidone For The Core Symptom Domains of Autism: Results From The Study By The Autism Network Of The Research Units On Pediatric Psychiatry. American Journal of Psychiatry, 162, 1142-1148; From Website: [www.ajp.psychiatryonline.org/cgi/content/abstract/162/1142?/ijkey=68ea62ff134a7fb35516415814ca0ef&keytype2=tf\\_ipsecsha](http://www.ajp.psychiatryonline.org/cgi/content/abstract/162/1142?/ijkey=68ea62ff134a7fb35516415814ca0ef&keytype2=tf_ipsecsha) .



# Risperidone, Autism Spectrum Disorders and Social Interaction

**“In conclusion, we believe that, based on this study, it would be misleading to state the effectiveness of risperidone on *any* domain of autism and would like to emphasize to clinicians that research continues on pharmacological intervention, the behavioral approach still has the broadest empirical validation for effectiveness and has been shown to play a significant role in enhancing functioning” (p. 551).**

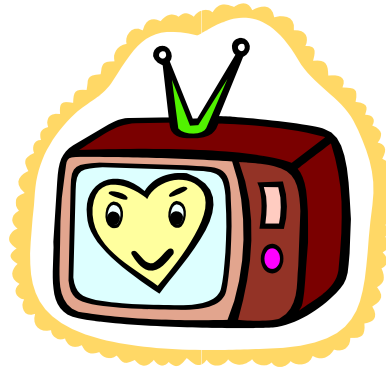
Adetunji, B., Mathews, M., Osimowo, T., and Williams, A. (March, 2006). Letter to the Editor: Risperidone for the Core Symptom Domains of Autism. American Journal of Psychiatry, 163, p. 551; From Website: [www.ajp.psychiatryonline.org/cgi/content/full/163/3/551](http://www.ajp.psychiatryonline.org/cgi/content/full/163/3/551) .



# Diagnostic Tools for Alexithymia

- Beth Israel Questionnaire (BIQ)
- Toronto Alexithymia Scale (TAS-20)

Author (July 28, 2003). The Alexithymia FAQ. From web site:  
[www.alexithymia.info/faq.htm/](http://www.alexithymia.info/faq.htm/) .





# Professionals Who Can Help With Alexithymia

- Psychologists-American Psychological Association: [www.apa.org](http://www.apa.org)
- Psychiatrists-American Psychiatric Association: [www.apa@psych.org](http://www.apa@psych.org)
- Social Workers-National Association of Social Workers: [www.naswdc.org](http://www.naswdc.org)
- American Association of Marriage and Family Therapists: [www.aamft.org](http://www.aamft.org)
- Counselors-National Board of Certified Counselors: [www.nbcc@nbcc.org](http://www.nbcc@nbcc.org)
- Behavioral Neurology/Neuropsychiatry-American Neuropsychiatric Association: [www.anpaonline.org](http://www.anpaonline.org)
- Speech Language Pathologist – American Speech-Language Hearing Association: [www.professional.asha.org](http://www.professional.asha.org)

# The Opposite of Autism Spectrum Disorder?





# Williams Syndrome



- What makes a domesticated dog different from a wolf is a cascade of genetic changes caused by a difference in the WBSCR17 gene.
- Those with Williams Syndrome have the same difference in the WBSCR17 gene and the same cascade of changes.
- This is what, among other things makes dogs and those with Williams Syndrome typically extremely friendly.
- This genetic difference may be the primary genetic source of the differences between homo sapiens and our non-human ancestors and cousins.

# Williams Syndrome



**Williams Syndrome is a rare condition caused by missing genes. Parents may not have any family history of the condition. However, a person with Williams syndrome has a 50% chance of passing the disorder on to each of his or her children. The cause usually occurs randomly.**

**Williams Syndrome occurs in about 1 in 8,000 births.**

**One of the 25 missing genes is the gene that produces elastin, a protein that allows blood vessels and other tissues in the body to stretch. It is likely that having only one copy of this gene results in the narrowing of blood vessels seen in this condition.**

**A.D.A.M. Medical Encyclopedia (November 14, 2011). Williams Syndrome (Williams-Beuren Syndrome). Bethesda, MD: National Center for Biotechnology Information, U.S. National Library of Medicine. From website: <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002105/>.**

# Williams Syndrome



**Those with Williams Syndrome have brains that are 20% smaller, particularly in the back of the brain which includes the occipital and parietal lobes. The temporal lobes are either normal in size or larger than normal. Their planum temporale is larger than normal and hence they often have perfect pitch. Finally, they use their cerebellum, brain stem and amygdala to process music thus it provides them an uniquely emotional experience when they hear it.**

**Sacks, O. (2007). Musicophilia: Tales of Music and the Brain. New York, NY: Alfred A Knopf.**

# ASD and Williams Syndrome



**ASD and Williams Syndrome, “two sides of the same coin,” Allan Reiss Stanford Medical School professor said. Social behavior and communication are underdeveloped in ASD and overdeveloped in Williams Syndrome.**

**Inman, E. (May 20, 2010). New Findings About Williams Syndrome May Shed Light On Autism Research. The Stanford Daily. From website: <http://www.stanforddaily.com/2010/05/20/new-findings-about-williams-syndrome-may-shine-light-on-autism-research/>.**



# Williams Syndrome



**“Williams Syndrome is a genetic condition that is present at birth and can affect anyone. It is characterized by medical problems, including cardiovascular disease, developmental delays and learning disabilities. These occur side by side with striking verbal abilities, highly social personalities and an affinity for music... Individuals with Williams Syndrome have a very endearing personality. They have a unique strength in their expressive language skills and are extremely polite. They are typically unafraid of strangers and show a greater interest in contact with adults than with their peers.”**

**Author (No Date). What Is Williams Syndrome? From Williams Syndrome Association website:  
<http://www.williams-syndrome.org/what-is-williams-syndrome>.**

# Williams Syndrome



**vonHoldt, B.M. et al. (July 19, 2017). Structural variants in genes associated with human Williams-Beuren syndrome underlie stereotypical hypersociability in domestic dogs. Science Advances. DOI: [10.1126/sciadv.1700398](https://doi.org/10.1126/sciadv.1700398).**

**vonHoldt, B.M. et. al. (June, 2018). Activity of Genes with Functions in Human Williams–Beuren Syndrome Is Impacted by Mobile Element Insertions in the Gray Wolf Genome. Gene Biology and Evolution. DOI: [10.1093/gbe/evy112](https://doi.org/10.1093/gbe/evy112).**

**Neigro, A. et al. (March 18, 2019). Williams Syndrome, Human Self-Domestication, and Language Evolution. Hypothesis and Theory. DOI: [10.3389/fpsyg.2019.00521](https://doi.org/10.3389/fpsyg.2019.00521).**

# Williams Syndrome



- Those with Williams Syndrome have been found to have an anomaly in the genetics of their oxytocin system, too.

Ryo, K. et al. (May 2020). Dysregulation of the oxytocin receptor gene in Williams syndrome. Psychoneuroendocrinology. DOI: [10.1016/j.psyneuen.2020.104631](https://doi.org/10.1016/j.psyneuen.2020.104631).



# Oxytocin/Vasopressin Augmentation in Those with Autism Spectrum Disorder





# A Cure For Autism?

**In 2013 researchers from Yale published a study where they randomly assigned children with autism to one of two groups: 1. a treatment group, and 2. a control group. The treatment group got oxytocin sprayed up their nose, and they sprayed saline solution up the noses of the controls. Both groups received pre and post fMRI of the social areas of their brains and were given pre and post test evaluations of their social skills. There was no difference between the two groups neurologically, or behaviorally prior to being sprayed. However, after receiving the oxytocin nose spray the treatment group was found to exhibit significantly better social skills and their social brain was more active than the control group. In some these changes lasted more than an hour. These results rocked the scientific community.**

# A Cure For Autism?

**Ilanit, G. et al. (December 2, 2013). Oxytocin enhances brain function in children with autism. PNAS. DOI: [10.1073/pnas.1312857110](https://doi.org/10.1073/pnas.1312857110).**





# However

**However a very large well designed study published in the New England Journal of Medicine in 2021 showed oxytocin spray it was no help at all in helping those with autism with interaction. This two rocked the scientific community!**

**Sikich, L. et al. (October 14, 2021). Intranasal Oxytocin in Children and Adolescents with Autism Spectrum Disorder. New England Journal of Medicine. DOI: [10.1056/NEJMoa2103583](https://doi.org/10.1056/NEJMoa2103583).**

# To Make Things More Confusing

**Recently, Scientists from California used CRISPR to genetically alter prairie vole pups so they would have no oxytocin. When they grew up the males were still monogamous, and helped with child care and the females were able to go into labor, give birth and lactate as if they were not genetically altered. This exactly the opposite results from previous research!**

# To Make Things More Confusing

**Brenedzen, K.M. et al. (December 28, 2022). Oxytocin receptor is not required for social attachment in prairie voles.**

**Neuron. DOI:**

**[10.1016/j.neuron.2022.12.011](https://doi.org/10.1016/j.neuron.2022.12.011).**



# What is Going On?!

**Even though the prairie voles' entire oxytocin system was genetically removed they behaved as if it was totally intact. The researcher speculated that for such evolutionarily important system there are multiply redundant systems in the organism to take over if the oxytocin system is destroyed.**

**They went on to say that oxytocin augmentation may eventually be found as helpful, but they learned the system is far more complicated and involved than was first expected. This would also apply to treatment, too.**

Brenedzen, K.M. et al. (December 28, 2022). Oxytocin receptor is not required for social attachment in prairie voles. Neuron. DOI: [10.1016/j.neuron.2022.12.011](https://doi.org/10.1016/j.neuron.2022.12.011).

# What is Going On?!

**Another thing to keep in mind is there is an estimated 236 genes evolved in the expression of autism. About 70 of those are thought to be evolved in brain development and/or function. Individuals with autism can have an infinite variety of permutations and combination of those genes and still display autistic behavior.**

**However, the biological cause of that behavior may be different in every one of them. Those who have anomalies in their oxytocin systems to the extent it cause them problems may benefit from oxytocin augmentation, those that don't probably will not.**

**Lossifov, I et al. (May, 13, 2015). The contribution of de novo coding mutations to autism spectrum disorder. Nature: [10.1038/nature13908](https://doi.org/10.1038/nature13908).**

# Bottom Line

**We need to do a lot more research to figure all this out. We are just at the beginning. Not at the end like we thought a few years ago!**



# Thank You!



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