An overview of theories about autism.

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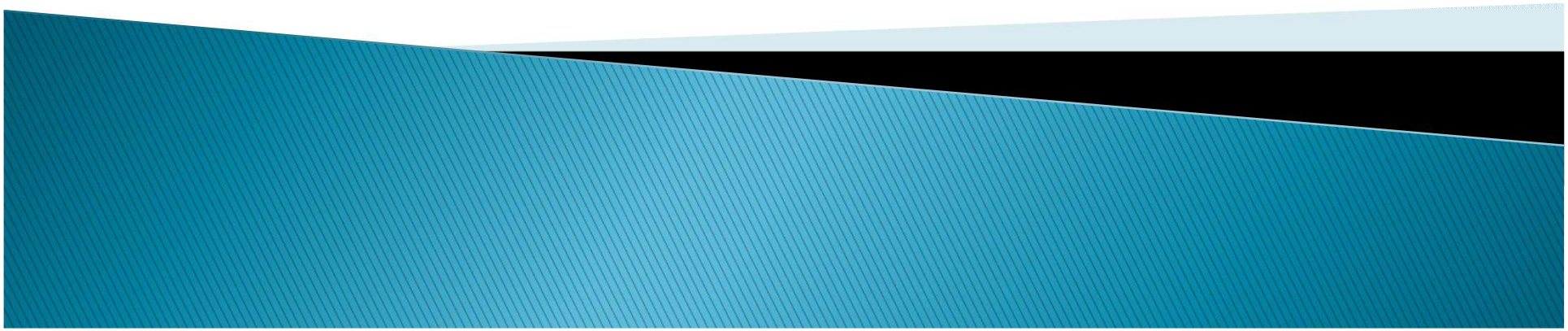

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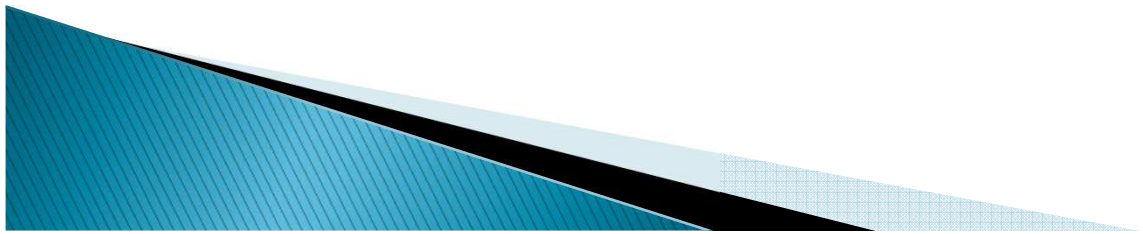
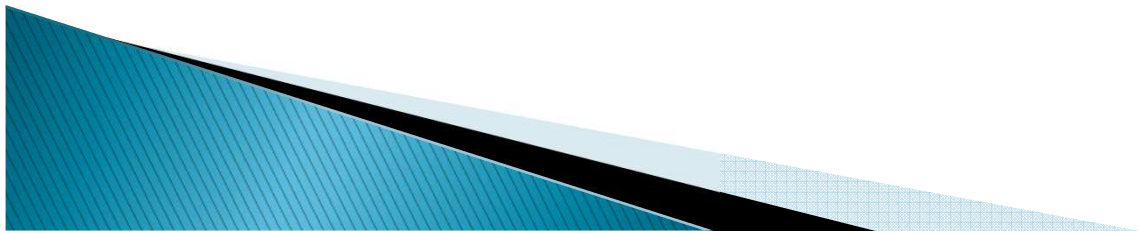


Autism as the result of an extreme male brain

- affected individuals are extremely focused on systemizing >< empathizing
- Men: more systemizing brain
- Women: empathizing brain
- Support for the theory:

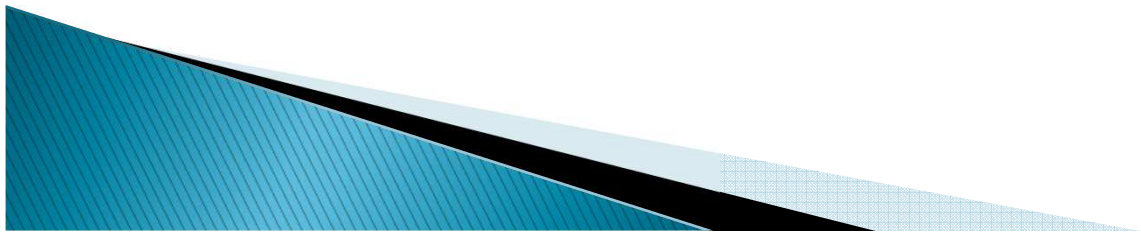
1) more males are affected by autism
2) high-functioning affected individuals tend to outperform unaffected people with similar IQs on systemizing tasks
3) behavioral differences between people with and without autism are mediated by differences at the anatomical level of the brain.
4) prenatal exposure to testosterone (an androgen) is positively related to the development of autistic traits.

- (Ploeger & Galis, 2011)



So having an extreme male brain..

- condition which we strongly associate with autism
- may have had practical advantages given demands of ancestral times
- These advantages would have conferred greater reproductive success
- (Ploeger & Galis, 2011)



Autism as the result of an extreme imprinted brain

- imbalanced genomic imprinting theory
- Genomic imprinting: expression of genes from only one of the two parental chromosomes.
- We inherit two copies of every allele, a maternal and a paternal copy.
- In most cases both copies are functional
- in some exceptional cases one of the copies is turned off and thus not functional.
- (Ploeger & Galis, 2011)

This may be the consequence of imprinting..

- maternal imprinting ensures that only the maternal copy is expressed
- paternal imprinting ensures that only the paternal copy is expressed.
- evolutionary function of imprinted genes is unknown
- (Ploeger & Galis, 2011)

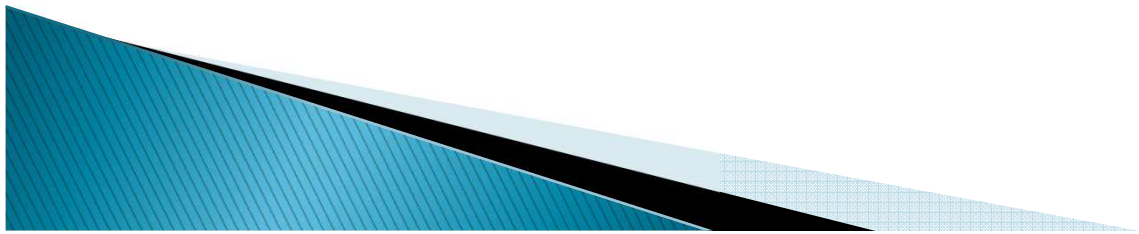
But it has been suggested ..

- genomic imprinting originates in a conflict
- between the sexes about the amount of investment of the mother in the child.
- Paternally expressed imprinted genes tend to promote fetal growth
- >< maternally expressed imprinted genes tend to suppress fetal growth
- father's point of view: beneficial that the mother invests as much as possible in the child
- mother's point of view: important to preserve her resources
- imprinted genes are highly expressive in the central nervous system
- they are involved in neurodevelopment
- Imprinted genes are often implicated in disorders, because a single change can dysregulate their function

(Ploeger & Galis, 2011)

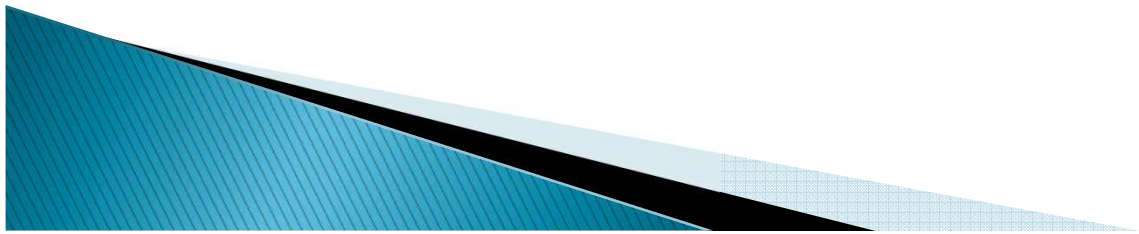
Crespi and Badcock

- hypothesized that autism reflects reduced maternal brain functions, and enhanced paternal brain functions.
- more males are affected than females.
- children with autism impose additional demands compared to normal children
- which is beneficial from the point of view of the father, because the mother will spend more of her time and resources on the child
- in the case of autism, the behavior of the child assumes pathological proportions which no longer benefit either the mother or the father.
- (Ploeger & Galis, 2011)



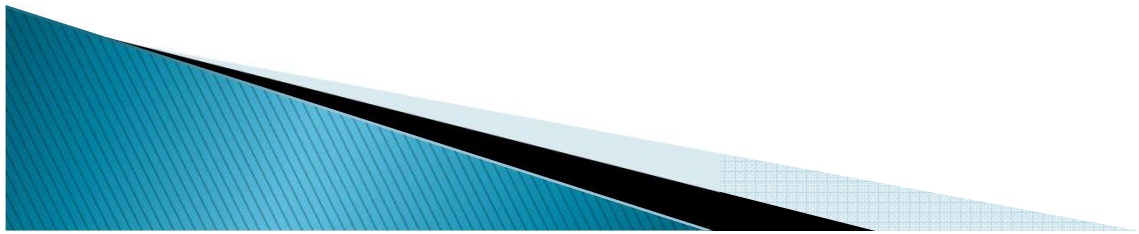
Autism as the result of a reptile brain

- Polyvagal theory
- through stages of phylogeny, mammals, have evolved a functional neural organization that regulates emotions and social behavior.
- humans have a well-developed ability to shift adaptively between mobilization and social engagement behaviors
- individuals with autism lack this ability
- nervous system of the autistic individual is in a constant state of hypervigilance or shutdown.
- generally adaptive responses in reptiles, but are severely maladaptive in mammals.
- does not explain the genetic background and the heritability of autism
- (Ploeger & Galis, 2011)



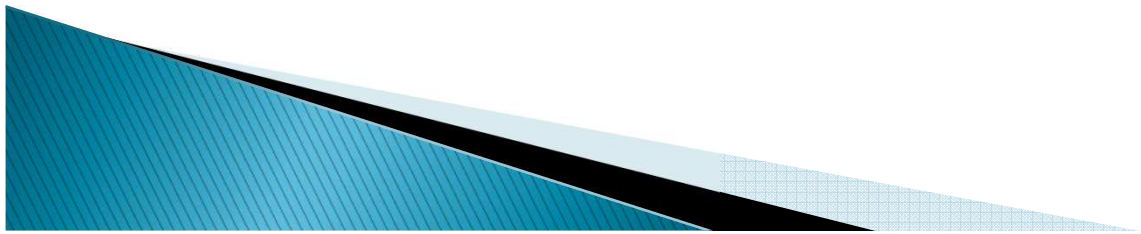
Epistatic interactions between the effects of genes

- Epistatic: interaction in which one gene suppresses the expression of another
- integration of different approaches on the evolution of autism: interactions between the effects of genes
- autism is caused by many interacting genes (nearly 30 genes)
- this same set of genes is involved in the development of intelligence.
- intelligence is positively correlated with potential reproductive success
- 30 genes that are involved in autism can potentially spread in the population, thanks to the link with intelligence.
- (Ploeger & Galis, 2011)



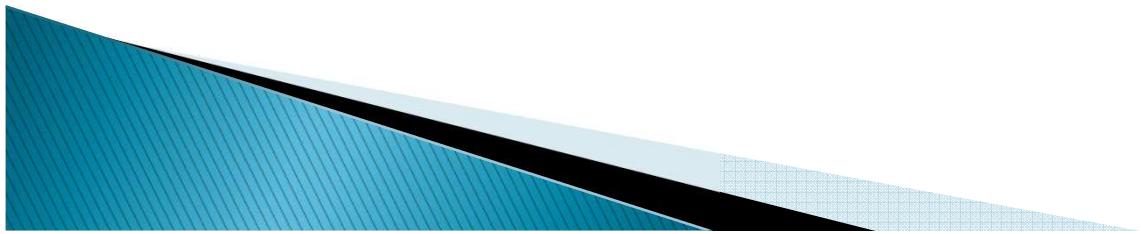
Epistatic interactions between genes ..

- some unlucky interactions, especially in combination with negative spontaneous mutations
- lead to the development of autism, low intelligence, or other pathologies.
- On certain intelligence tests, individuals with autism show equal or better performance levels compared to normal individuals.
- evidence for the relation between autism and exceptional abilities, with some famous examples of autistic savants.
- co-occurrence of savant syndrome and autism is an example of the effect of epistatic interactions between genes
- (Ploeger & Galis, 2011)



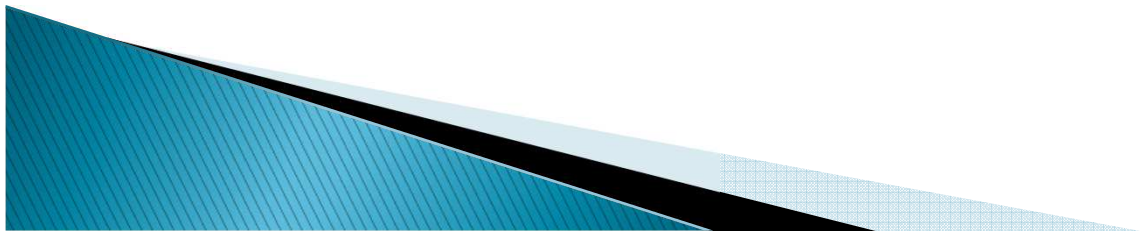
The proposal

- combination of high heritability and low fertility in autism
- can be explained by the effects of epistatic interactions
- between genes that are involved in both intelligence and autism.
- (Ploeger & Galis, 2011)



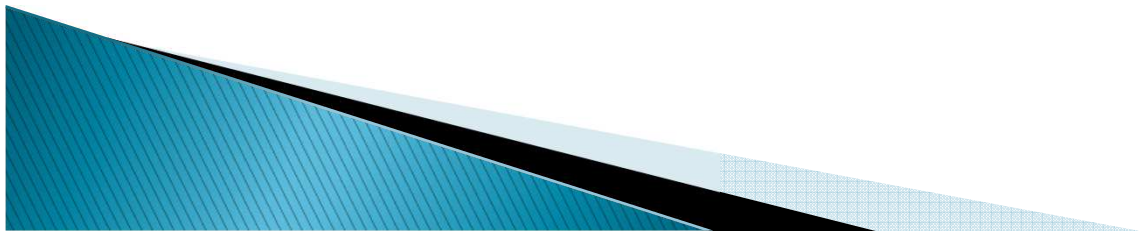
The Theory of Mind Hypothesis of autism

- refers to the ability to infer the full range of mental states that cause action.
- Possessing a theory of mind is to be able to effectively reflect on the contents of one's own and others minds
- allows us to predict and anticipate behaviors in others
- and respond accordingly and appropriately.
- Difficulty in understanding other minds and interpreting behavior is a core cognitive feature of individuals diagnosed with autism.
- individuals with autism fail to “impute mental states to themselves and others”
- this deficit manifests as inability to mentalise, or failure to take into account others’ mental states.
- (Rajendran & Mitchell 2007)



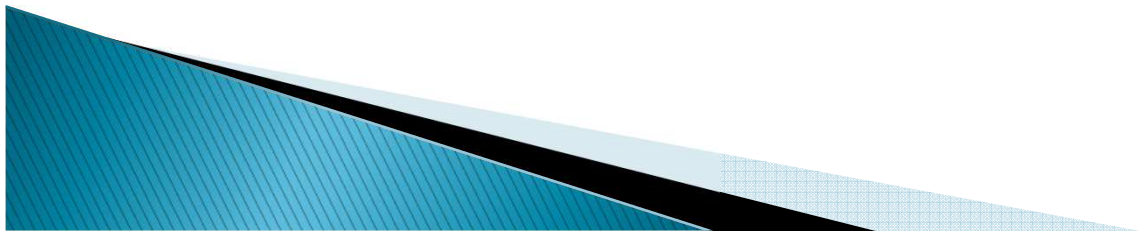
Widely used test of Theory of Mind

- transfer test of false belief
- the participant watches a sequence of events
- usually enacted by dolls
- story unfolds so that one doll has a belief about the location of an object that is incongruous with its real location
- participant then makes a judgment about where the doll will look
- in order to give the correct answer the participant has to infer the mental state of the doll (I think he thinks)
- 80%of children with autism failed the unexpected transfer task
- (Rajendran & Mitchell 2007)



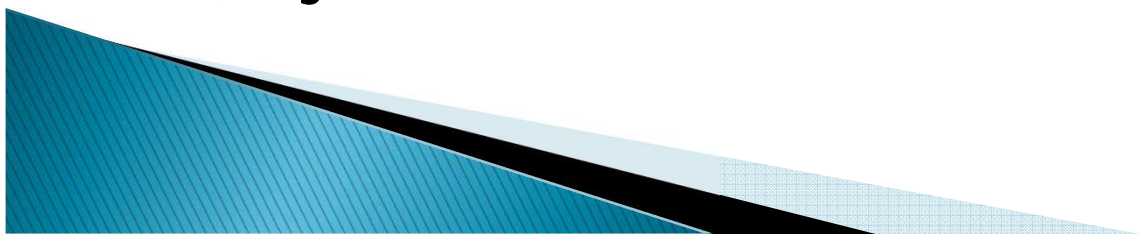
Second-order false belief task

- Problem: 20% of autistic individuals passed tests of false belief
- deficit seemed not to be universals
- So they used the more difficult second-order false belief task
- (I think, he thinks, she thinks)
- none of the children with autism passed the test.
- (Rajendran & Mitchell 2007)



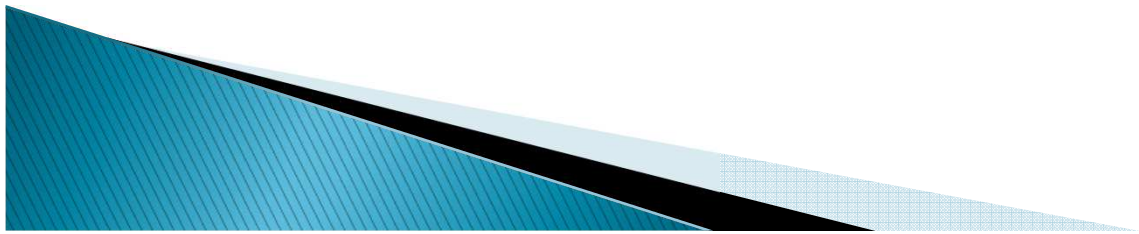
The theory of mind

- remarkably successful in making specific predictions about the impairments
- in socialization, imagination and communication shown by people with autism.
- It cannot explain either the non-triad features of autism, or earlier experimental findings of abnormal assets and deficits on non-social tasks.
- it may be necessary to postulate an additional cognitive abnormality
- (Rajendran & Mitchell 2007)



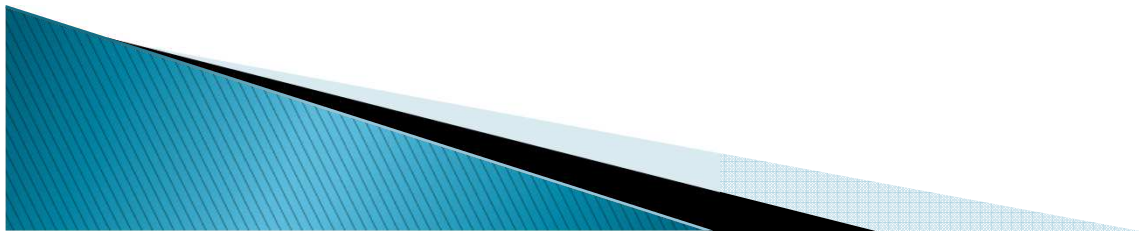
Weak Central Coherence theory

- it explains some of the non-social, as well as the social features of autism
- such as the attention to acute detail that ranges from pedantry to obsession.
- typically developing individuals process information by extracting overall meaning or gist.
- autism is characterized by weak or absent drive for global coherence
- individuals with autism process things in a detail, focused or piecemeal way
- processing the constituent parts, rather than the global whole.
- (Frith & Happé, 1994)



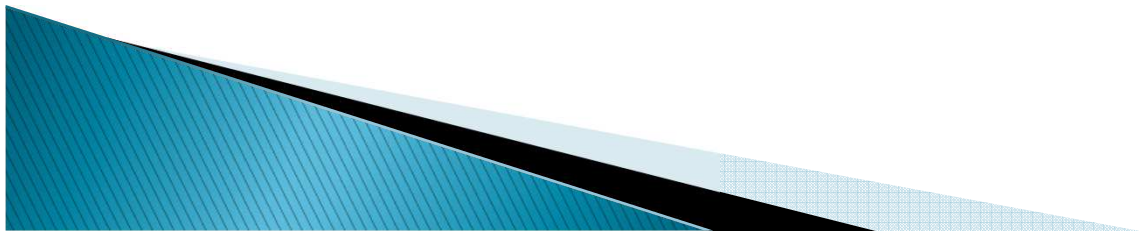
The broken mirror theory

- caused by a hypoactivity of mirror neurons
- a neuronal system that is activated when an action is performed by a person
- and when the subject observes the same action done by a conspecific.
- one of the key mechanisms for what concerns social interactions
- it allows an individual to embody in himself the mental states of those who have faced as they were their own.
- Autistic patients would not be able to embody in themselves others' mental states
- due to a dysfunction related to mirror neurons.
- hypoactivity of the mirror system would be found only in certain circumstances and not in other.
- (Keller & Bugiani & Fantin & Pirfo 2011)



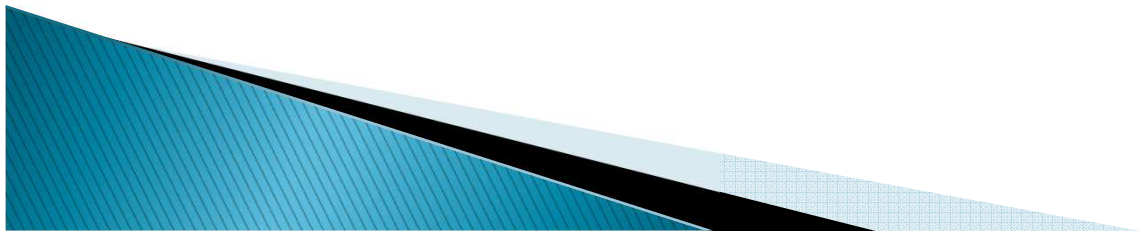
Hypoactivity ot the mirror system

- imitation tasks which **do not** require an explicit imitative behavior: hypoactivity of the autistic mirror system.
- does not occur when the subject is explicitly asked to imitate an observed movement.
- deficits associated with the mirror system does not stop at simple task imitation.
- Autistic subjects have great difficulty in understanding the others' intentions
- seem to have no impairment regarding the goal of the action, or rather the "what" of the action.
- could not understand the general intention of the model: "why" this action is performed.
- (Keller et al. 2011)



Conclusion

- Autistic subjects, for those problems of embodiment of the mental states of others,
- which are possible only thanks to mirror neurons
- have many difficulties in reading the emotional states of others.
- (Keller et al. 2011)



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