Psychology 3016 – Social Cognition 3
Developmental Psychology

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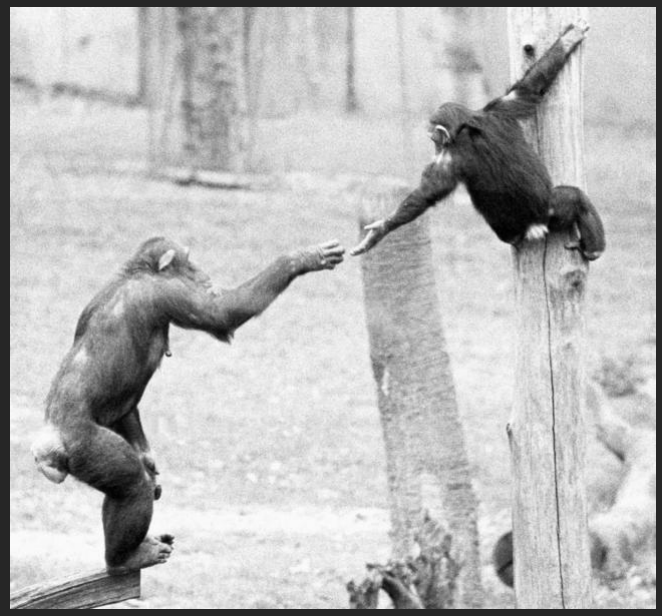


Social Cognition Learning Outcomes

Learning Outcomes across the Social Cognition mini-course

LO1 – demonstrate a deep understanding of the evidence to show different aspects of social cognition in human children and the great apes.

LO2 – consider the strengths and limitations of experiments used to test social cognition in humans and apes.

LO3 – explain how results from experiments used to test social cognition provide evidence to show different aspects of social cognition.

LO4 – understand how experimental results of tests of social cognition can inform knowledge and practice regarding child social-cognitive development and autism spectrum disorder.

LO1 – critically consider what the research evidence tells us about the development of social cognition and determine what questions remain.

How do we explain early social cognitive understanding?

- Familiar from 1st and 2nd year?
- Trevarthen (Trevarthen & Hubely)
  - Innate infant intersubjectivity (two subjects and we can understand one another)
  - Secondary intersubjectivity (incorporate objects into their interactions)
- Tomasello and Carpenter
  - "Shared intentionality"

Michael Tomasello:

Shared intentionality

- "Human cognition seems very different"
- "The big Vygotskian idea is that what makes human cognition different is not more individual brainpower, but rather the ability of humans to collaborate with others in collective activities"
- *Shared intentionality* is the mechanism put forward to explain this cultural achievement. (Sounds like secondary intersubjectivity!)
- Consider these four domains, each of which is seen in an individualistic manner with chimpanzees but which is transformed by shared intentionality
  - Gaze following → joint attention
  - Group activity → collaboration
  - Social learning → instructed learning

Michael Tomasello:

Shared intentionality

Gaze following → joint attention

What can we learn from other apes?
(Behne et al., 2005; Call & Tomasello, 2005)

- Apes are good at following "head" gaze, even human: Therefore, they do not have trouble following directionality from pointing cue
- But they do not seem to grasp that partners in communication share a joint attentional frame, or *common ground*
- Thus, in a game of hide-and-seek, 14-month-olds understand that adult pointing to a bucket may reveal something within; such an assumption follows from the joint attentional frame
- In a similar game with a chimp, a point or look to the very same bucket elicits a response of the type: A bucket, so what? Where's the food?

Crucial distinctions

- Belief *versus* ignorance
- Coordination *versus* collaboration
- Implicit *versus* explicit ToM

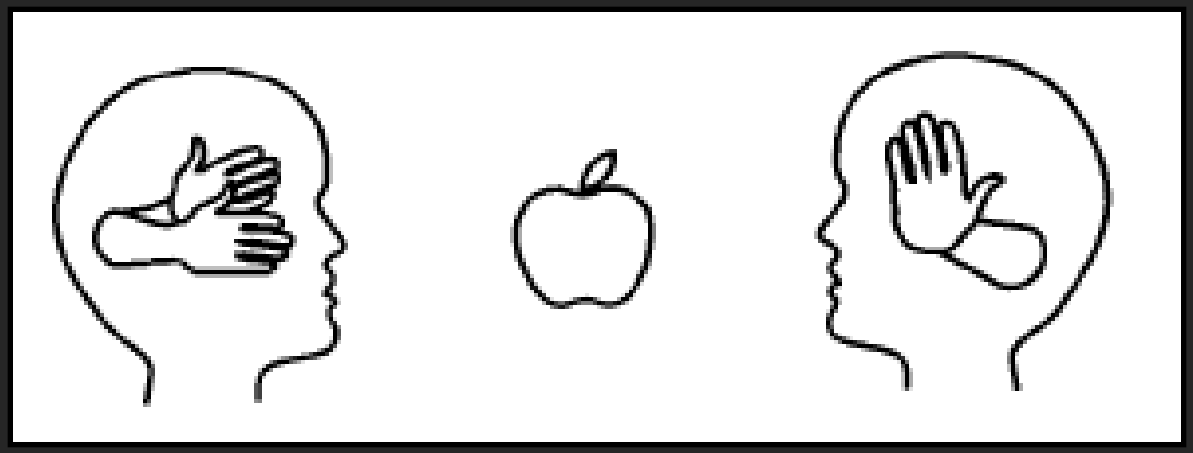
Basics

- Mirror self recognition
- Empathy
  - Contagion
  - Helping
- Goal and intentions
- Perception and knowledge
- False belief understanding: what is involved?

The child's 'mental-state' understanding

The special case of FB

What is involved in understanding desires?



Bartsch and Wellman (1995), Wellman (1990)

Young children understand the subjective nature of desires: *you may want an apple and I may not!*

Here, the different desires of two individuals toward the same object are represented schematically

Note, desires can be construed as a "subjective connection between a person and an objective state of affairs"

The child's 'mental-state' understanding

The special case of FB

What is involved in understanding beliefs?

Bartsch and Wellman (1995), Wellman (1990)

A subjective understanding can be contrasted with an understanding of mental states as representations

Thinking, *that object is an apple* involves construing B as representing an apple in his mind

Note, "simple desires […] could require no attribution to the target person of a representation"

The child's 'mental-state' understanding

The special case of FB

Desires versus beliefs

Beliefs trump desires

Bartsch and Wellman (1995), Wellman (1990)

A belief-desire framework allows us to conceive of two very different kinds of mental states:

Beliefs can explain why two people with identical desires (A and B both *want* an apple) might do different things:
One thinks there is an apple in the fridge and the other does not

Desires can account for why two people with the same beliefs (A and B both believe there is an apple in the fridge) might do different things:
one want an apple and goes to the fridge; the other doesn't want an apple, so does not go to the fridge

The child's 'mental-state' understanding

The special case of FB

What is involved in understanding false-beliefs?

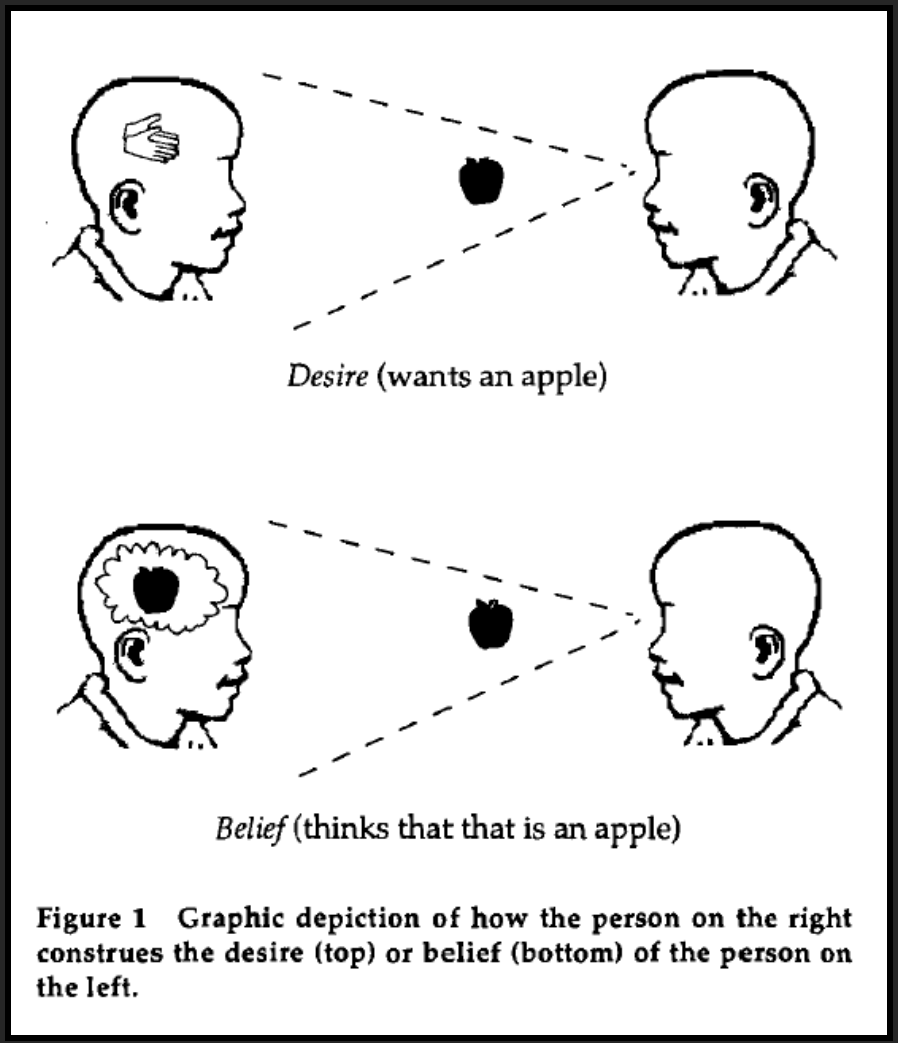


Figure 1 Graphic depiction of how the person on the right construes the desire (top) or belief (bottom) of the person on the left.

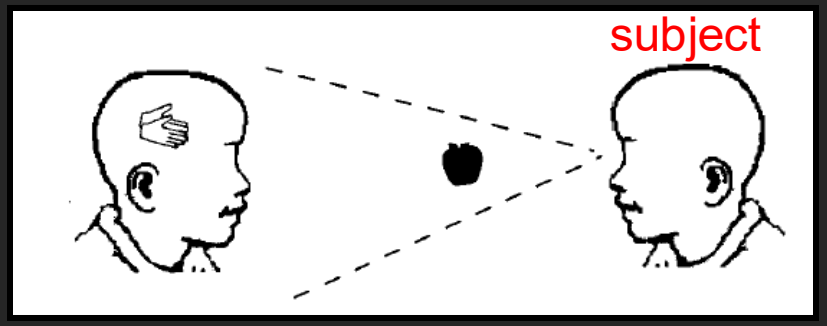
Bartsch and Wellman (1995), Wellman (1990)

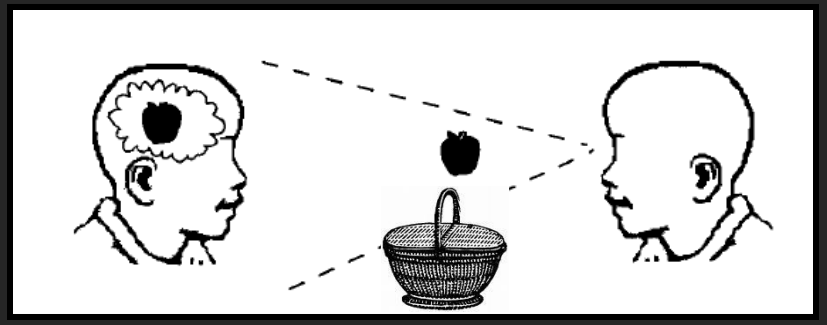
Here the child on the right knows that the child on the left likes apples

He also knows that the child on the left *believes there to be an apple*

To understand false-beliefs, the child on the right needs to be able to think separately about the real state of the world (*there is an apple*) and the represented state of the world (*child on left thinks there is an apple*) … PTO

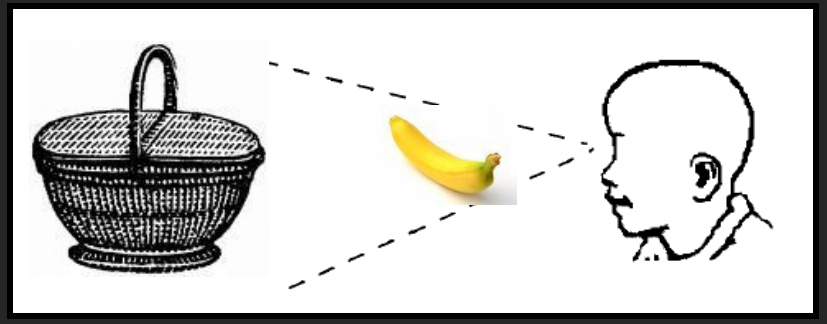
The classic false-belief test situation





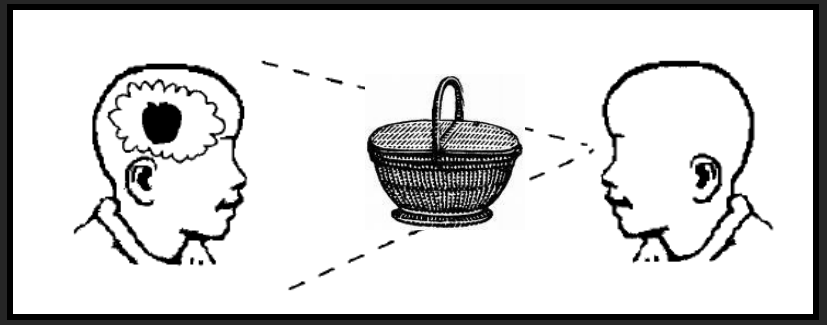
1. Subject and story protagonist share a common understanding of the ‘true’ state of the world

There is an apple in the basket



2. Subject (only) sees a transformation in the true state of the world

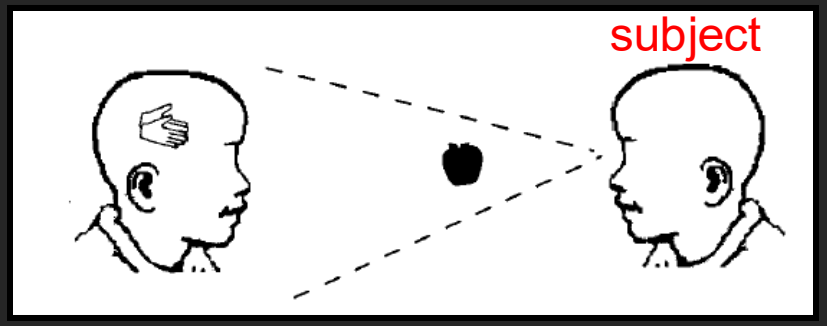
Apple is replaced with banana



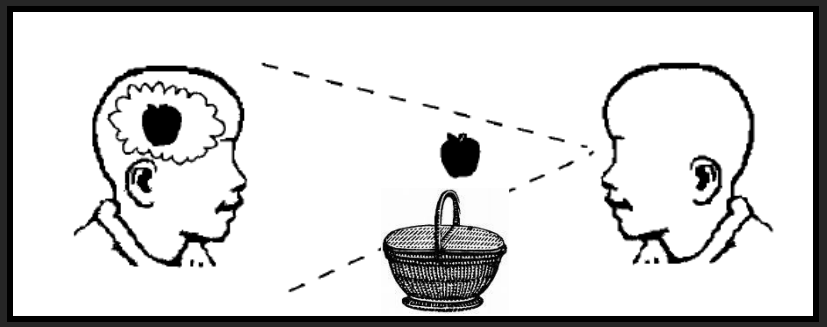
3. Protagonist returns and his belief no longer matches the true state of the world

The protagonist has a false-belief concerning the basket’s contents

The classic false-belief test situation



We can now establish (directly or indirectly on the basis of actions) whether the subject understands that the protagonist has a false-belief



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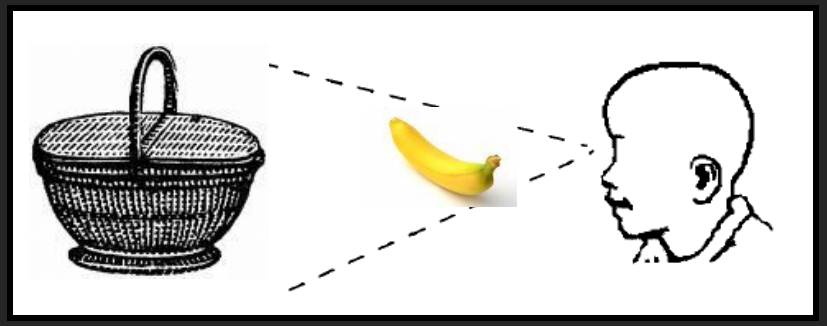

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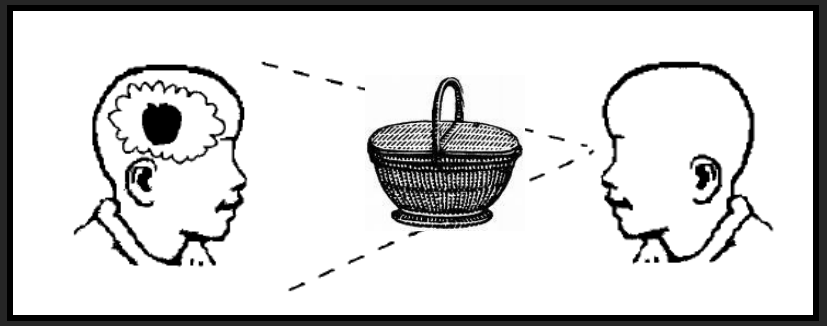
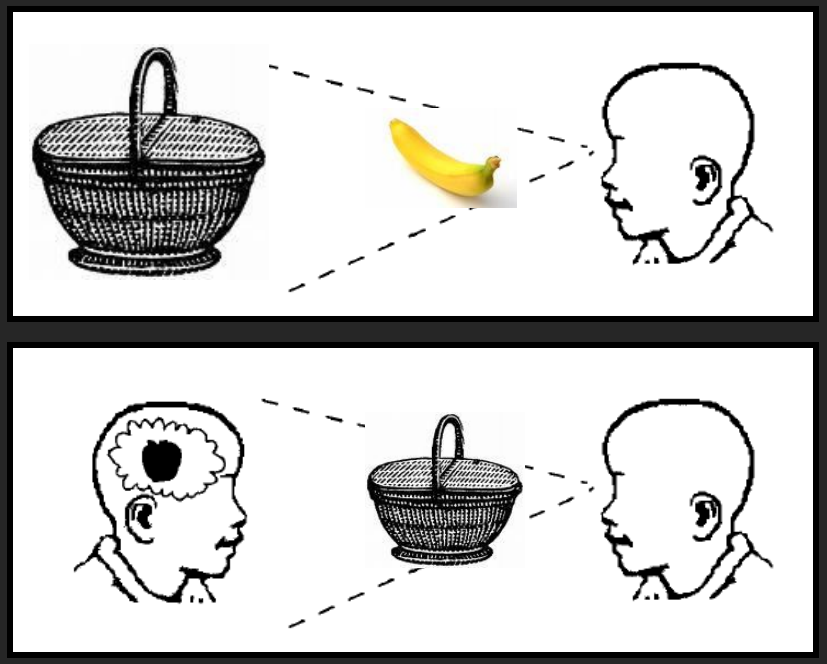


3. Protagonist returns and his belief no longer matches the true state of the world
The protagonist has a false-belief concerning the basket's contents

The child's 'mental-state' understanding

The special case of FB

Herein lies the key for the representational theory of mind proponents



Wellman (1990)

The child acquires the ability to represent mental states and so moves from being a desire psychologist to a belief-desire psychologist

Another way to think about this is …

- Human's understand (or perceive) that *behaviour is not guided by objective reality*
- Instead, behaviour is guided by
  - What we want, AND
  - What we think
- So, people's actions are based on their intentions, which balance their desires and their beliefs – this is the complex claim of ToM
- (Don't think that reality is irrelevant, but you will never understand humans if you do not account for the role of their beliefs in moderating their actions)

A classic study, launching 1000s of others

Cognition, 21 (1985) 37–46

Does the autistic child have a "theory of mind"?*

SIMON BARON-COHEN
ALAN M. LESLIE
UTA FRITH

MRC Cognitive Development Unit, London

Abstract

We use a new model of metarepresentational development to predict a cognitive deficit which could explain a crucial component of the social impairment in childhood autism. One of the manifestations of a basic metarepresentational capacity is a 'theory of mind'. We have reason to believe that autistic children lack such a 'theory'. If this were so, then they would be unable to impute beliefs to others and to predict their behaviour. This hypothesis was tested using Wimmer and Perner's puppet play paradigm. Normal children and those with Down's syndrome were used as controls for a group of autistic children. Even though the mental age of the autistic children was higher than that of the controls, they alone failed to impute beliefs to others. Thus the dysfunction we have postulated and demonstrated is independent of mental retardation and specific to autism.

Can't hold in mind the other person's represented state of the world…

Never assume their point of view…

Motivation to communicate?

Baron Cohen et al. (1985): Sample

Table 1. *Means, SDs and ranges of Chronological Age (CA) and Mental Age (MA) in years; months*

Diagnostic groups	*n*		CA	Nonverbal* MA	Verbal** MA
Autistic	20	Mean	11;11	9;3	5;5
		SD	3;0	2;2	1;6
		Range	6;1–16;6	5;4–15;9	2;8–7;5
Down's syndrome	14	Mean	10;11	5;11	2;11
		SD	4;1	0;11	0;7
		Range	6;3–17;0	4;9–8;6	1;8–4;0
Normal	27	Mean	4;5	–	–
		SD	0;7		
		Range	3;5–5;9		

*Leiter International Performance Scale.
**British Picture Vocabulary Test.

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		SD	4;1	0;11	0;7
		Range	6;3–17;0	4;9–8;6	1;8–4;0
Normal	27	Mean	4;5	–	–
		SD	0;7		
		Range	3;5–5;9		

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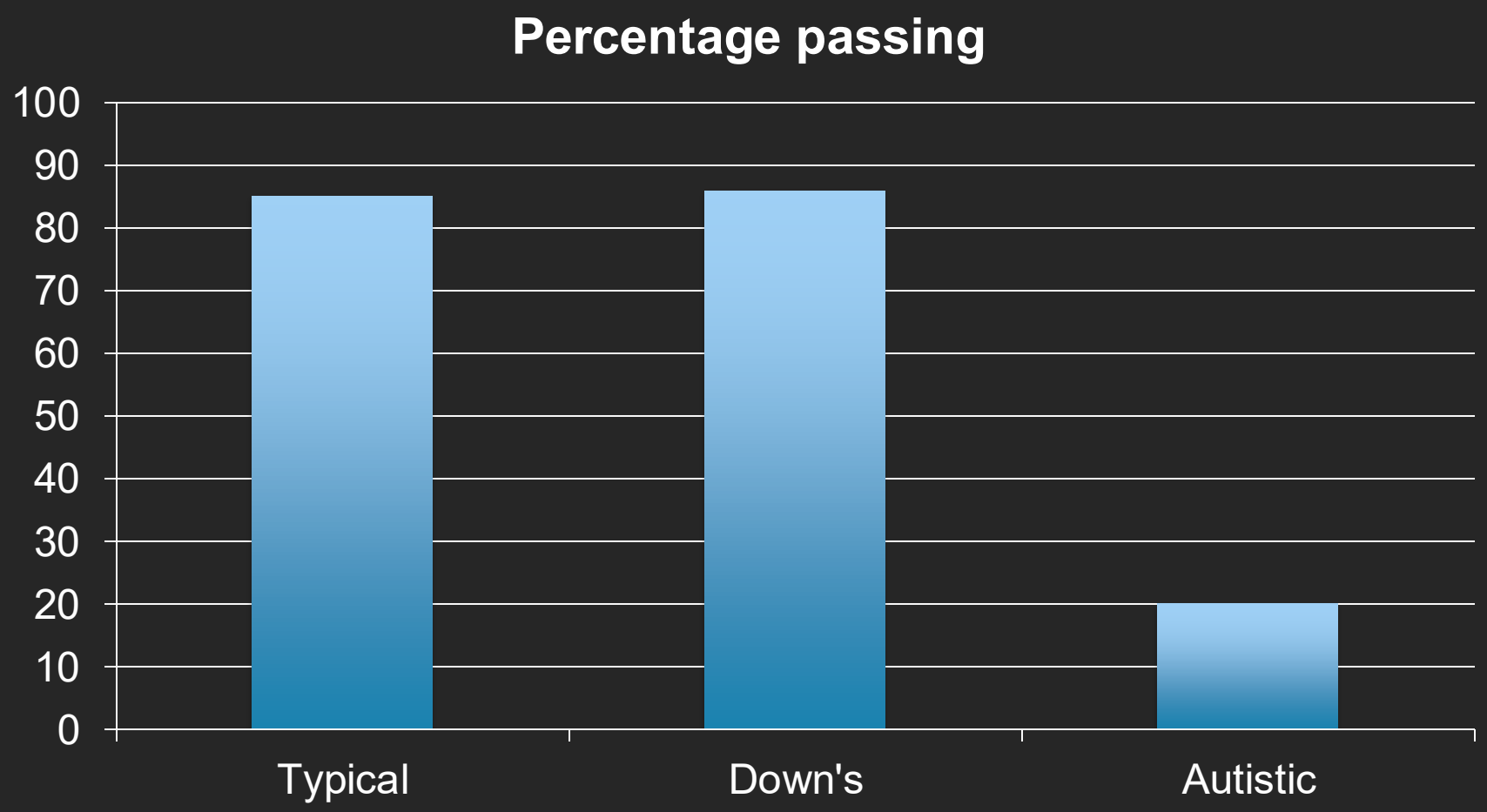
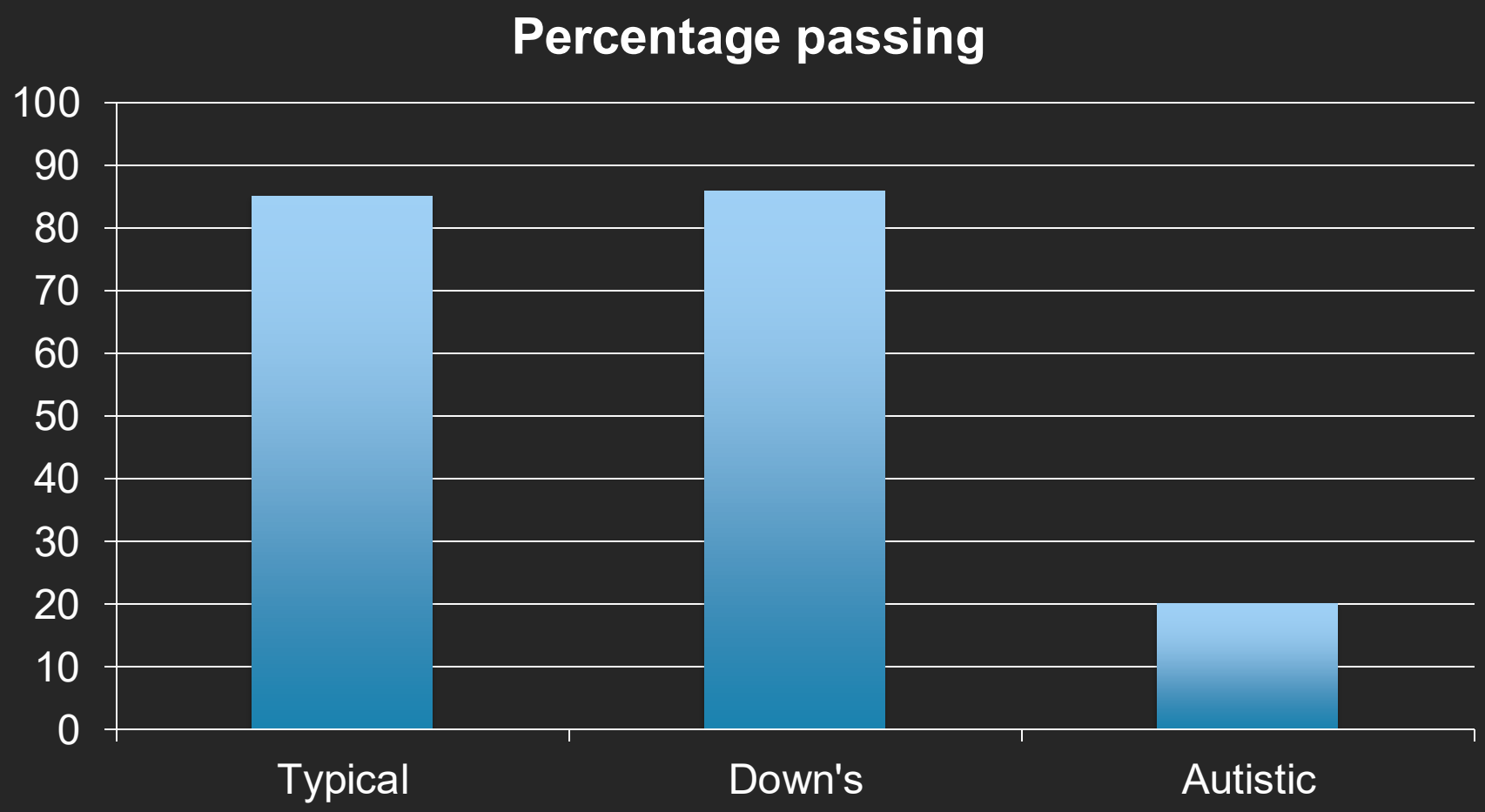
Baron Cohen et al. (1985): Results



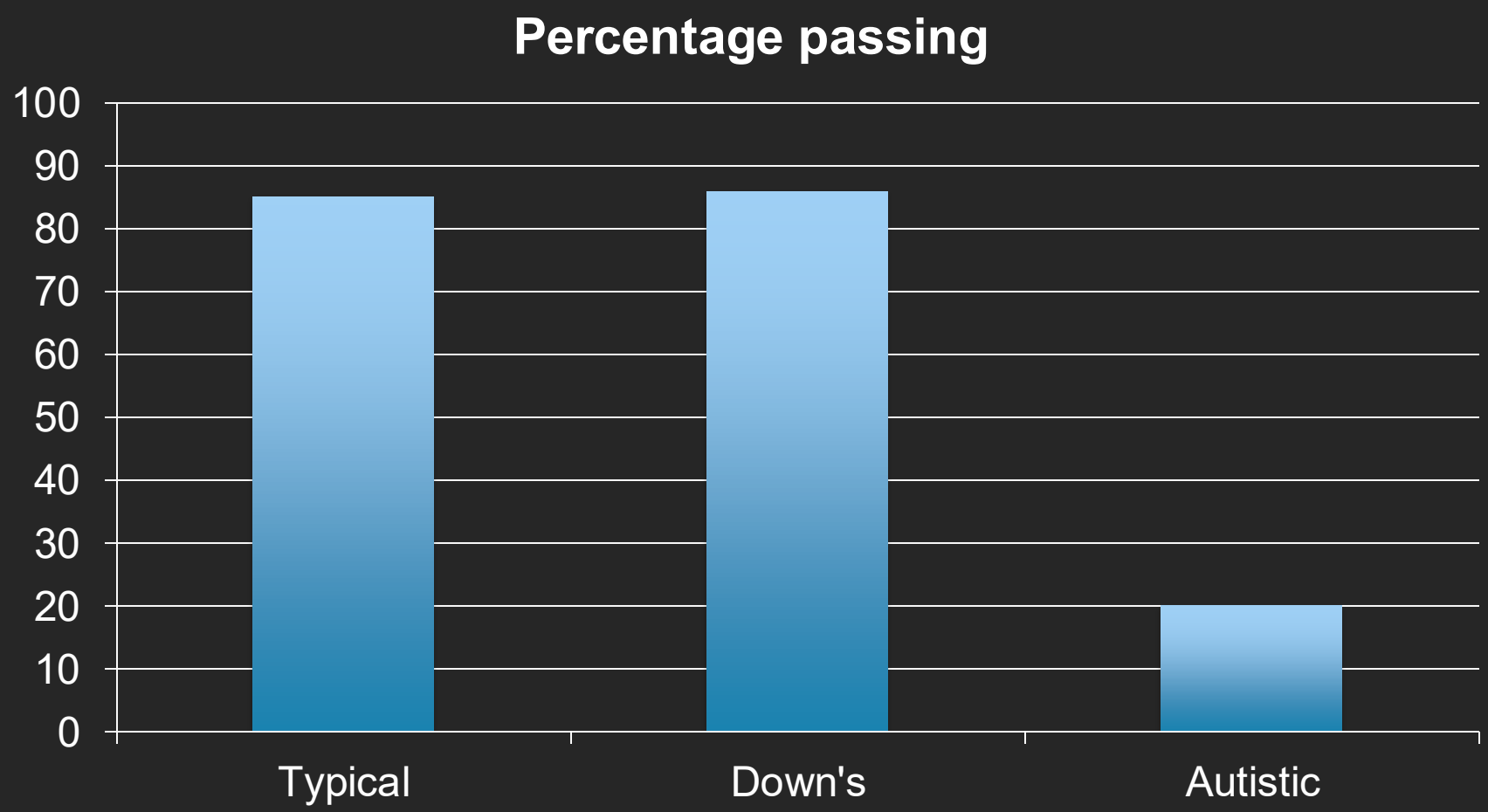
It seems ASD kids don't have a ToM

Baron Cohen et al. (1985): Results



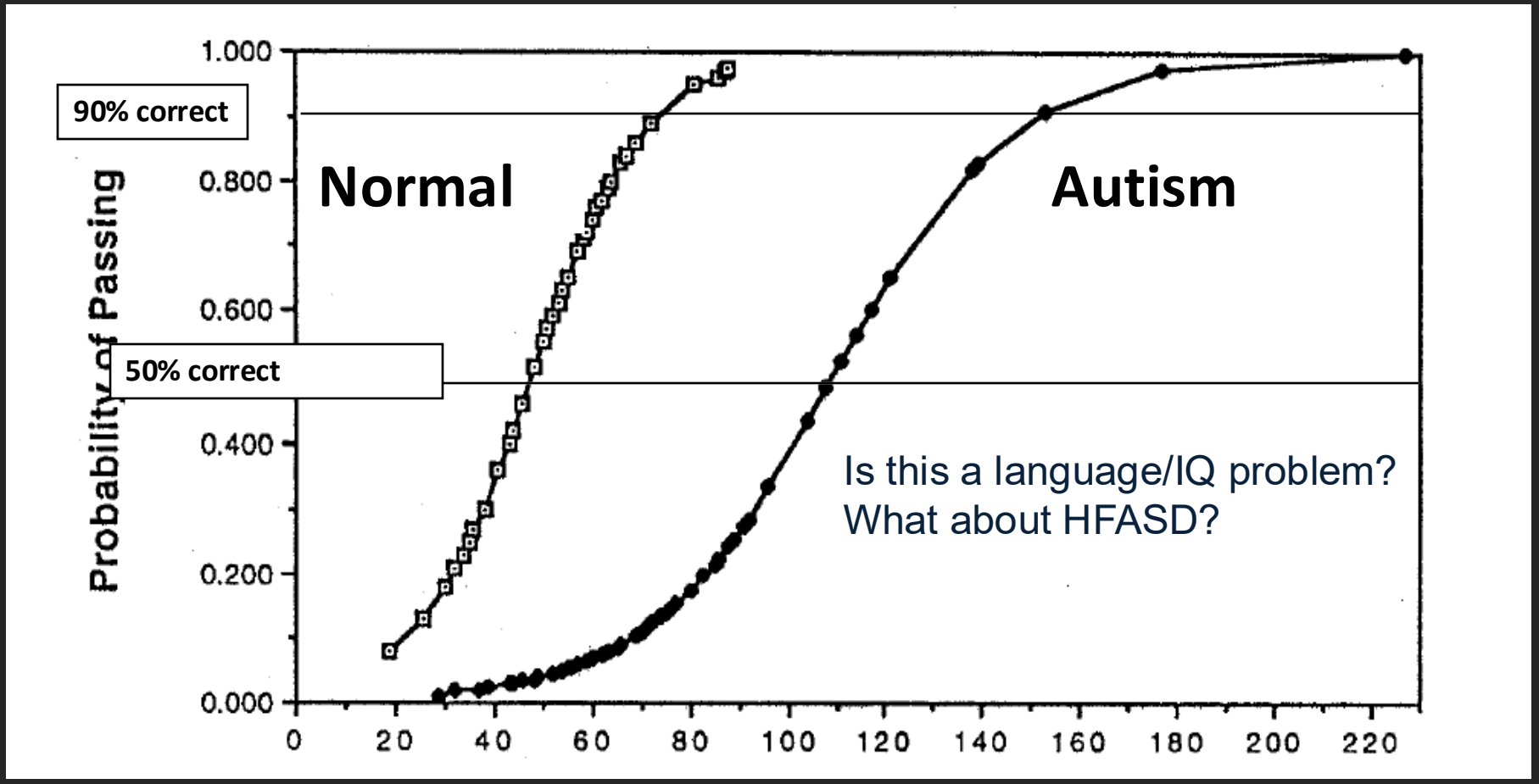
But 4 kids did pass …

Baron Cohen et al. (1985): Results



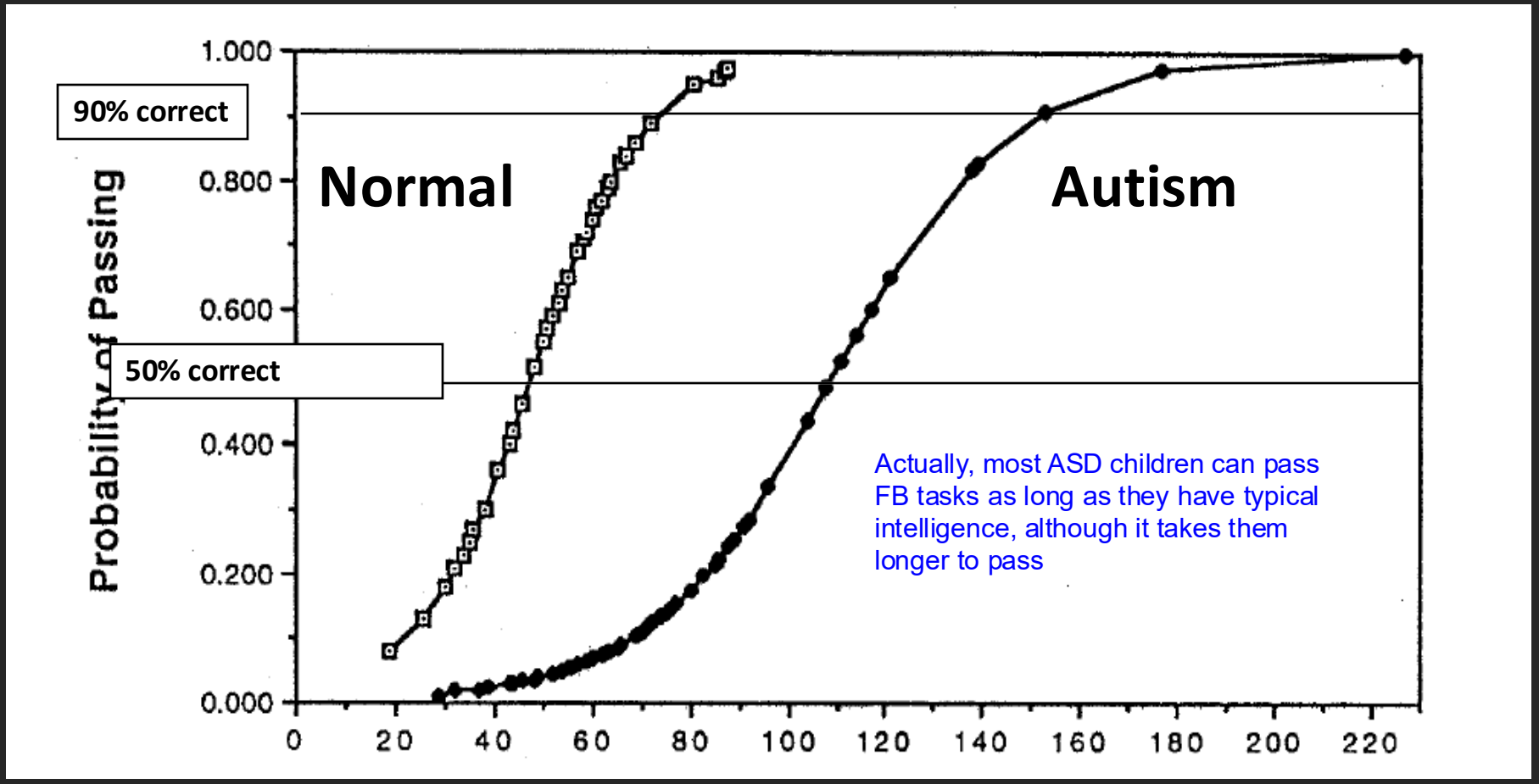
Why did 4 kids pass ..?

How does the FB task perform?



Happé, et al, (1995)

How does the FB task perform?



Happé, et al, (1995)

Is the FB task too simple?
Maybe we need advanced ToM tasks

“I think …”

“I think he thinks…”

“I think she thinks I think…”

“I know you think you understand what you thought I said, but I don’t think you realise that what you heard was not what I meant.”

Daniel Greenspan

But a 4 year old can't follow this…

We must get better as we get older

"I know you think you understand what you thought I said, but I don't think you realise that what you heard was not what I meant."

Advanced ToM

Advanced ToM tests are an eclectic mixture of social stories that require some form of second order reasoning

- Second order false belief
- Strange Stories task (e.g. take into account a misunderstanding)
- Irony, faux pas, display rules, white lie, joke, pretence, figure of speech

Anecdote: fairies in the garden

Advanced ToM

Advanced ToM tests are eclectic mixture of social stories that require some form of second order reasoning

- Second order false belief ASD < Typical
- Strange Stories task ASD < Typical
- Irony, faux pas, display rules, white lie, joke, pretence, figure of speech ASD < Typical
- ? Marc's question…Reporting bias?

THE JOURNAL OF CHILD PSYCHOLOGY AND PSYCHIATRY

ACAMH

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Rethinking theory of mind in high-functioning autism spectrum disorder

Anke M. Scheeren, [1] Marc de Rosnay, [2] Hans M. Koot, [1] and Sander Begeer[1,2]

[1]VU University Amsterdam, Department of Developmental Psychology, Amsterdam, The Netherlands; [2]University of Sydney, School of Psychology, Sydney, Australia

Background: The sociocommunicative problems in autism spectrum disorder (ASD) are traditionally linked to impairments in Theory of Mind (ToM), the ability to ascribe mental states to others. Although ToM impairments are consistently reported in young children with ASD, findings on more advanced ToM understanding in older individuals with high-functioning ASD (HFASD) are less straightforward. Therefore, we assessed the advanced ToM abilities of a large sample of school-aged children and adolescents with HFASD (n = 194; 6–20 years) and compared them to a typically developing (TD) comparison group (n = 60). **Methods:** Participants' advanced ToM was assessed with five social stories containing second-order false beliefs, display rules, double bluff, faux pas, and sarcasm. **Results:** Participants with HFASD performed equally well on each of the ToM stories as their TD peers. Consistent age effects were noticed with adolescents outperforming the children. Furthermore, advanced ToM was positively associated with participants' age, verbal abilities, and general reasoning abilities. **Conclusions:** Counter to what the ToM theory of ASD would predict, school-aged children and adolescents with HFASD seem to be able to master the theoretical principles of advanced mental state reasoning. However, they may still fail to apply these theoretical principles during everyday social interactions. **Keywords:** Autism spectrum disorder, advanced theory of mind, children and adolescents, high-functioning, social understanding.

Advanced ToM

Against an assumed deficit in advanced ToM in ASD children, we were unconvinced, but nobody likes a negative finding or a negative argument.

So, in a large sample of HFASD (= typical IQ) children and typically developing children, they examined

- 2nd order FB
- Display rules
- Double bluff
- Faux pas
- Sarcasm

Scheeren et al. (2013): Results

Table 2 Observed and predicted probability (between brackets) of passing the mental state question of each theory of mind story

	Children		Adolescents		Contrast *p*-values	
	HFASD (n = 59)	TD (n = 27)	HFASD (n = 135)	TD (n = 33)	Group	Age
1. Second-order false belief[a]	.85 (.83)	.78 (.81)	.95 (.95)	.97 (.95)	n.s.	<.01
2. Emotional display rule[b]	.92 (.91)	.89 (.90)	.96 (.97)	.97 (.96)	n.s.	n.s.
3. Double bluff[c]	.46 (.48)	.44 (.41)	.65 (.64)	.55 (.58)	n.s.	<.05
4. Faux pas[d]	.49 (.50)	.44 (.43)	.68 (.68)	.61 (.62)	n.s.	<.01
5. Sarcasm[e]	.32 (.33)	.26 (.24)	.62 (.64)	.49 (.50)	n.s.	<.001

HFASD, high-functioning autism spectrum disorder; TD, typically developing.
[a]The overall model for 1 was significant, $\chi^2_{(2)} = 10.54$, $p < .01$.
[b]The overall model for 2 was not significant, $\chi^2_{(2)} = 3.04$, $p > .10$.
[c]The overall model for 3 was significant, $\chi^2_{(2)} = 8.15$, $p < .05$.
[d]The overall model for 4 was significant, $\chi^2_{(2)} = 9.27$, $p < .05$.
[e]The overall model for 5 was significant, $\chi^2_{(2)} = 22.18$, $p < .001$.

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Taking stock

- Okay, so HFASD children aren't really that bad at *explicit ToM* at all!!
- In fact, once they can pass the FB test, and assuming they have normal IQ, they are equally as good as TD children
- So, what is going on?

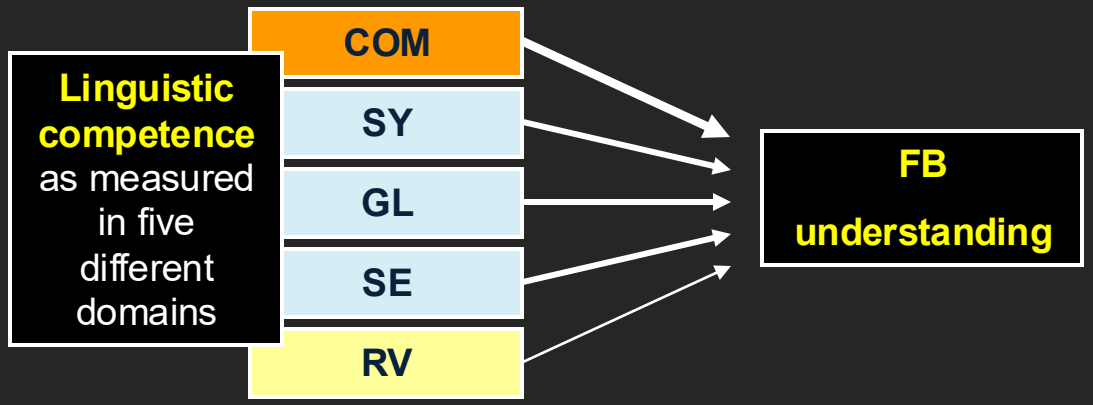
Taking stock

- Okay, so HFASD children aren't really that bad at *explicit ToM* at all!!
- In fact, once they can pass the FB test, and assuming they have normal IQ, they are equally as good as TD children
- So, what is going on?
- Perhaps ToM is anchored to a developmental variable like verbal ability?

Milligan, Astington & Dack (2007)

Conducted a meta-analysis of 104 studies examining the association between children's linguistic competence and their false-belief (FB) understanding. Only ONE study found a negative association between linguistic competence and FB understanding!!

Results: General language ability (GL), receptive vocabulary (RV), semantics (SE), syntax (SY) and memory for complements (COM) all associated with FB. However, there was some order in the strength of the relation between these aspects of linguistic competence and FB understanding



Note:
the weight of the line indicates the relative strength of the effect

Taking stock

- Okay, so HFASD children aren't really that bad at *explicit ToM* at all!!
- In fact, once they can pass the FB test, and assuming they have normal IQ, they are equally as good as TD children
- So, what is going on? Language?
- Maybe critical for **explicit** FB, but doesn't get you far with implicit or children with Down's Syndrome
- Arguably – conceptual relationship between ToM and language (part of the same thing?)

Taking stock

- Okay, so HFASD children aren't really that bad at *explicit ToM* at all!!
- In fact, once they can pass the FB test, and assuming they have normal IQ, they are equally as good as TD children
- So, what is going on?
- Perhaps HFASD children have an *implicit* ToM deficit?

Science, 325 (August), 2009

Mindblind Eyes: An Absence of Spontaneous Theory of Mind in Asperger Syndrome

Atsushi Senju,[1*] Victoria Southgate,[1] Sarah White,[2] Uta Frith[2,3]

Adults with Asperger syndrome can understand mental states such as desires and beliefs (mentalizing) when explicitly prompted to do so, despite having impairments in social communication. We directly tested the hypothesis that such individuals nevertheless fail to mentalize spontaneously. To this end, we used an eye-tracking task that has revealed the spontaneous ability to mentalize in typically developing infants. We showed that, like infants, neurotypical adults' (n = 17 participants) eye movements anticipated an actor's behavior on the basis of her false belief. This was not the case for individuals with Asperger syndrome (n = 19). Thus, these individuals do not attribute mental states spontaneously, but they may be able to do so in explicit tasks through compensatory learning.

Senju et al. (2009): Sample

Table 1. Mean chronological age (CA), verbal IQ (VIQ), performance IQ (PIQ), full-scale IQ (FIQ) (WAIS-III UK), composite ToM score (ToM), Strange Stories test score (SS), scores of autism quotient (AQ), and autism diagnostic observation schedule–generic (ADOS-G).

Group	Asperger syndrome			Neurotypical		
	Mean	SD	Range	Mean	SD	Range
CA	36.8	14.3	21–67	39.6	11.7	26–63
VIQ	116.8	14.4	85–144	116.1	13.2	91–138
PIQ	109.6	13.0	80–132	111.5	10.6	97–132
FIQ	115.6	14.9	89–144	115.3	11.0	95–129
ToM*	9.7	2.0	4–13.5	10.6	1.3	8.5–12.5
SS†	13.2	1.8	10–16	13.6	1.3	12–16
AQ‡	34.9	7.6	17–48	16.5	7.6	6–37
ADOS-G	7.9	4.7	0–17	–	–	–

*The ToM tests consisted of five first-order FBTs [Sally-Anne (*4*), Smarties (*23*), interpretational false belief (*24*), belief-emotion and real-apparent emotion (*25*)] and two second-order FBTs [ice cream van (*26*) and coat story (*6*)]. †The Strange Stories test was taken from (*27*) and required the participant to either interpret another's behavior or understand another's emotion. ‡AS and NT groups differed significantly on the autism-spectrum quotient confirming their diagnostic status [AQ: (*28*), $t(34) = 7.23$, $P < 0.001$, Cohen's $d = 2.41$, t test]. No other variables were significantly different between the two groups.

Senju et al. (2009): Method

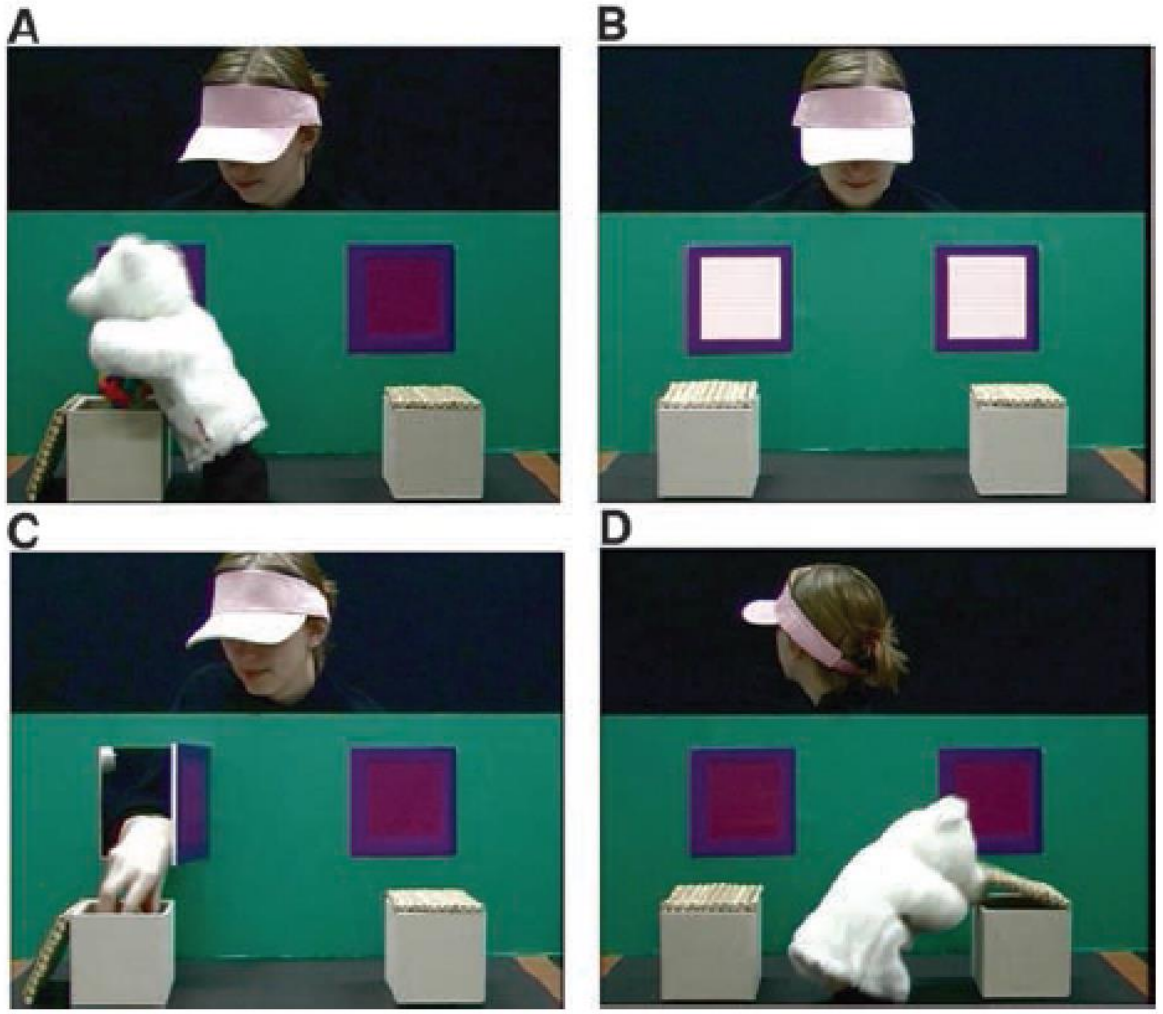


Fig. 1. Selected scenes from stimulus movies (see also movies S1 and S2). In familiarization trials, participants were familiarized to an event in which (**A**) the puppet placed a ball in one of two boxes, (**B**) both windows were illuminated and a chime sounded, and (**C**) an actor reached through the window above the box in which the ball was placed and retrieved the ball. The participants were familiarized to the contingency between (B) and (C). In (**D**), the puppet moves the ball while the actor is looking away. This operation induces a false belief in the actor about the location of the ball.

Senju et al. (2009): Results

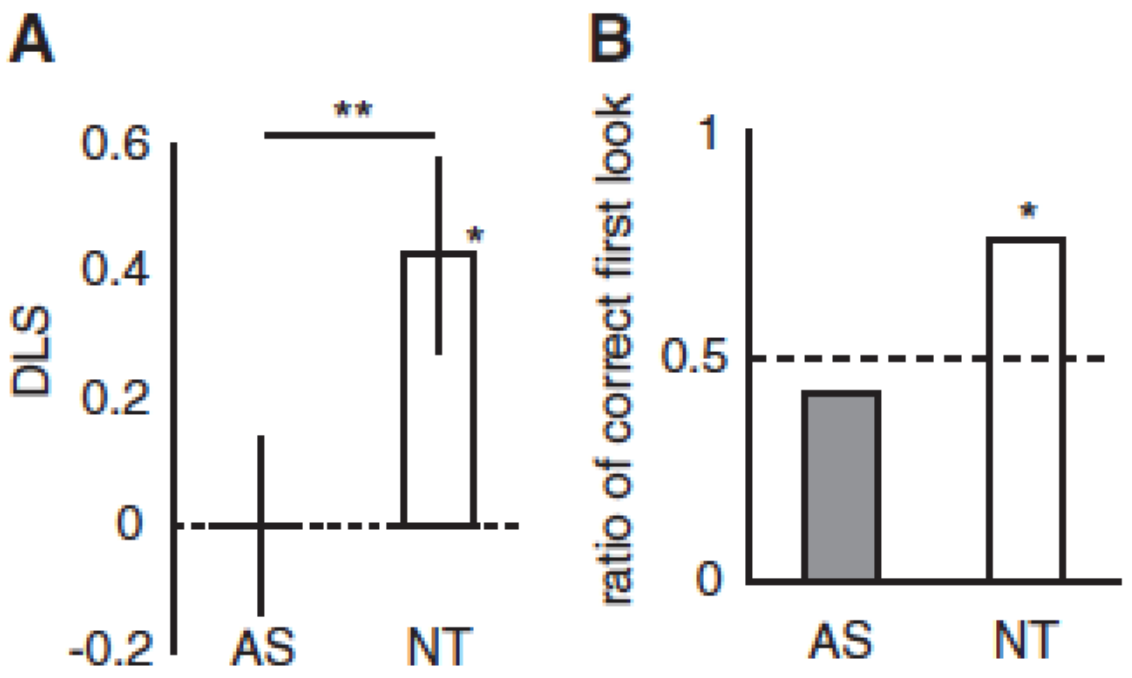


Fig. 2. (A) Mean (± SEM) DLS (*19*) and (B) the ratio of the number of participants who made correct first saccades in each group. AS, participants with Asperger syndrome ($n = 19$); NT, neurotypical participants ($n = 17$). *$P < 0.05$; **$P < 0.01$. Dotted lines indicate chance level. Statistical test used: (A), *t* test; (B), binominal test.

Taking stock

- Okay, so HFASD children aren't really that bad at *explicit ToM* at all!!
- In fact, once they can pass the FB test, and assuming they have normal IQ, they are equally as good as TD children
- So, what is going on? Implicit deficit in HFASD?
- Well, actually, this looks plausible – but it creates a huge headache explaining explicit ToM!!

Taking stock: summary

- Apes are pretty sophisticated, they have many of the precursor skill of ToM (mirror-self recognition, joint attention, perhaps also social referencing)
- However, apes fail explicit false-belief understanding tasks (fruit in the buckets)
- Perhaps apes just lack language? And this is the bridge between their social cognition and a truly mentalistic understanding of mind?

Taking stock: summary

- Apes are pretty sophisticated, they have many of the precursor skill of ToM (mirror-self recognition, joint attention, perhaps also social referencing)
- However, apes fail explicit false-belief understanding tasks (fruit in the buckets)
- Perhaps apes just lack language? And this is the bridge between their social cognition and a truly mentalistic understanding of mind? NO
- This language hypothesis doesn't really seem to cut it
- HFASD kids have good explict ToM and poor implicit ToM – how can this be?

But wait…

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MINI-REVIEW

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Eye tracking uncovered great apes' ability to anticipate that other individuals will act according to false beliefs

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ABSTRACT

Using a novel eye-tracking test, we recently showed that great apes anticipate that other individuals will act according to false beliefs. This finding suggests that, like humans, great apes understand others' false beliefs, at least in an implicit way. One key question raised by our study is why apes have passed our tests but not previous ones. In this article, we consider this question by detailing the development of our task. We considered 3 major differences in our task compared with the previous ones. First, we monitored apes' eye movements, and specifically their anticipatory looks, to measure their predictions about how agents will behave. Second, we adapted our design from an anticipatory-looking false belief test originally developed for human infants. Third, we developed novel test scenarios that were specifically designed to capture the attention of our ape participants. We then discuss how each difference may help explain differences in performance on our task and previous ones, and finally propose some directions for future studies.

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KEYWORDS
anticipatory look; eye-tracking; false belief; great ape; theory of Mind

- Evidence of false-belief tracking in apes using an implicit measure (eye-tracking)
- 15 month-old infants and great apes demonstrate implicit false belief understanding
- By 4 years old, children can start to pass explicit false-belief tasks
- Apes do not pass explicit false belief tasks
- Individuals with HFASD can learn to pass explicit false-belief tasks (including sophisticated ones) but children with HFASD do not demonstrate implicit false belief.

Links

- Kanzi
  https://www.youtube.com/watch?v=dBUHWoFnuB4