

The Development of Cognition within an Evolutionary Framework



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Reader in Psychology



Comparative
Cognition
Group

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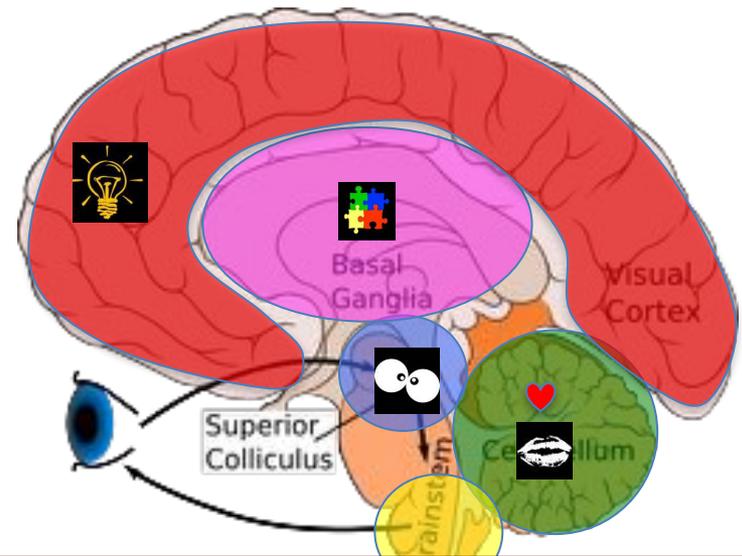
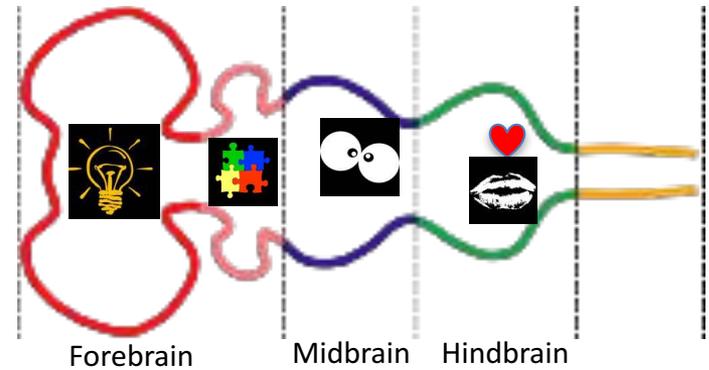
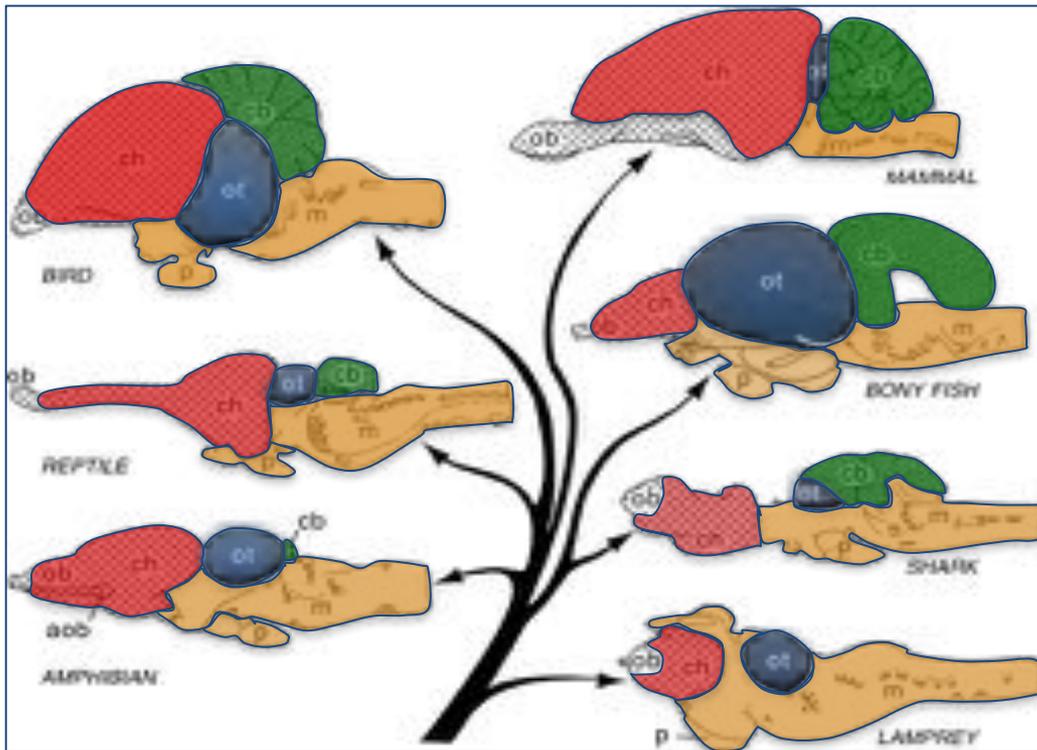
In the same spirit, we can tell you that Dr. Gilly Forrester, who many of you may remember was with us last year for nine months, gave birth to her second daughter, Edie at the end of September. Congratulations to Gilly, Neil and Scarlett!



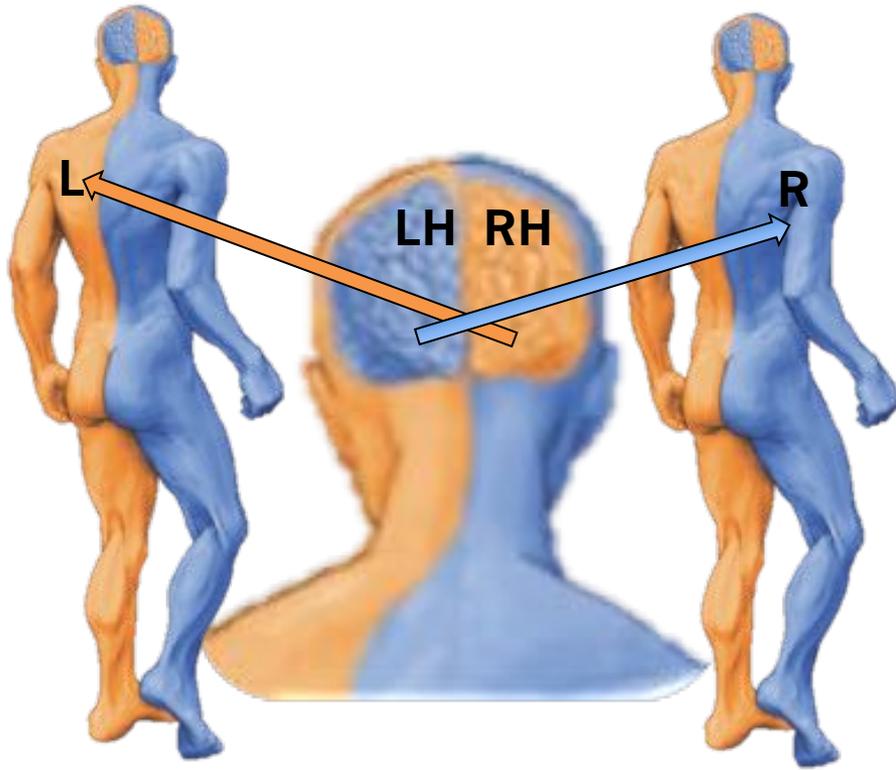
Edie Forrester



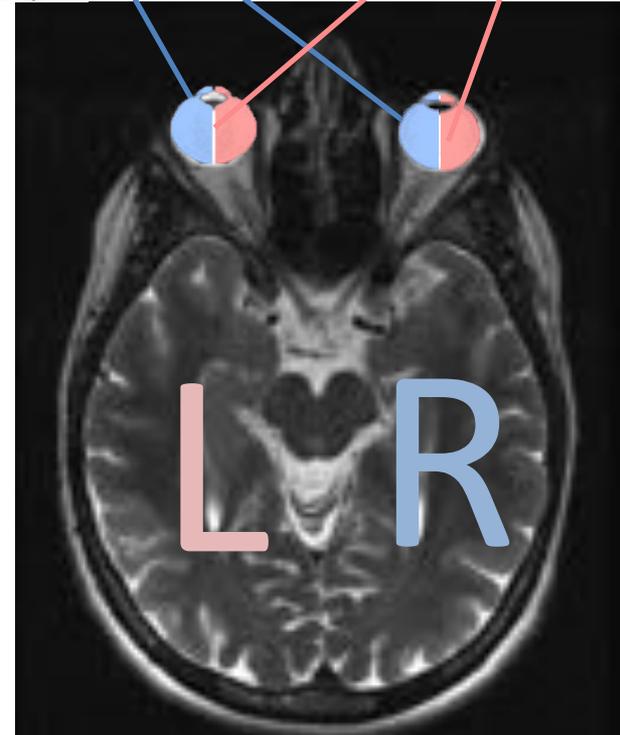
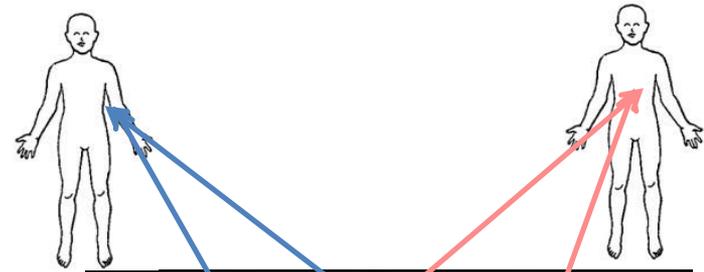
Vertebrate Brain



Motor Control

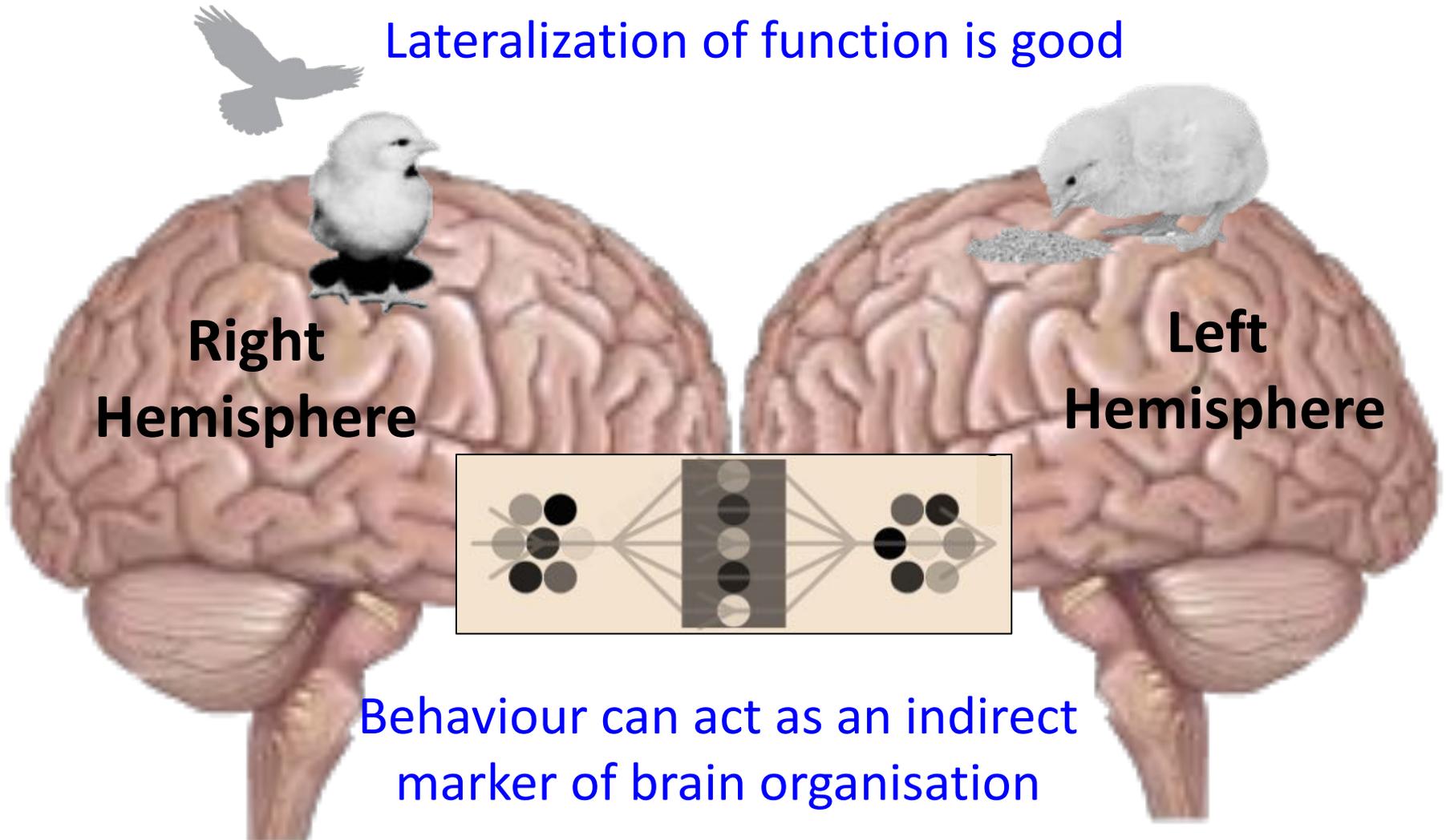


Contralateral



Cerebral Lateralization

Lateralization of function is good



Behaviour can act as an indirect marker of brain organisation

Human Cognition



Perceiving Social Behaviour



Perceiving Social Behaviour



Perceiving Social Behaviour



FIGURE 2 | Examples of emotional/neutral stimuli face stimuli; people tend to select the image in which emotion is presented in the left visual field (A) as more expressive than the identical image

Social Gaze Behaviour



Di Santa et al., 2001



Bisazza et al., 1996



Bonati et al., 2013



Nagy et al., 2010



Vallortigara and Andrew, 1991



Karenina et al., 2010



Hook-Costigan & Rogers 1998



Wallez & Vauclair 2011



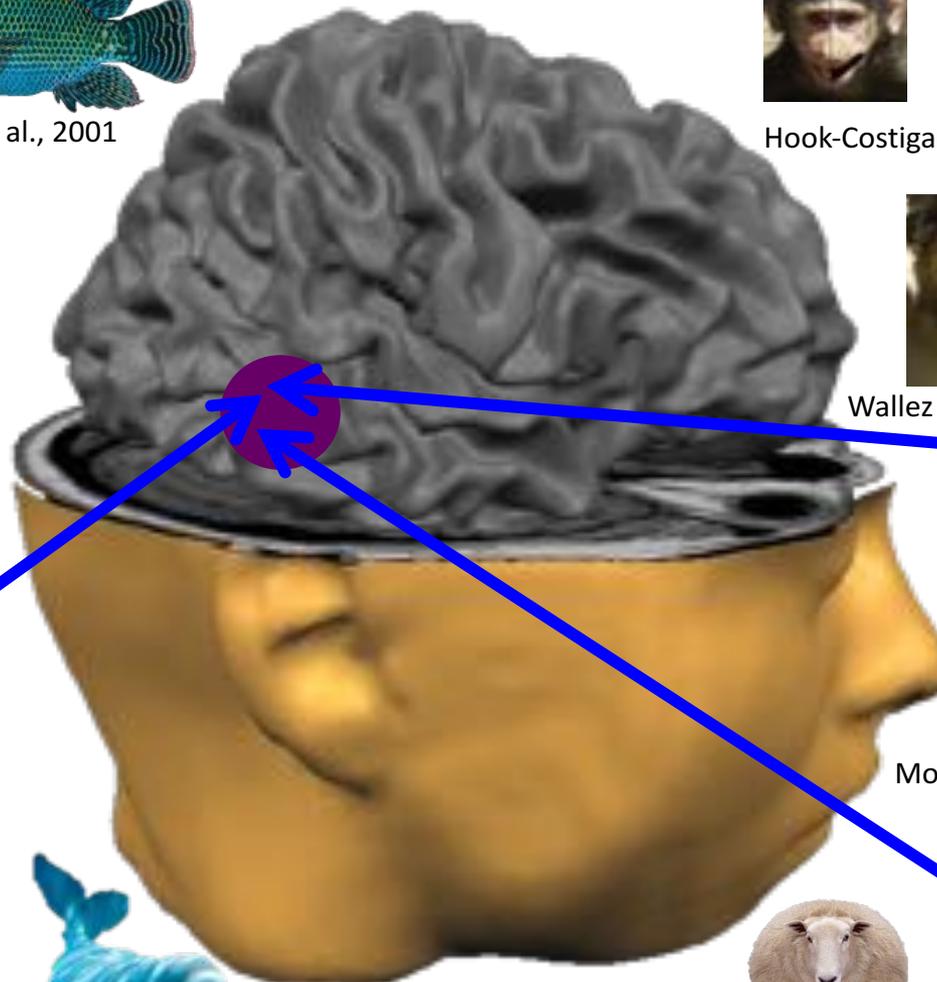
Morris & Hopkins 1993



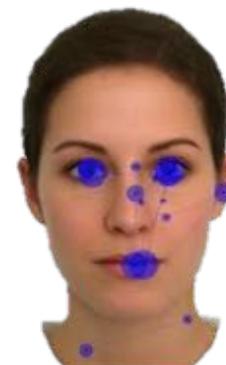
Peirce et al., 2000



Guo et al., 2000



Right Hemisphere
Fusiform Face Area

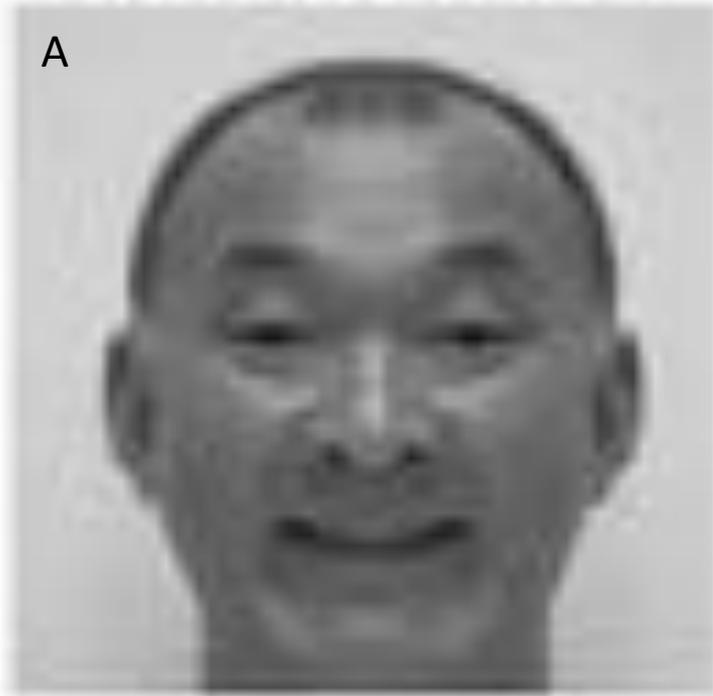


Kanwisher et al. 1997

Producing Social Behaviour



Left-left Composite



Right-right Composite

FIGURE 1 | Examples of mirrored chimeric face stimuli; people tend to select the left-left chimeras as showing stronger emotion than the right-right chimeras (Reprinted from Otsuka et al., 2013, Copyright with permission from Elsevier).

Producing Social Behaviour



Quaresmini, Forrester, Spiezio & Vallortigara 2014
Forrester, Crawley & Palmer 2014



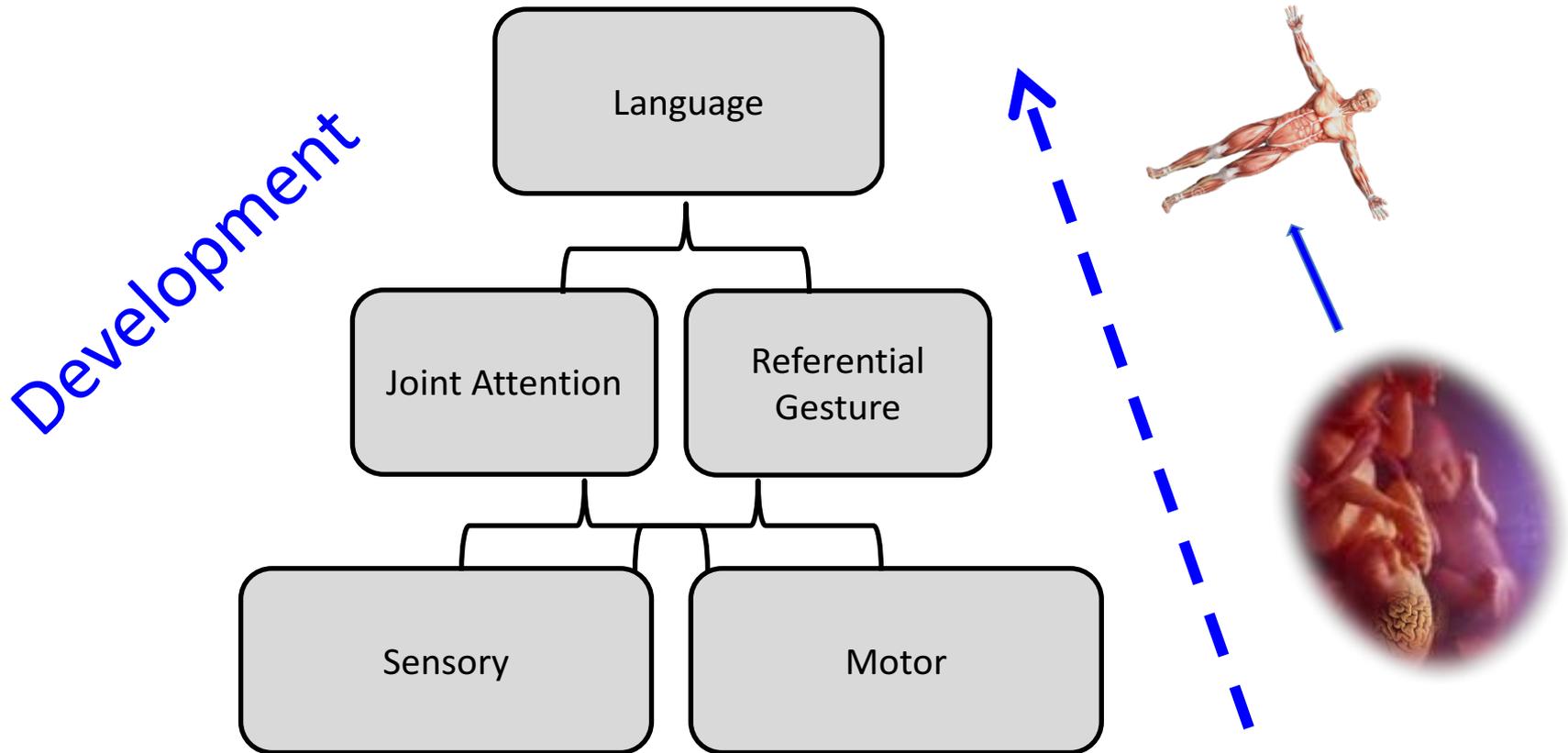
Karenina et al. 2017
Giljov et al. 2018

So What?

In animals good brain biases is linked with good physical fitness...
in humans are brain biases linked with cognitive fitness?

Cognitive Development

Cognitive abilities scaffold from early sensory motor abilities

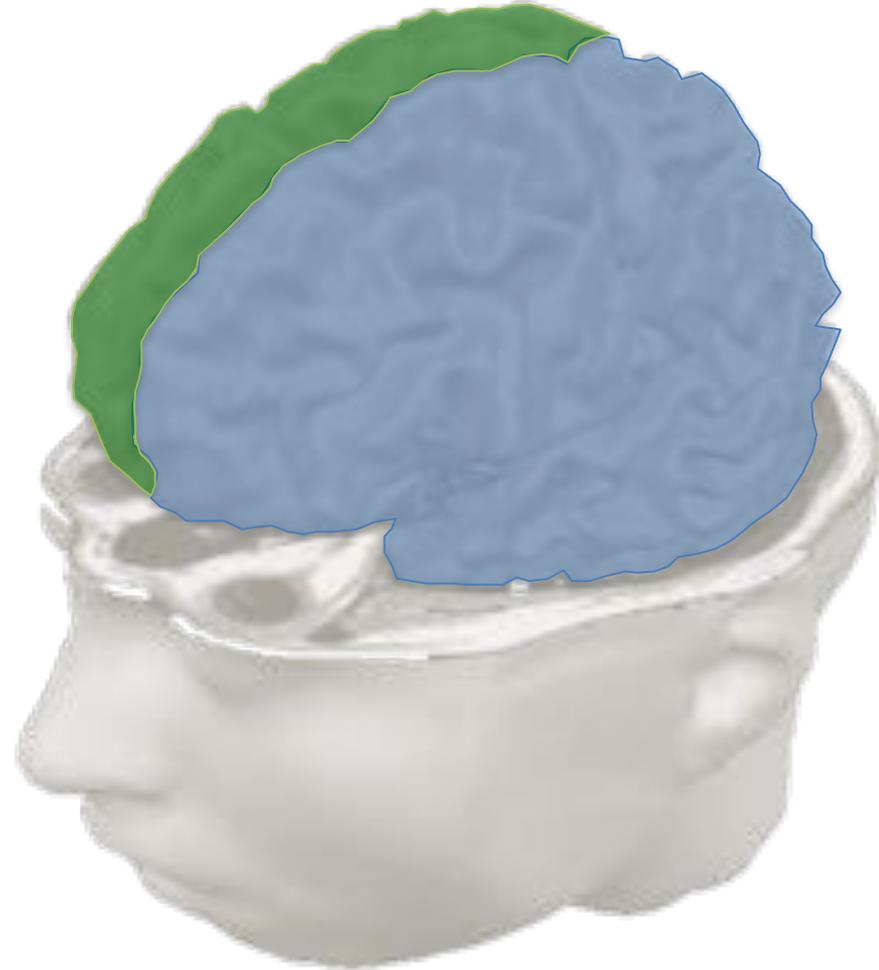


Neoconstructivist View

Karmiloff-Smith 2009; 2012

Brain Function Biases

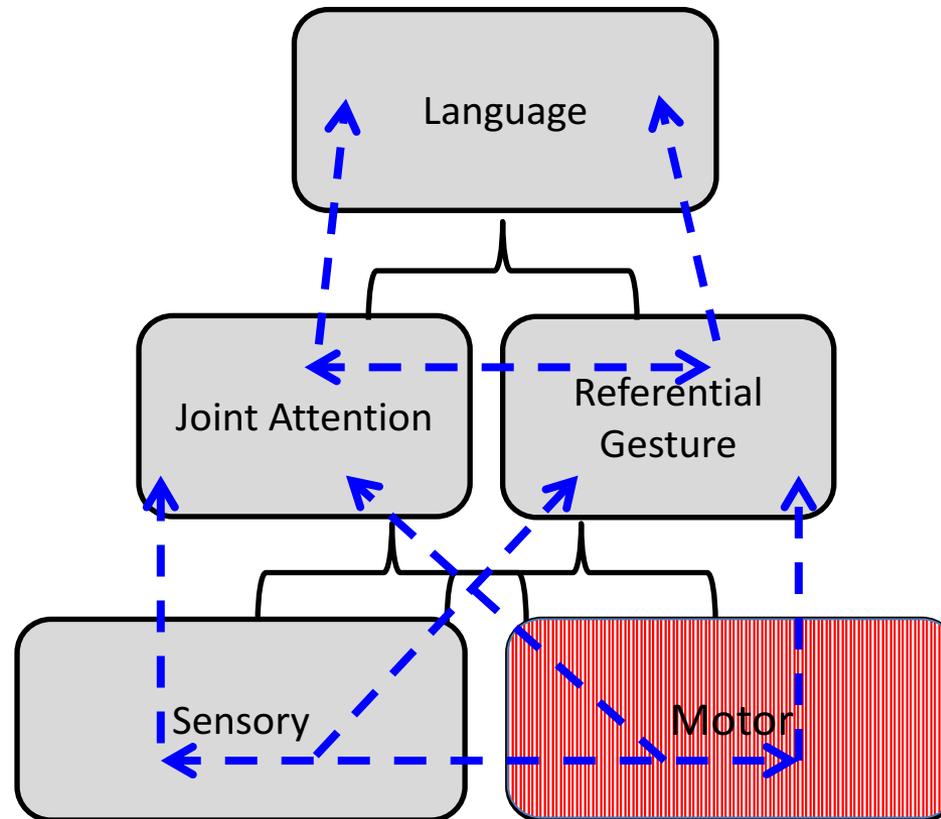
- Cerebral lateralization appears very early in typical populations
- Glasel et al., 2011; Kaspran et al., 2011



Atypical Development

Structural and functional imaging studies suggests brain biases are disrupted in autism

(Floris et al. 2015; 2016)



If biases fails to develop...

it may have knock-on effects to the development of specialized functional processes

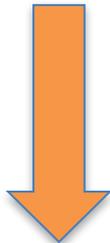
Neoconstructivist View

Karmiloff-Smith 2009; 2012

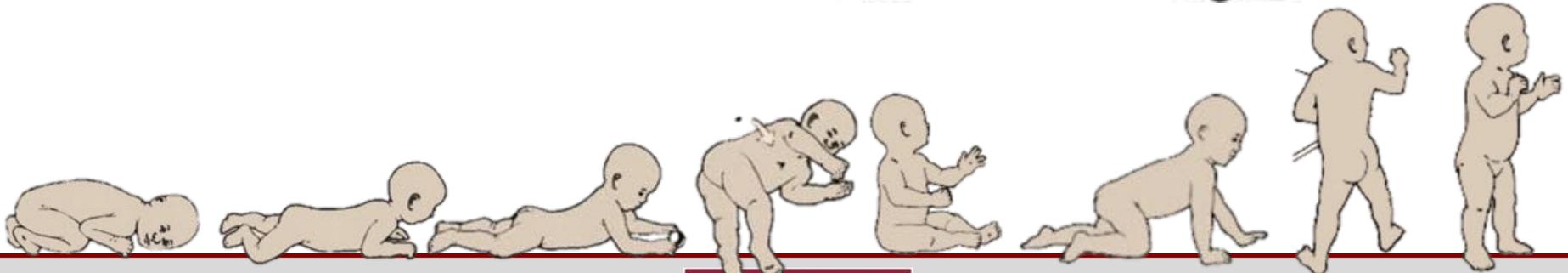
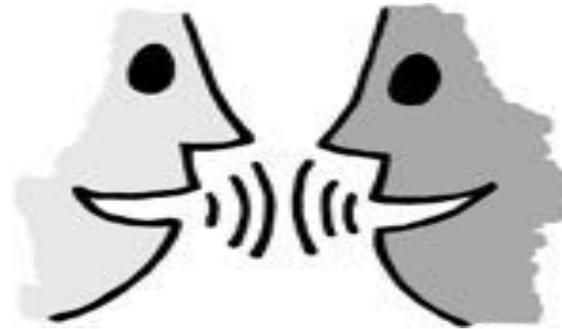
Motor Development



Cerebral
Lateralization



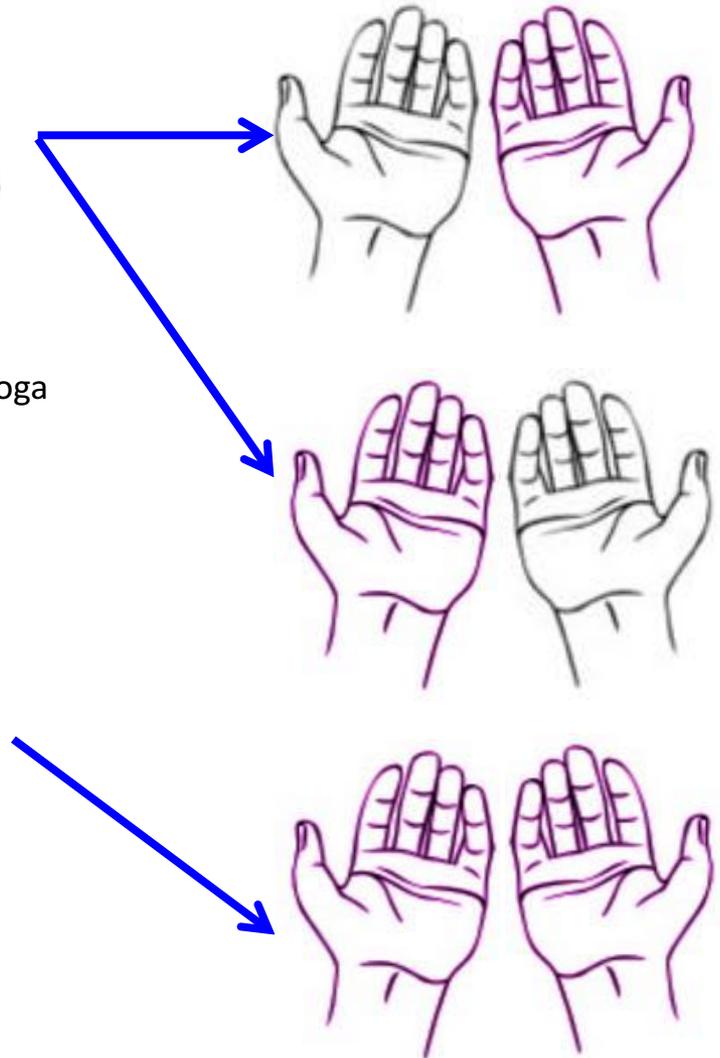
Cognitive
Attainment



Manual Lateralization

- Strong laterality (right or left) indicates typical = earlier language acquisition (Toga & Thompson 2003)

- Reduced lateralization (mixed-handedness) = impaired cognitive function (Rodriguez et al. 2010; Forrester et al. 2014)



Neurtypical Holding Behaviour

Baby Doll



Female Left*	Male Left
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Face Pillow



Female Left*	Male Left
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No Face Pillow



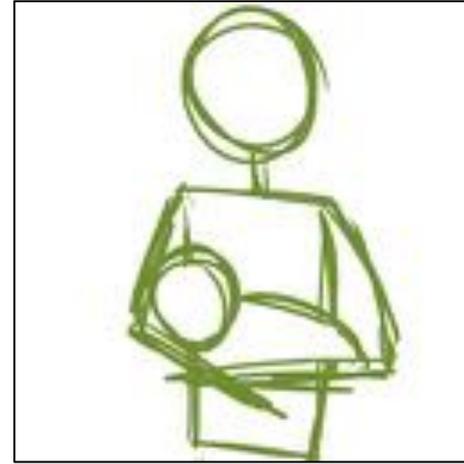
Female NS	Male NS
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Forrester et al. 2019: *Cortex*

Side of holding biases are present and visible in young children
Holding bias requires a face – but most basic prototypic face will suffice

Neurtypical Holding Behaviour

Left side advantage



Forrester et al. 2019: *Cortex*

- Girls and boys displayed similar holding patterns
- No effect of age or experience of holding babies
- Left side holders had significantly higher social scale scores compared with right side holders

Autsim Holding Behaviour

Baby Doll



Female NS	Male Right*
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Face Pillow



Female NS	Male NS
--------------	------------

No Face Pillow



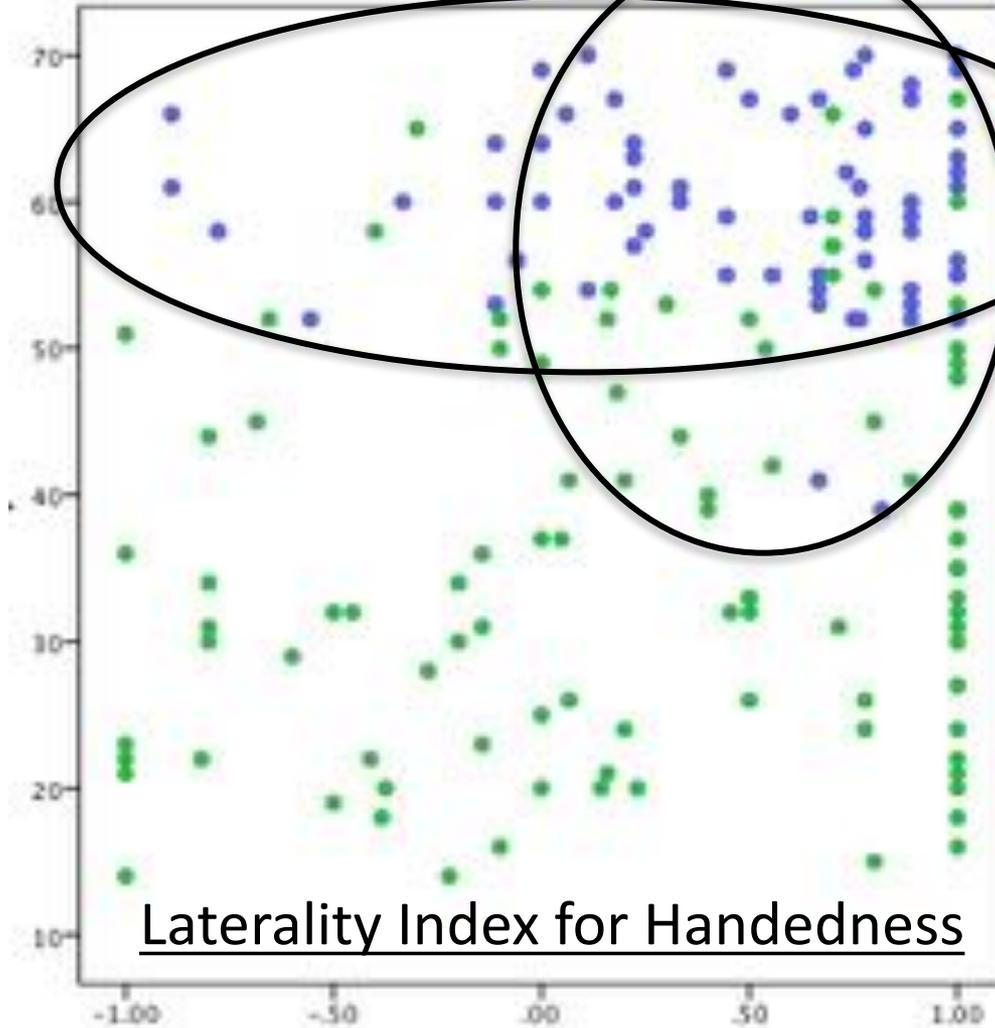
Female NS	Male NS
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Side of holding biases diminishes or reverses in children with ASD

Forrester et al. 2020a invited (*Scientific Reports*)

Strength of Bias

Cognitive Scales Score



Laterality Index for Handedness



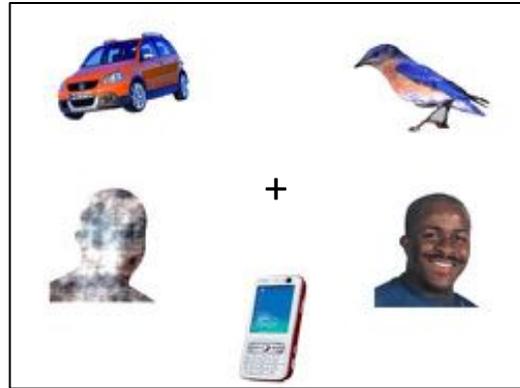
PHOENIX PRIMARY AND SECONDARY SCHOOL

jigsaw school.



St Martin's Garden
PRIMARY SCHOOL

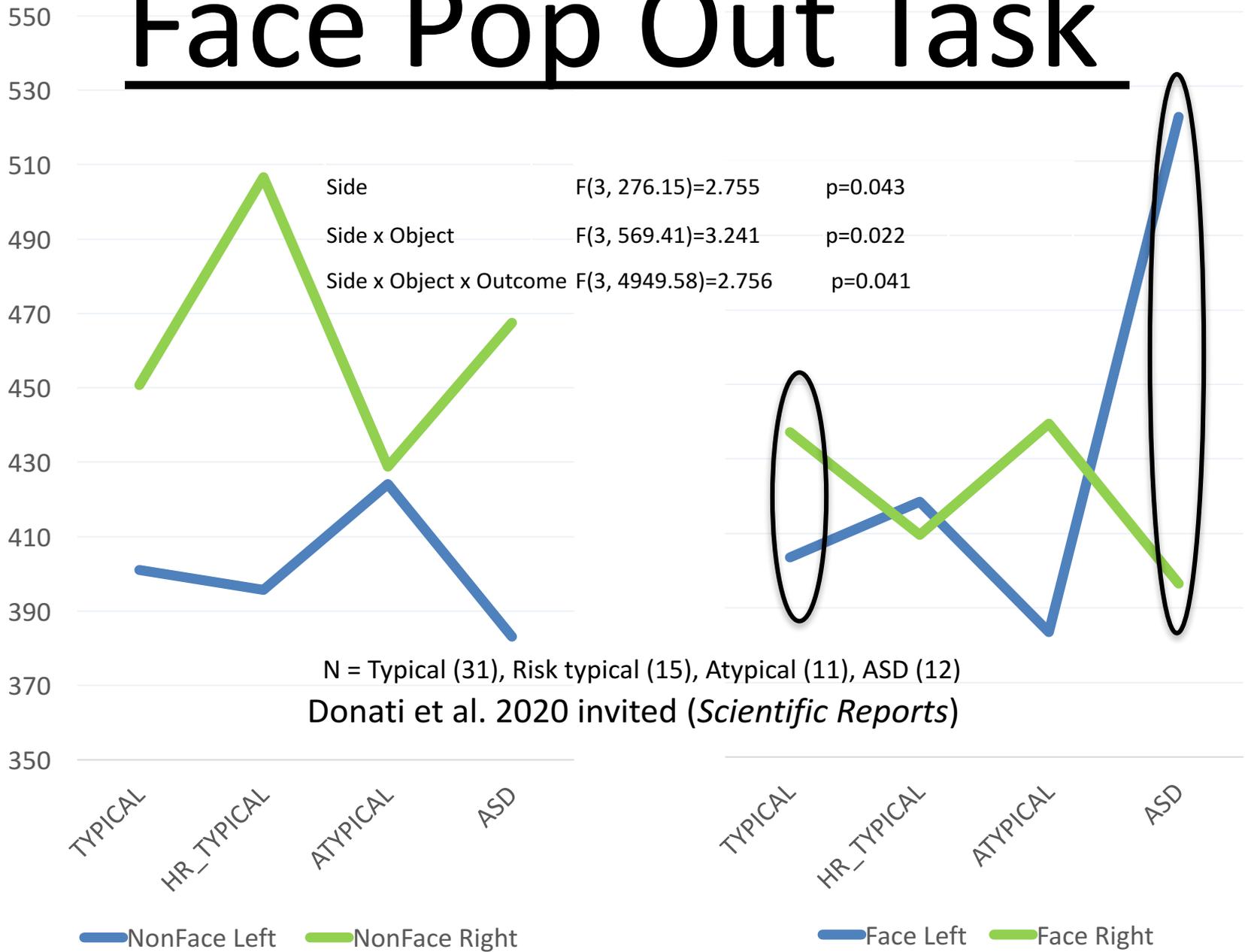
Face Pop Out Task



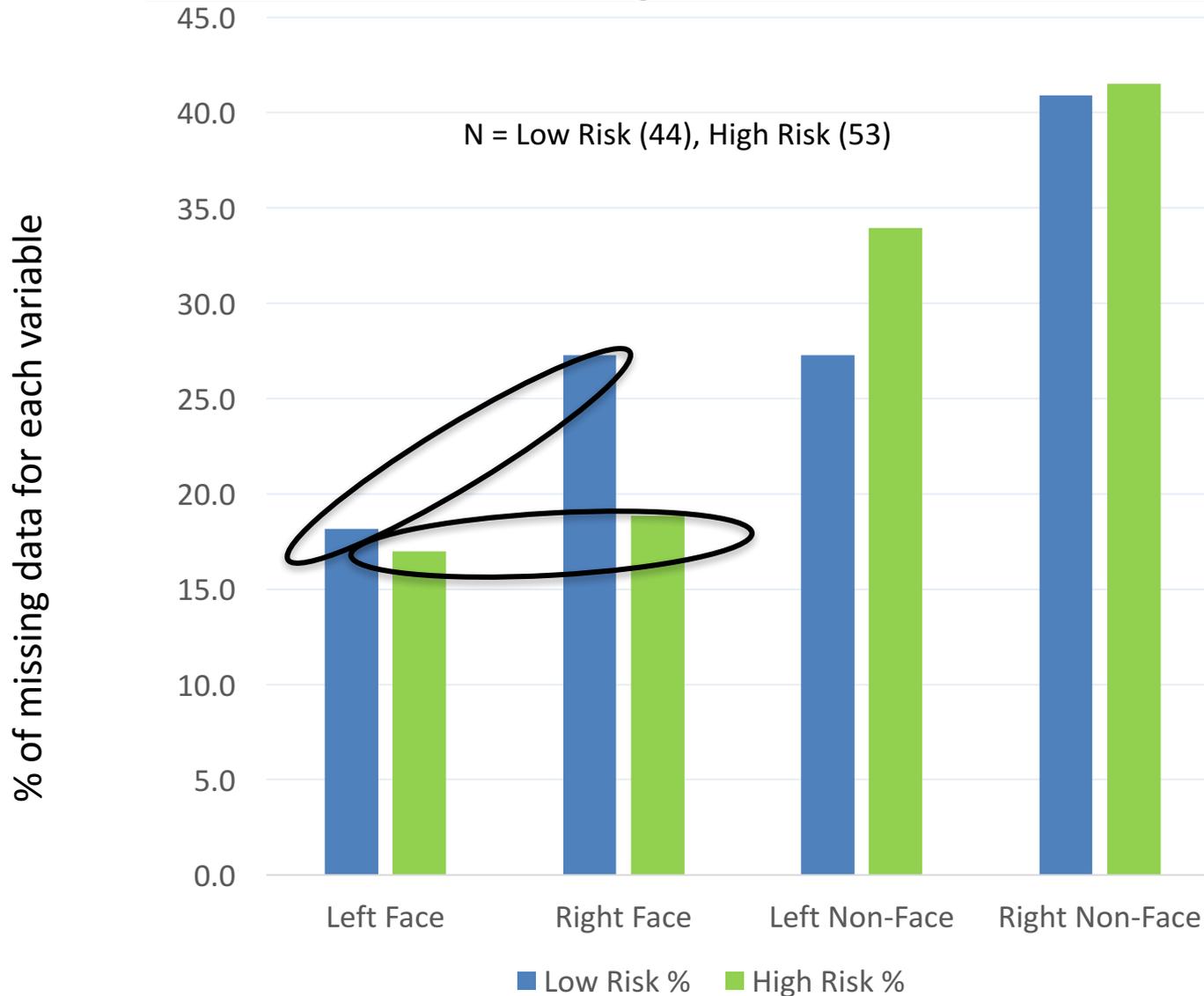
Low and High Risk Infants: 6 Months

Face Pop Out Task

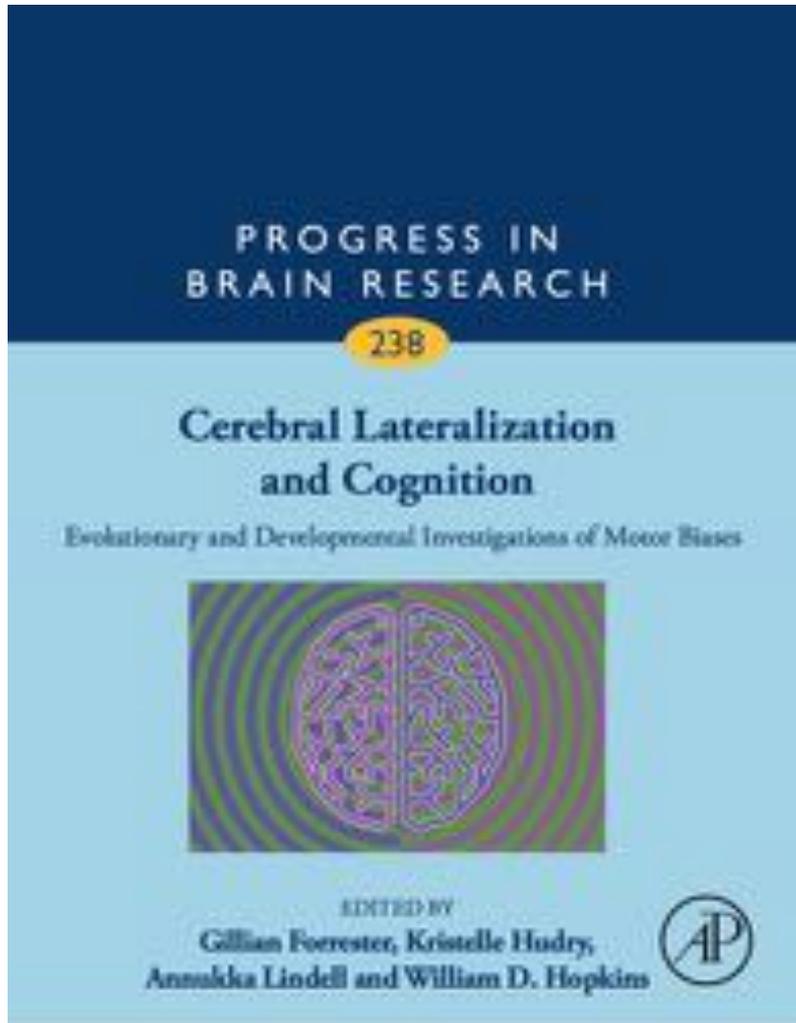
First Look Fixations in Milliseconds



Face Pop Out Task



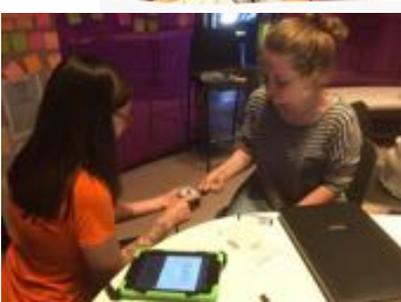
What Next?



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Going Forward

- Behavioural biases are evolutionarily old, but preserved in modern humans and present and observable early infant development
- The abnormal visual-motor bias response may be visible well before the cognitive signs of autism are detected.
- Behavioural markers of brain organisation/function risk



thewaterloofoundation*



ME, HUMAN



@Me__Human
www.mehuman.io



Hand to Mouth

The Role of Tool-Use in the Evolution & Development of Language



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Cognition
Group

LEVERHULME
TRUST



AN INTERACTIVE SCIENCE EVENING ABOUT HOW OUR ANCIENT BRAIN COPY IN THE MODERN WORLD

PSYCHED!



'Blah Blah Blah'

The Evolution of Language

28th November 2019

6:30-8:30pm

'I Fancy Your Friend'

The Evolution of Lust

13th February 2020

6:30-8:30pm

'Let's Talk about Sex'

(Differences)

The Evolution of Language

26th March 2020

6:30-8:30pm

Book Now: www.mehuman.io/psyched

PSYCHED! Is part of the *Me, Human* Project

City Lit's John Lyon's Theatre, Covent Garden, Tickets £9 (beverage included)



DR GILLIAN FORRESTER

Dr Forrester keeps company with gorillas and small children, studying how our minds and behaviour have evolved.



DR NATASHA KIRKHAM

Dr Kirkham studies how children learn – especially in the hurly-burly of the world outside the classroom.

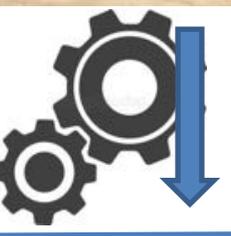
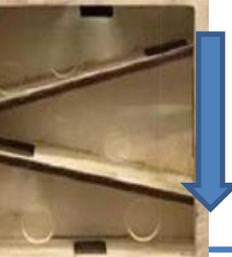
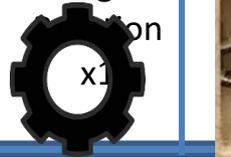
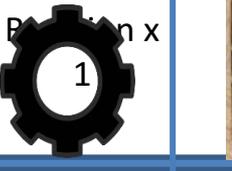
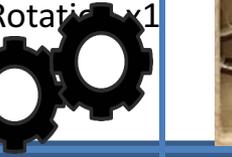


DR SIMON GREEN

Dr Green is a famously popular psychology lecturer with an interest in anxiety, fear and drugs (among many other things).

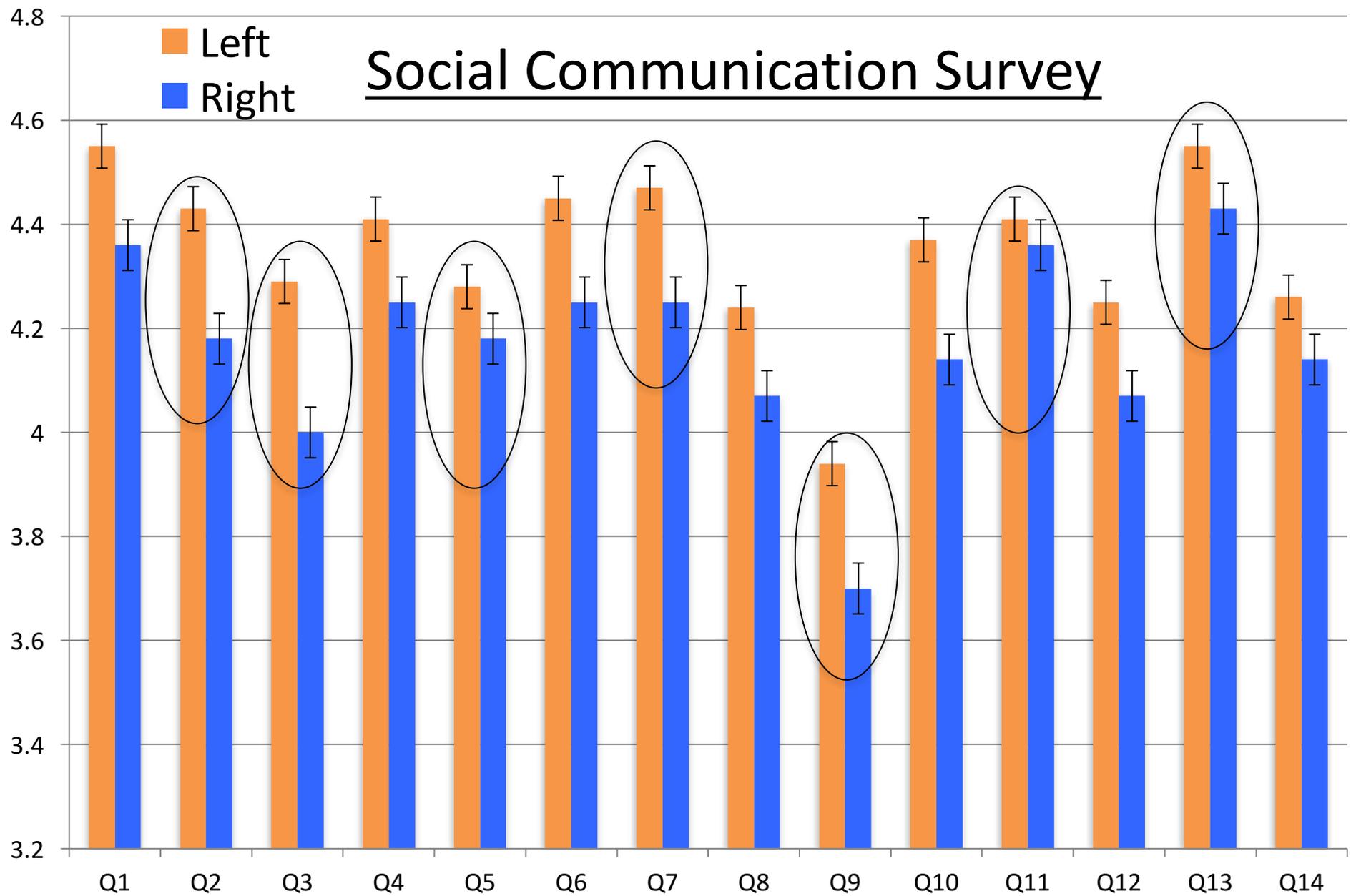
city lit

 **Birkbeck**
UNIVERSITY OF LONDON

	<p>Simple Finger Maze</p>		<p>Simple Tool Maze</p>		<p>Simple Meta-tool Maze</p>	
	<p>Recursion finger x3</p>		<p>Recursion tool x3</p>		<p>Recursion x3</p>	
	<p>Finger Trap Seesaw Maze</p>		<p>Tool Trap Seesaw Maze</p>		<p>Meta-tool Trap Seesaw Maze</p>	
<p>Simple Finger Rotation x1</p> 	<p>Finger Trap</p> 	<p>Simple Tool Rotation x1</p> 	<p>Tool Trap</p> 	<p>Simple Meta-tool Rotation x1</p> 	<p>Meta-tool Trap</p> 	

Social Communication Survey

Left
Right



Babylab Kids

