

Rare Moments of Tango. Dyadic Attention During Infant- Parent Interactions

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Instytut Psychologii
Polska Akademia Nauk



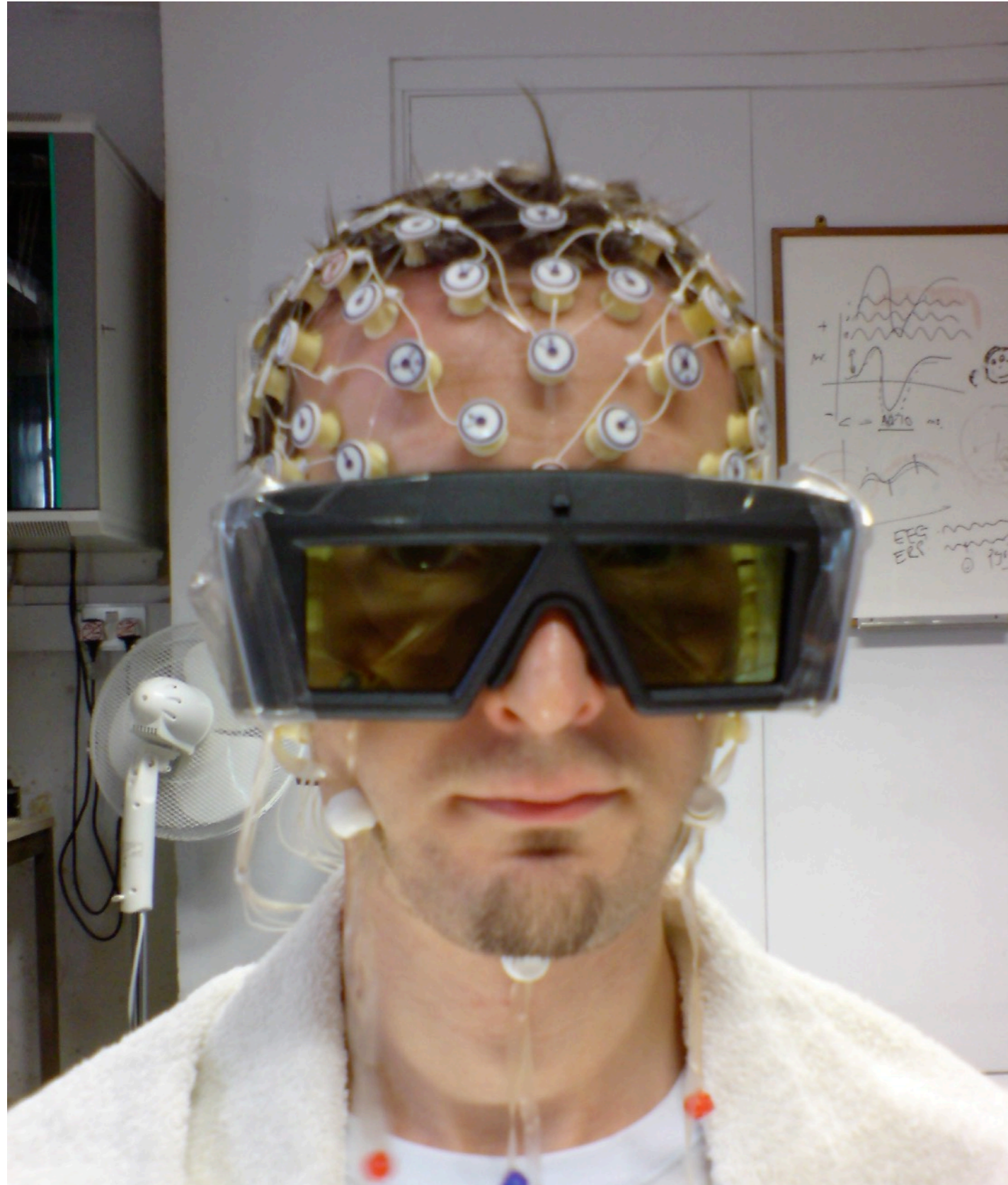
My time at CBCD (2005-2008)



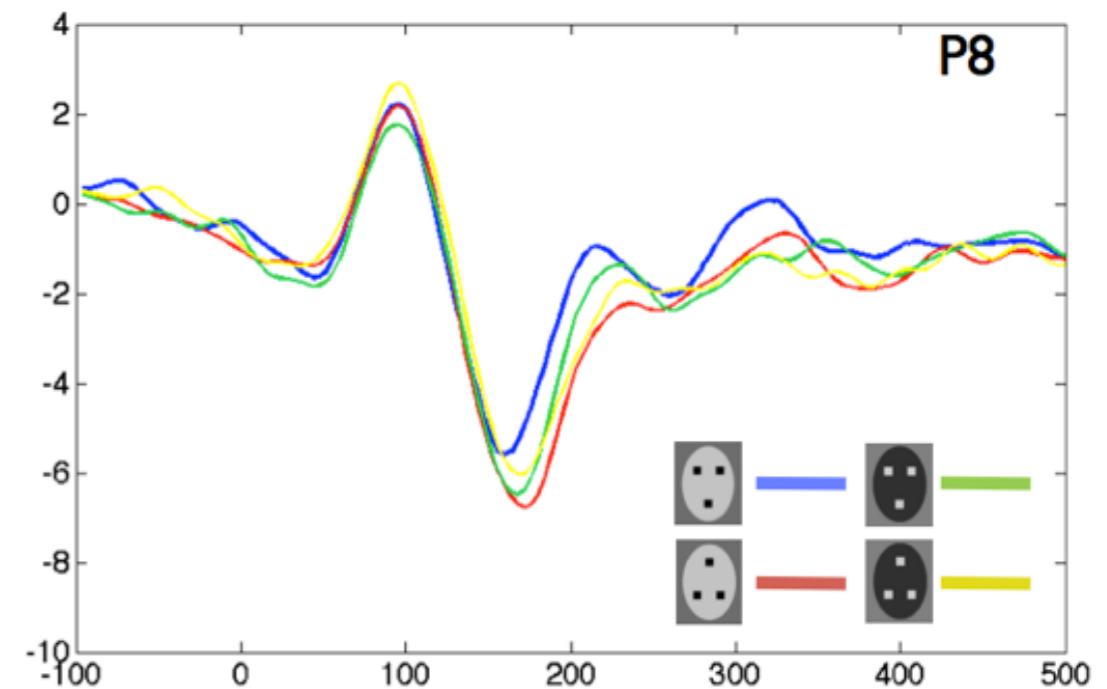
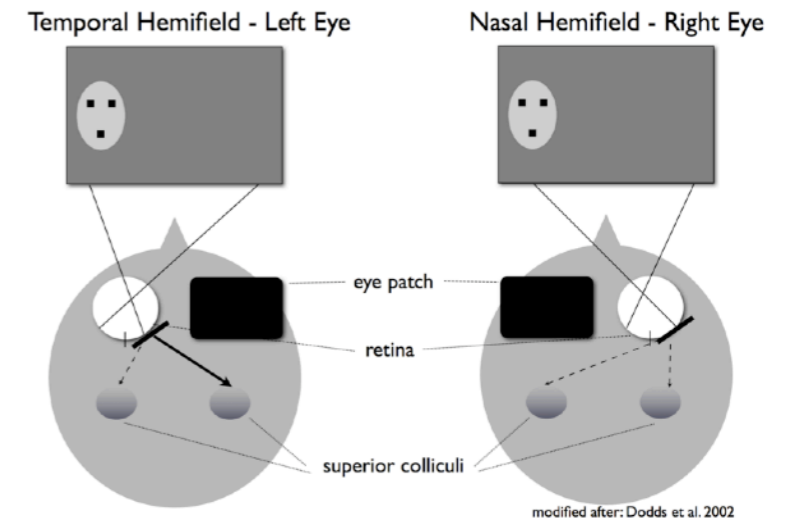
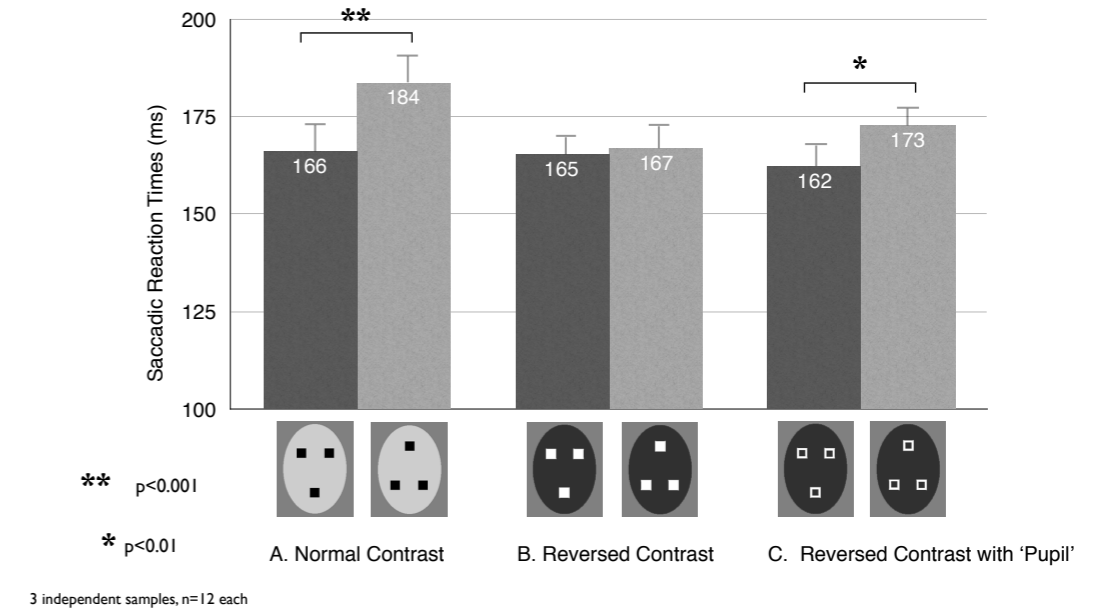
Frontal cortex development
↓
Rapid object recognition
↓
Subcortical face processing



PhD: Rapid orienting to faces and its neural basis



Experiment I: Orienting to Schematic Faces in Adults - the Role of Contrast Polarity





JPS Amsterdam 2007





Przemek, you are the project!



CBCD & UEL (2009-2012)
join forces to study SES and
neurocognitive dev

Institute for Research in Child Development



The ELAS study of early language, attention and social development in babies.

“Hello babies!”

هيا بيا بيا

“Convidamos todos os bebés!”

„Zapraszamy wszystkie niemowlęta!”

Εἰσαίτερες βρέφη

«Приглашаем всех малышей!»

مرحبا الرضع

INSTITUTE FOR RESEARCH IN CHILD DEVELOPMENT



University of East London
School of Psychology
Romford Road
Stratford E15 4LZ



We are finding out how to help children reach their full potential.

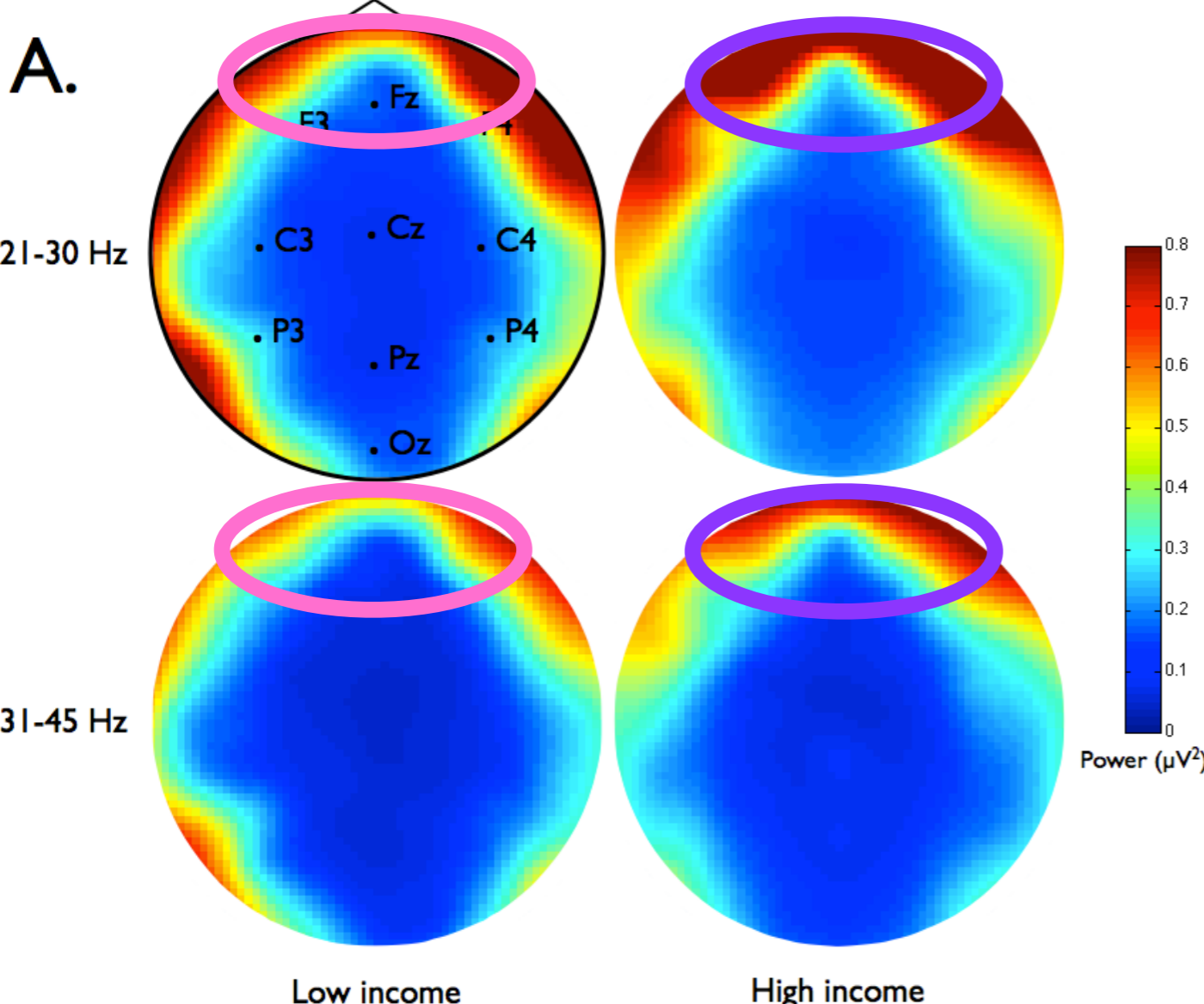
To take part in the study call
020 8223 4951

elas@uel.ac.uk
www.uel.ac.uk/IRCD/babylab

You will receive a £10 gift token each time you visit us and we will cover your travel expenses.

All procedures have been approved by the ethics committee of the University of East London
Version 1.0 (Feb 2009)

Family SES and neurocognitive development



Household income (also maternal occupation) predict frontal gamma

(linear regression)
 21-30 Hz, $R^2=.239$, $p = .002$
 31-45 Hz, $R^2=.228$ $p = .002$

Developmental Science

Developmental Science 16:5 (2013), pp 676-687 DOI: 10.1111/desc.12079

PAPER

Socioeconomic status and functional brain development – associations in early infancy

Przemyslaw Tomalski,^{1,3} Derek G. Moore,¹ Helena Ribeiro,^{1,2} Emma L. Axelsson,¹ Elizabeth Murphy,¹ Annette Karmiloff-Smith,² Mark H. Johnson² and Elena Kushnerenko¹

Infant Behavior and Development 57 (2019) 101384



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Infant Behavior and Development

journal homepage: www.elsevier.com/locate/inbede



Gamma power and SES replicated & predicts language

Oscillatory gamma activity mediates the pathway from socioeconomic status to language acquisition in infancy

Chiara Cantiani^{a,*}, Caterina Piazza^b, Giulia Mornati^a, Massimo Molteni^a, Valentina Riva^a

^a Scientific Institute, IRCCS E. Medea, Child Psychopathology Unit, Bosisio Parini, Lecco, Italy

^b Scientific Institute, IRCCS E. Medea, Bioengineering Lab, Bosisio Parini, Lecco, Italy



TALBY Project



Infant eye-tracking in the community

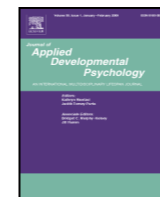
1. Predicting language at 24 mo with 6 mo ET data (soc cog, speech)
2. Attention training in low SES 12 mo infants

Infant and Child Development
Inf. Child. Dev. (2015)
Published online in Wiley Online Library
(wileyonlinelibrary.com). DOI: 10.1002/icd.1914



Contents lists available at ScienceDirect

Journal of Applied Developmental Psychology



Applying gaze-contingent training within community settings to infants from diverse SES backgrounds☆☆☆



Haiko Ballieux^{a,*}, Sam V. Wass^b, Przemyslaw Tomalski^{a,2}, Elena Kushnerenko^a, Annette Karmiloff-Smith^c, Mark H. Johnson^c, Derek G. Moore^{a,3}

Brief Report

Feasibility of Undertaking Off-Site Infant Eye-Tracking Assessments of Neuro-Cognitive Functioning in Early-Intervention Centres

Haiko Ballieux^{a,b}, Przemyslaw Tomalski^c,
Elena Kushnerenko^b, Mark H. Johnson^d,
Annette Karmiloff-Smith^d and Derek G. Moore^{b,e,*}

Journal of Vision (2018) 18(13):5, 1–17

1

Beyond fixation durations: Recurrence quantification analysis reveals spatiotemporal dynamics of infant visual scanning

David López Pérez

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Alicja Radkowska

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University of Warsaw, Poland

Joanna Rączaszek-Leonardi

Faculty of Psychology, University of Warsaw, Poland

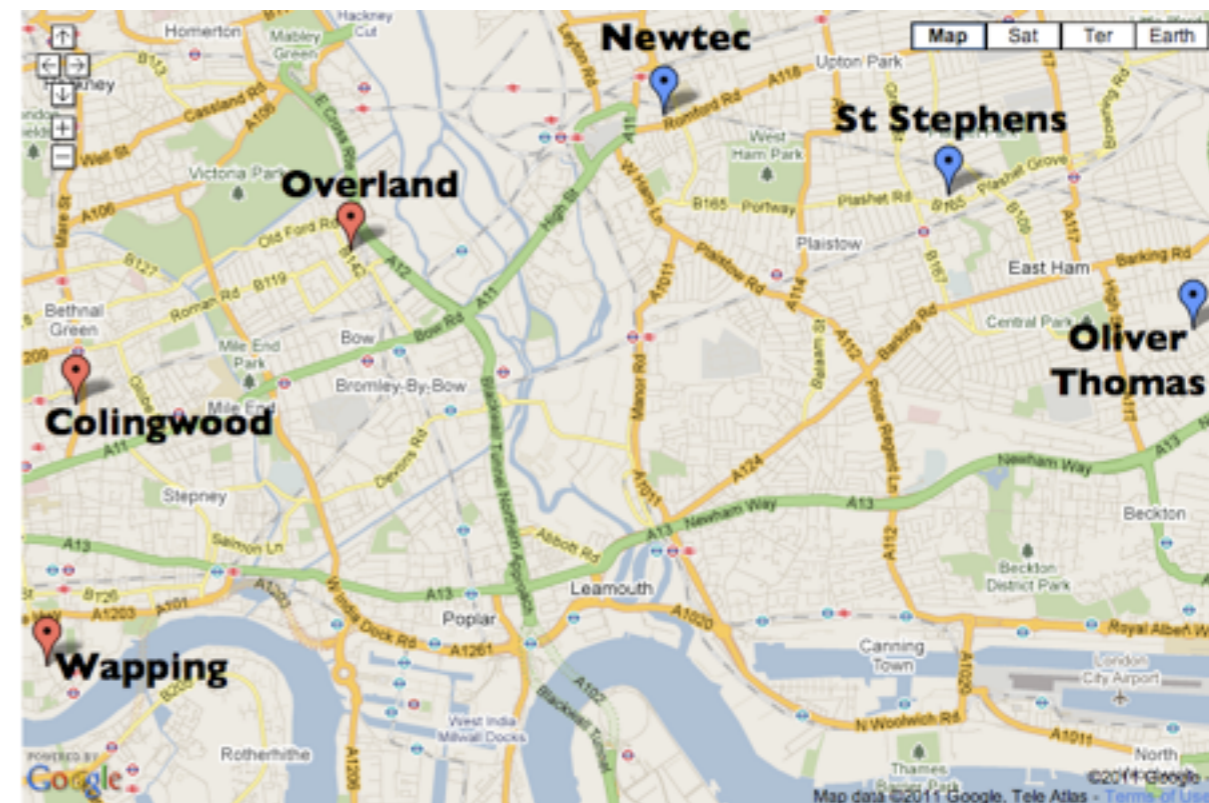
Przemysław Tomalski

Neurocognitive Development Lab, Faculty of Psychology,
University of Warsaw, Poland



The TALBY Study Team

TALBY Study Team: Haiko Ballieux, Elena Kushnerenko,
Mark. H. Johnson, Annette Karmiloff-Smith, Deirdre
Birtles & Derek G. Moore



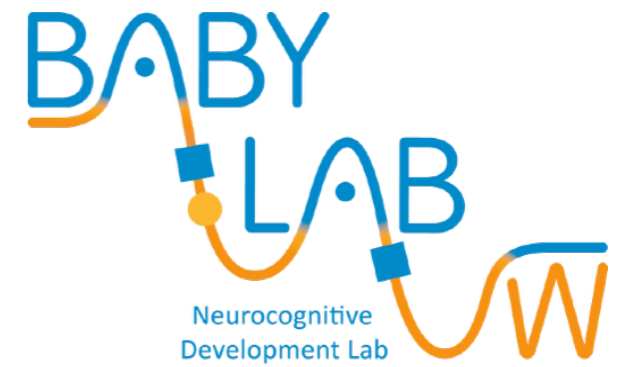


Back to Poland (2012) - setting up the first babylab in the country



Neurocognitive Development Lab

BabyLab UW



Occasionally Teresa sends her students for work experience...



We all know that social interactions in infancy are important for development across domains, but why?

We need to investigate the mechanisms

Does coordinated behaviour of the infant and the caregiver during interactions shape attention skills of the infant?

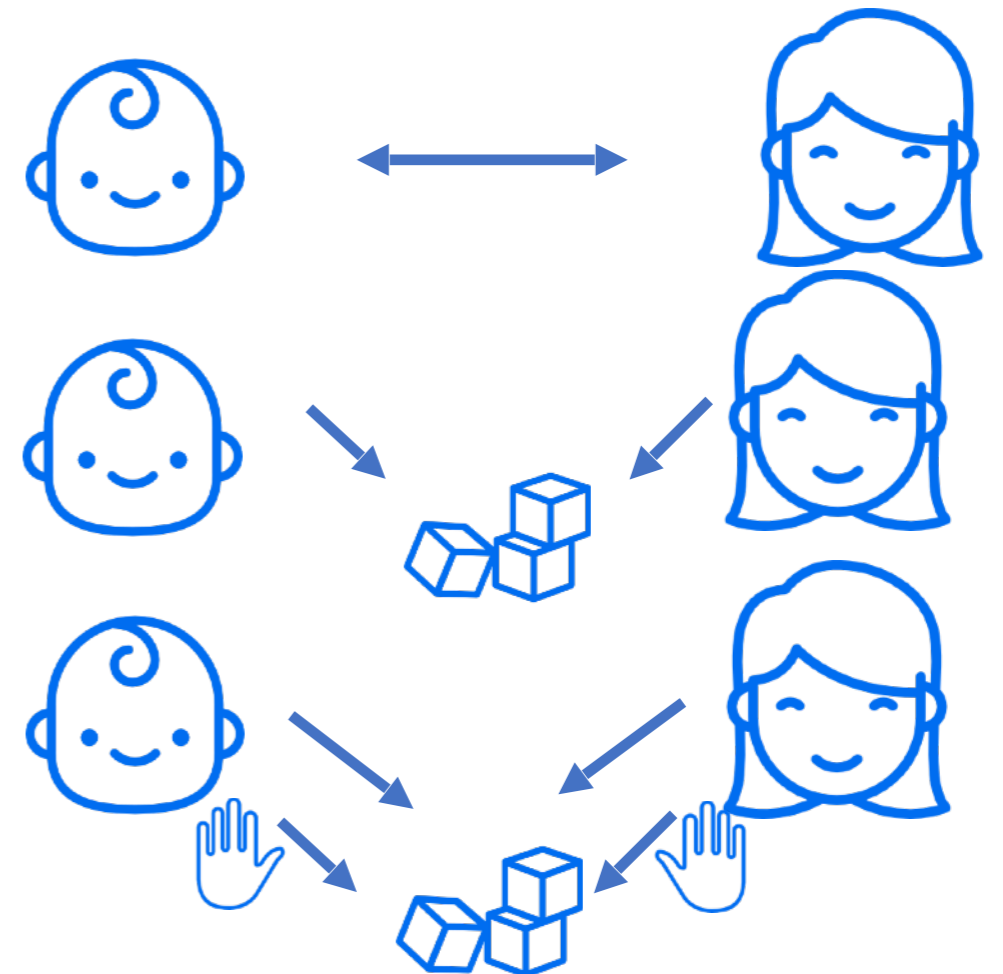
Role of early eye contact in development



- **Social communication** (Tronick, 1989; Jaffe i in., 2001; Lavelli i Fogel, 2005; Senju & Csibra, 2008; Csibra i Gergely, 2009, 2011; Gliga i Csibra, 2007)
- **BUT alternative ways of achieving JA** (hand-eye coordination, Yu & Smith, 2013)
- **Approach-related cue** (e.g. Hietaten et al., 2008)
- **Affiliative functions** (e.g. Heyes, 2015)
- **Emotion regulation** (np., Feldman 2007; MacLean i in., 2014)
- **Early sharing of the object of attention between infant and parent** (Reddy, 2003; 2011)
- **Motivation for learning** (Weiner, 2011)

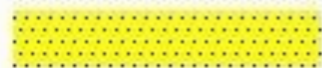
CODING SCHEME: Dyadic Codes

- **Mutual face to face gaze:** Both the parent and the infant are looking at the other person's face, involves eye contact
- **Parallel attention:** Parent and infant are simultaneously looking at the same object, person or event
- **Parallel attention and action:** Parent and infant are looking at the same object (or a group of objects), while touching, holding, moving, manipulating or animating it together (only at 10 months)



Dyadic attention

- Parallel
- Mutual face to face



Rare moments of tango - dyadic attention during infant-parent interactions



Visual attention during interactions at 5.5 mo (% observation time)

	<i>Parent</i>		<i>Elsewhere</i>	
	M	SD	M	SD
<i>Infant</i>	13.5	11.8	84.1	12.2

	<i>Infant</i>		<i>Elsewhere</i>	
	M	SD	M	SD
<i>Parent</i>	83.1	9.2	15.9	18.7

	<i>Mutual gaze (face)</i>		<i>Parallel attention</i>	
	M	SD	M	SD
<i>Dyad</i>	6.3	8.1	7.1	9.8

- Infants mostly explore the surroundings, rarely look at their mother (~13.5% time)
- Mothers mostly look at their babies (~ 83% time)
- Dyadic attention:
 - Mutual gaze (look at each other face-to-face) very rare and represents very little of interaction time
 - Likewise parallel attention - looking together at same object was infrequent

Does mutual gaze during interactions at 5.5 months predict attention disengagement in infants at 11 months?




Alicja Niedźwiecka

CHILD DEVELOPMENT



Child Development, November/December 2018, Volume 89, Number 6, Pages 2230–2244

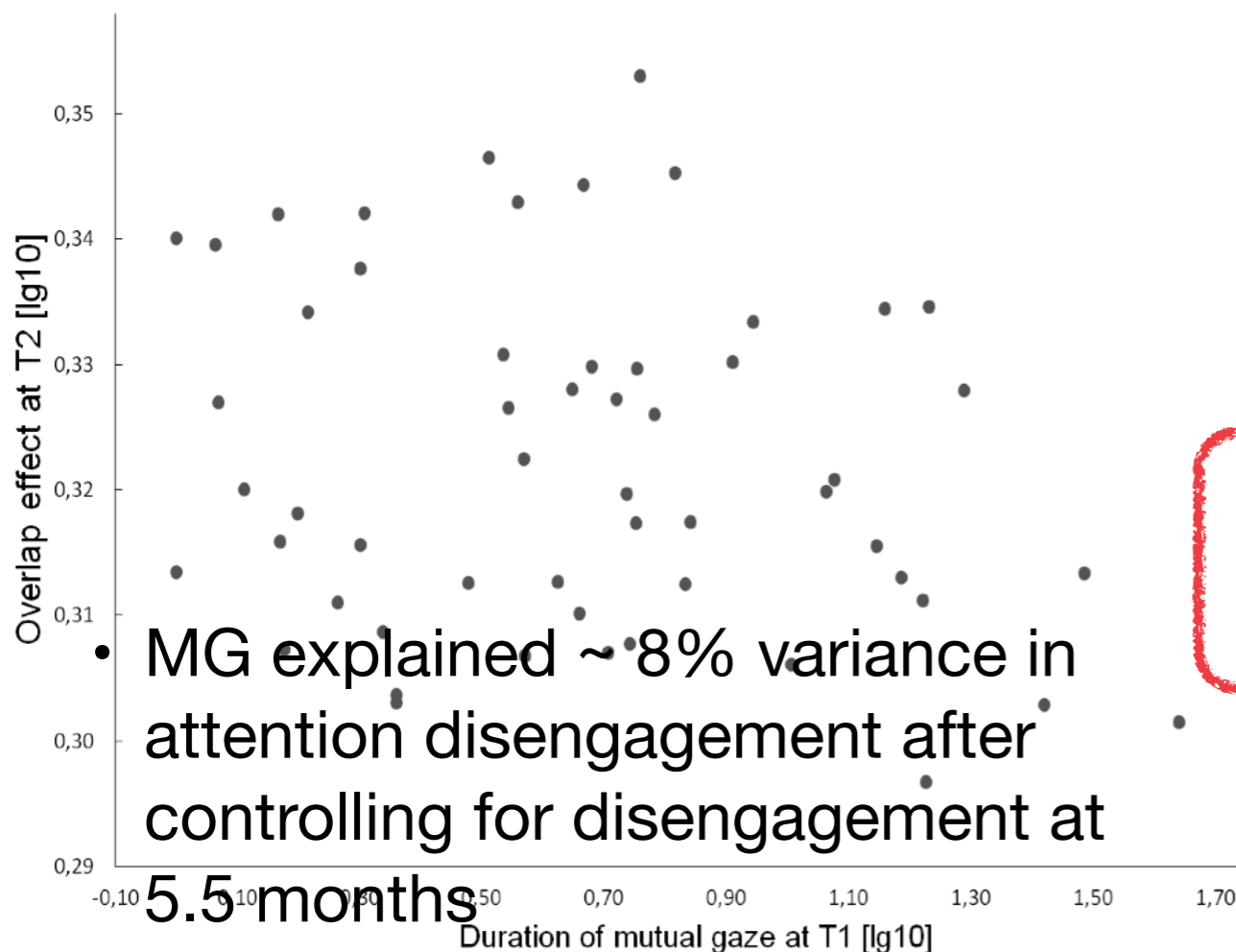
Mutual Gaze During Early Mother–Infant Interactions Promotes Attention
Control Development

Alicja Niedźwiecka , Sonia Ramotowska, and Przemysław Tomalski
Faculty of Psychology, University of Warsaw

Mutual gaze at 5.5 months predicts better attention disengagement in infants at 11.5 months

Results of Regression Analysis for Overlap Effect at T2 and the Duration of Mutual Gaze as Predictor (Model 1)

	B	SE B	β	t	p	Ba CI 95% Low., Upp.
Step 1						
Constant	.251	.034		7.400	.000	.183, .319
Overlap effect T1	.215	.105	.271*	2.051	.045	.005, .426
$R^2 = .074, R^2_{\text{adjusted}} = .056$						
Step 2						
Constant	.251	.033		7.684	.000	.185, .316
Overlap effect T1	.235	.102	.296*	2.316	.025	.031, .439
Mutual gaze T1	-.010	.004	-.288*	-2.248	.029	-.019, -.001
$\Delta R^2 = .082$ $R^2 = .156, R^2_{\text{adjusted}} = .123$						



Discussion

- **Eye contact** modulates stimulus processing of simultaneous and subsequent stimuli (Senju & Johnson, 2009; Johnson, Senju & Tomalski, 2015)
- **MG Increases approach motivation and exploration** - direct gaze modulates neural systems for approach motivation (e.g. Hietanen i in., 2008)
- **MG boosts cognitive resources allocated to stimuli ?**
 - Eye contact increases arousal (Hietanen i in., 2016)
 - Differences in arousal in typical and atypical development (Falck-Ytter i Johansson, 2015; Kylliainen i in., 2012)
 - Sharing attention boosts neural processing of objects in infants (Hoehl et al., 2014)
- **Contingent maternal responding during face-to-face interactions** increases infant motor activity and responding (Rayson i in., 2017)

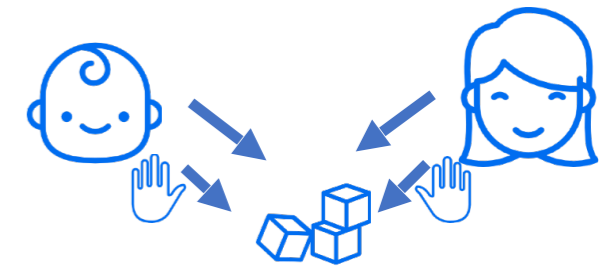
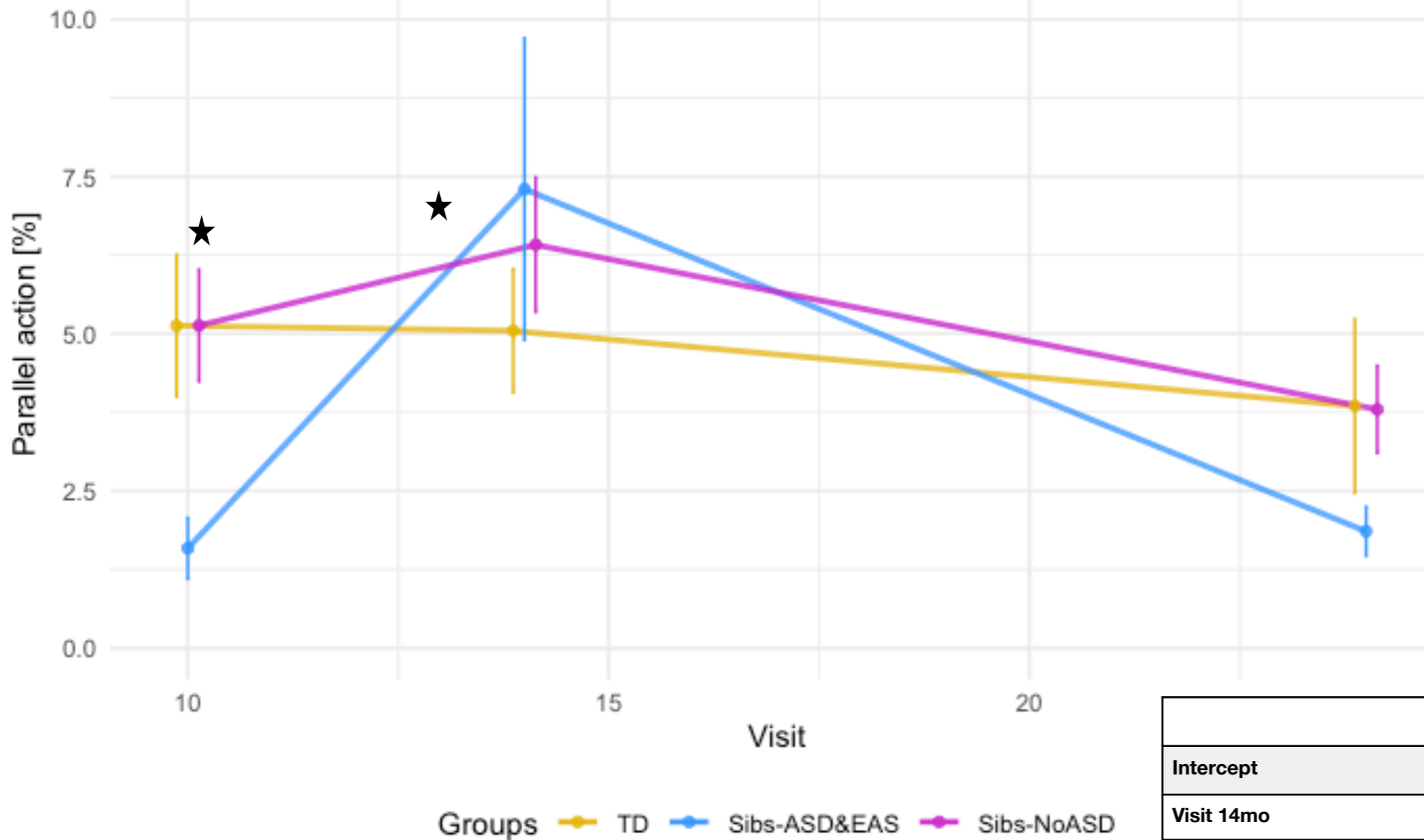


Alicja Radkowska

Trajectories of dyadic attention in infant siblings of children with ASD

- No differences in mutual gaze, but what about more advanced forms of dyadic attention that emerge before 12 months of age?
- Dyadic mutuality, infant positive affect and **infant attentiveness to parent** at 12 months (but not at 6 months) predicted 3-year ASD outcome (Wai Wan et al., 2013)

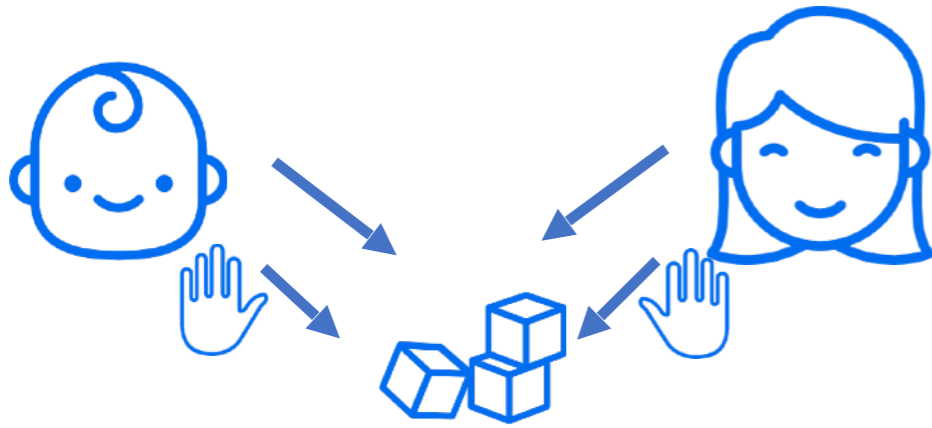
Trajectories of parallel + action - by outcome group



*Error bar 1 SE, LMM

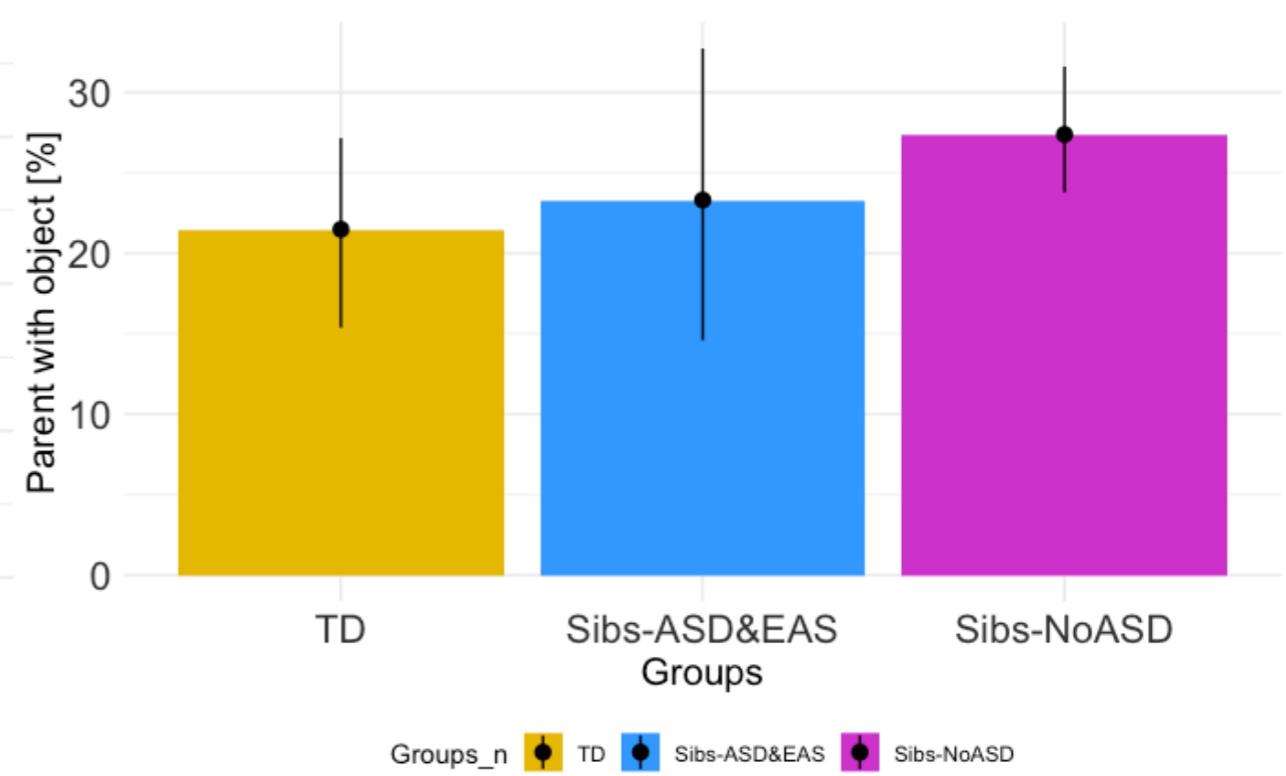
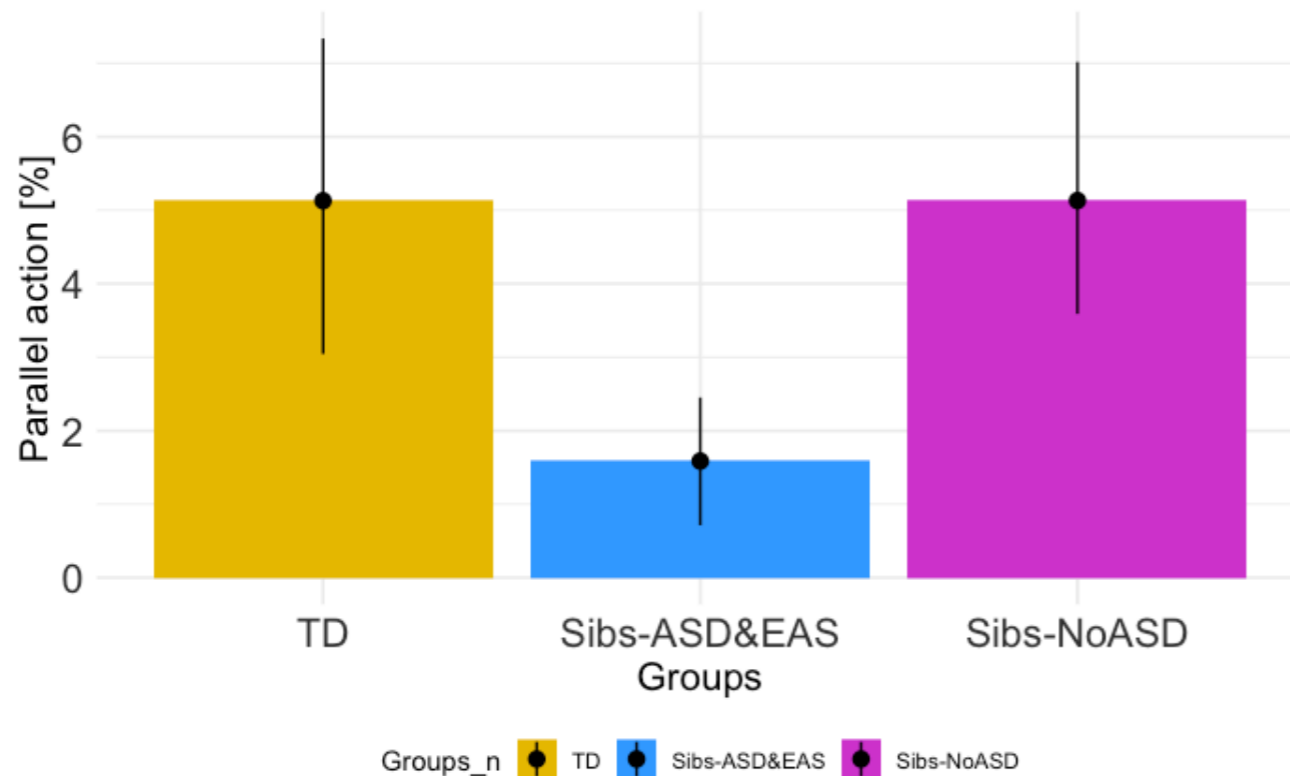
	Estimate (SE)	t
Intercept	5.08 (1.08)	4.72
Visit 14mo	-0.06 (1.42)	-0.04
Visit 24 mo	-1.34 (1.46)	-0.91
Group Sibs-ASD&EAS	-3.57 (1.78)	-2.01 ($p = 0.048$)
Group Sibs-NoASD	0.04 (1.42)	0.03
Visit 14mo x Sibs-ASD&EAS	5.83 (2.36)	2.47 ($p = 0.01$)
Visit 24mo x Sibs-ASD&EAS	1.83 (2.46)	0.74
Visit 14mo x Sibs-NoASD	1.33 (1.88)	0.71
Visit 24mo x Sibs-NoASD	-0.01 (1.94)	-0.01

Triadic object play at 10 months



Kruskal-Wallis test
Sibs-ASD&EAS < LR ($p = 0.03$)
Sibs-ASD&EAS < Sibs-noASD ($p=0.07$)

No group differences in time spent by the infant in looking at parent with object



* Error bars 95%CI

Summary



- Early asymmetry in attention between infants and parents
- **Dyadic aspects of social interactions** predict specific developmental outcomes in attention better than individual measures (two heads are better than one?)
- Trajectories of dyadic attention (joint looking and object play) in siblings shows early (10 m), but not late differences between siblings depending on their clinical outcome
- Future directions:
 - wearables for accelerometry during interactions
 - adding other modalities (e.g. vocalisations)

In 2019 we are looking for PhD students

SAPIENS Network : Shaping the social brain through early interactions (EU Network grant)



- Opportunities for PhD studies in 11 institutions in Europe (Cambridge, King's, Birkbeck-London, Uppsala, Karolinska, Ghent, Utrecht, Nijmegen, Rome, Cracow and Warsaw)
- Coordinator: P. Tomalski (Warsaw)
- 15 fully-funded positions for 36 months for early researchers (<4 years of experience postgraduate)
- Strong focus on experimental and neuroimaging methods with infants (Eye-tracking, EEG, NIRS, also MRI)
- Longitudinal studies of infants and children at risk for ASD, also ADHD



EUROSIBS

The European Babysibs Autism Research Network

Participants and design

Typical development, mostly middle-class families

$N = 55$ (24 ♂, 31 ♀)

T1: 5 months (134-189 days)

Free play in the lab coded for visual attention

(High inter-rater-reliability: 0.86 - 0.96 ($M = .91$))

Eye-tracking: Gap-and-overlap task (Farroni in, 1999)

Controlled: maternal depression, anxiety, infant temperament

T2: 11 months (330-369 days)

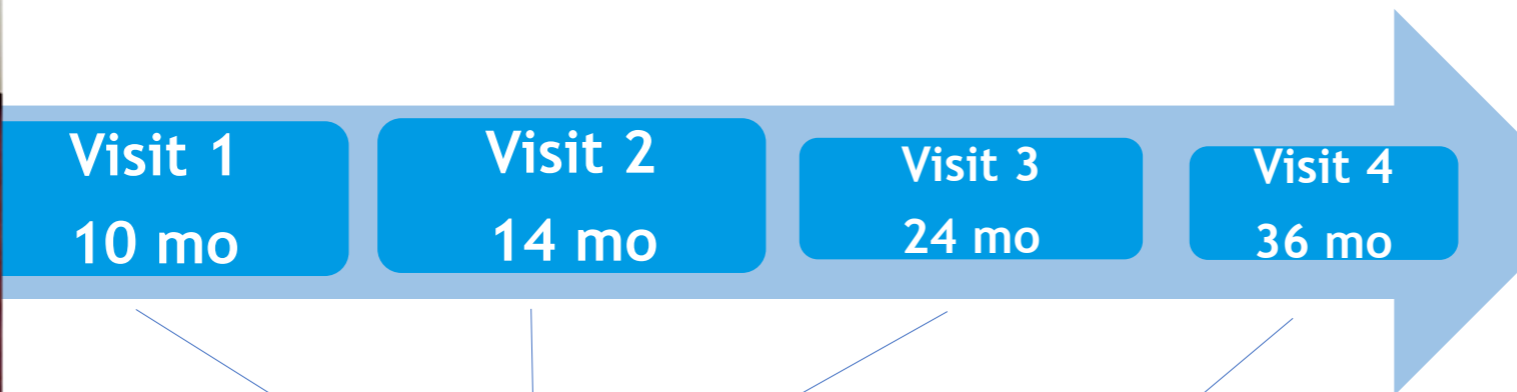
Eye-tracking: Gap-and-overlap task

Controlled : standardised measures of development

- Mullen Scales of Early Learning (MSEL)



POLISH LONGITUDINAL STUDY OF INFANTS AT FAMILIAL RISK FOR AUTISM: DESIGN



Study protocol:

Eurosibs Network/
EU-AIMS Protocol

Analysis of interactions - study aims:

- Analysis of gaze behavior during interaction with parent
- Analysis of relationship between dyadic attention and outcomes

Visit 1
10 mo

Visit 2
14 mo

Visit 3
24 mo

Visit 4
36 mo

Coding PCI

6 minutes of unstructured play with toys in interaction with parent

Measures

VA during PCI: duration of looking time / interaction time (%), log transformed

Reliability

Satisfactory reliability of coders agreement: 0.86 - 0.96 (M = .91)

Outcomes

Mullen
ECBQ
ITSP
VABS

Sample PCI total

10 months

N = 49; HR = 29 ; LR = 21
HR = 12 ♀, 17 ♂ ; LR = 10 ♀, 11 ♂

14 months

N = 38; HR = 25 ; LR = 13
HR = 12 ♀, 13 ♂ ; LR = 7 ♀, 6 ♂

24 months (ongoing)

N = 24; HR = 14 ; LR = 10
HR = 7 ♀, 7 ♂ ; LR = 6 ♀,