



The Leverhulme Trust



LCICD 2017

**Lancaster International
Conference on Infant and
Early Child Development**

August 23-25, 2017



www.lancaster.ac.uk

LCICD 2017 OVERVIEW

Wednesday, Aug 23 rd	Thursday, Aug 24 th
<p>8.30 – 9.00 Registration</p> <p>9.00 – 9.15 Opening remarks</p> <p>9.15 – 10.15 Keynote 1: Olivier Pascalis</p> <p>10.15 – 11.15 Talk Session 1</p> <p>11.15 – 11.45 Coffee break</p> <p>11.45 – 13.15 Talk Session 2</p> <p>13.15 – 14.15 Lunch break</p> <p>14.15 – 16.15 Poster Session I</p> <p>15.45 – 16.15 Coffee break</p> <p>16.15 – 17.15 Talk Session 3</p> <p>19.30 onwards Conference Dinner at The Sun Café (advance booking required)</p>	<p>8.30 – 9.00 Registration</p> <p>9.00 – 10.00 Keynote 2: Daniel Swingley</p> <p>10.00 – 11.00 Talk Session 4</p> <p>11.00 – 11.30 Coffee break</p> <p>11.30 – 13.00 Talk Session 5</p> <p>13.00 – 14.00 Lunch break</p> <p>14.00 – 15.30 Talk Session 6</p> <p>15.30 – 16.00 Coffee break</p> <p>16.00 – 17.00 Talk Session 7</p> <p>17.00 – 19.00 Poster Session II</p> <p>18.00 – 19.00 Reception</p>
	Friday, Aug 25th
	<p>8.30 – 9.00 Registration</p> <p>9.00 – 10.00 Keynote 3: György Gergely</p> <p>10.00 – 11.00 Talk Session 8</p> <p>11.00 – 11.30 Coffee break</p> <p>11.30 – 12.30 Talk Session 9</p> <p>12.30 – 12.45 Awards and Closing Ceremony</p> <p>12.45 – 13.45 Lunch break</p>

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ORGANISATION

We are thankful to the following staff and students who have dedicated their time and effort to help organise this conference.

LCICD 2017 Organisation Committee and Volunteers (in alphabetical order):

Anna Barnett
Marina Bazhydai
Arthur Capelier-Mourguy
Jacky Chan
Shirley Cheung
Kirsty Dunn
Lynne Hargreaves
Nina Harrison
Katharina Kaduk
Han Ke
Christian Kliesch
Szilvia Linnert
Marina Loucaides
Eugenio Parise
Charlotte Rothwell
Priya Silverstein
Louah Sirri
Katie Twomey
Gert Westermann

Website: <http://wp.lancs.ac.uk/lcicd>

Contact: lcicd.enquiries@lancaster.ac.uk

Facebook: <https://www.facebook.com/LCICD/>

Twitter: <https://twitter.com/LCICD>

SPONSORSHIP

We are grateful to the Lancaster University Department of Psychology, The Leverhulme Trust, NIRx, Acuity, and EGI for their financial support.



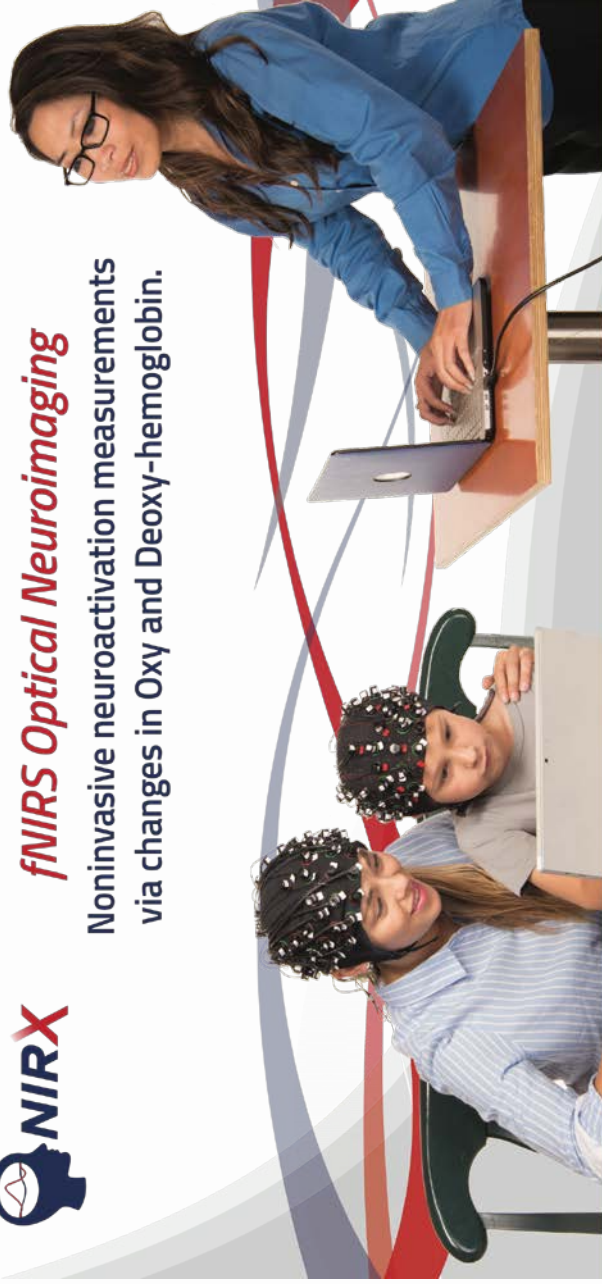
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fNIRS Optical Neuroimaging

Noninvasive neuroactivation measurements
via changes in Oxy and Deoxy-hemoglobin.



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IMPORTANT INFORMATION

Location

- The conference will take place at the Lancaster University Management School (building 52 on the campus map, found in your conference packs).
 - <http://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/maps/campus-map.pdf>
- Keynotes and paper presentations will take place in **Lecture Theatre 1**.
- Poster presentations will take place in **The Hub**, the large social area adjacent to Lecture Theatre 1.

Travel information

- For detailed travel information, please visit <http://www.lancaster.ac.uk/travel>
- **Local taxi services** can be reached on the following numbers: +44 (0)1524 32090; +44 (0)1524 35666; and +44 (0)1524 848848.
- **Visitor car parking** is available on campus 24/7 and is free after 6pm. If you are visiting the campus during the day, then parking charges apply and can be purchased from any of the 11 pay and display machines across campus at a cost of £2 for two hours. Chip and pin card payment facilities are available at several machines. Alternatively, all-day visitor scratch cards are available from the Cashiers' Desk in University House (building 33 on the campus map) priced at £5 each. The cheapest option (£3 per day) will be to park at Alexandra Park Visitor on the edge of campus.
- **In the City:** The bus station is situated on Damside Street in the City Centre. Due to maintenance work at the Lancaster Bus Station, services are temporarily departing from Dalton Square. Please visit <https://www.stagecoachbus.com/service-updates> to receive the latest news on changes to bus routes. Services 2, 2A, 3, 3A, 4, 40, and 42 also stop at Common Garden Street if you prefer to depart from there. Additionally, the 3A and X4 bus services run between the Railway Station and the University.
- **On Campus:** Buses will drop off and collect passengers at the University Underpass (C6 the campus map). Additionally, services 3, 3A and 4 serve the southern perimeter road around Alexandra Park. There are also bus stops directly outside the Sports Centre on the main drive.

Registration

- The registration desk is located in The Hub area.
- The desk will be staffed between 8.30am and 9.00am on Wednesday, Thursday, and Friday as well as during coffee breaks.

Coffee breaks, lunch, and reception

- Coffee breaks (Wed, Thu, Fri), the evening reception (Thu), and lunches (Wed, Thu, Fri) will take place in The Hub.

Social events

- Wednesday, August 23, 2017: *Conference dinner*
 - This year's conference dinner will be hosted at **The Sun Café** from 19.30. The restaurant is located at **25 Sun Street, Lancaster LA1 1EW**.
 - The Sun Café combines classic British dishes with the flare and excitement of the Mediterranean, influenced by Southern French, Italian, Spanish, Portuguese and North African cuisine (<https://www.thesuncafe.co.uk>).
 - The conference dinner is not included in the registration fee. Advance booking was required via the Online Store to attend this event.
- Thursday, August 24, 2017: *Evening reception*
 - The reception will take place in **The Hub** between 18.00 to 19.00.
 - Canapés and drinks will be served.
 - The reception is included in the registration fee.

Internet access

- To access the Visitor Wi-Fi network, simply select the "LU-Visitor" network, then follow the registration instructions.
- Visitor Wi-Fi access will last for 24 hours. For longer access, you will need to register again.
- For support on the day, please see one of our volunteers.

FOOD & DRINK ON CAMPUS AND IN TOWN

Below is a list of favourites, based on an informal survey of Lancaster Psychology staff and students. Reservations in the town centre are recommended, especially for larger groups.

Options on Campus

As the University is now in summer term, hours are subject to change. Please call/check in advance to be sure.

- Café 21 Nice vegetarian, vegan, and gluten-free food, great views, a 10-min walk from venue and slow service.
- Costa Coffee Nice coffee, sandwiches, and cakes.
- Greggs Quick bites; grab and go food.
- Marketplace (County College) Offers a fresh menu, with hearty hot options both sweet and savoury, and a healthy salad bar. There are also sweet treats and fresh cakes alongside sandwiches and soups.
- Pizetta Republic Good restaurant for those who like pizza, late opening times. Good for coffee, too.
- Sultan of Lancaster Indian restaurant and takeaway, serves a variety of curries, chicken and wraps. Late opening times.
- The Deli Popular deli salad bar with fresh, homemade tartlets, a selection of meats and cheeses as well as hot roast sandwiches and filled focaccias.
- The Mill (Flyde College) A great choice of fresh toasties and sandwiches or for something more filling, try the burgers and burritos. Open for dinner, too.
- Wibly Wobbly Burger Good burger place, not on the campus map, simply follow directions to Grizedale College.
- Wong's Kitchen Traditional Chinese food. Located in the George Fox building.
- The Winning Post (Cartmel College) Serves a range of traditional pub food including starters, sharers, sandwiches and classic meals such as lasagne, mixed grill and gammon steak. Open for dinner, too.

Options in Lancaster town centre

- 1725 Nice Tapas restaurant. Serves dinner until 21:30 (though open for drinks until 23:00). (Market Street, 01524-66898).
- Full House Noodle Bar Chinese, Malaysian. Very casual. Just walk through the shop and go upstairs. Shuts at 21:00. (21 Common Garden Street, 01524-842888).
- Kashish Good Indian restaurant. Bring your own alcohol (which can be purchased at nearby Sainsbury's supermarket). Open until 23:00. (32 Parliament Street, 01524-388222).
- Nami Sushi Good sushi and small plates. Serves dinner until 21:00 (31, China Street, 01524-33388).
- Priory Hall Serves excellent coffee from local, award-winning roastery (Atkinson's). Nice cakes, too. Shuts at 17:00. (10 China Street).
- Pizza Margherita Authentic pizzas, plus pasta dishes, in an informal setting, with classic marble tables. (2 Moor Lane, 01524-36333)
- Quite Simply French French cuisine with a chic style and an intimate vibe. (27a St George's Quay, 01524-843199).
- Siam Balcony Authentic Thai cuisine in a relaxing atmosphere. You will feel like you've been transported to a cosy, classic style wooden house in Thailand (6A Chapel Street, 01524-383889).
- Sun Pub Good pub food, also nice for drinks. (63-65 Church Street, 01524-66006).
- The Borough Nice pub in town centre, has its own brewery. Serves food till 21:00, drinks till 23:30. (3 Dalton Square, 01524-64170).
- The Music Room Serves excellent coffee from local, award-winning roastery (Atkinson's). Nice cakes, too. Shuts at 17:00. (Sun Square).
- The Tap House Artisan brews and niche wines, good for drinks (open till midnight). (Gage Street, 01524-842232).
- The Water Witch A towpath pub in a converted stable block. Perfect for some afternoon/evening pub grub by the canal.
- Whale Tail Café Vegetarian dishes from local, organic and fairtrade produce in a quirky café with whitewashed walls. One of our favourite lunch spots. Open until 4.30pm. (78a Penny Street).

DAYS OUT IN AND AROUND LANCASTER

Things to do in Lancaster

- **Williamson Park** - Lancaster's favourite Park offers beautiful panoramic views of Lancaster and its surrounding area. The Ashton memorial, butterfly house and mini beasts (meet the new arrival of Lancaster's meerkats) and birds attractions make an entertaining visit.
- **Lancaster Castle** – Take a tour of Lancaster's most historic building dating back to Roman times and owned by (and visited by!) Her Majesty the Queen.
- **The River Lune** – Take a stroll along the River Lune. The pathway between Lancaster and Caton offers some interesting features on and around the river.
- **The Zone soft play, Lancaster** – Found in central Lancaster, this offers play areas for babies, toddler and juniors including sensory features, wall puzzles, bouldering wall and aerial slide.
- **Morecambe beach and promenade** – Take the train or bus to our nearest seaside town. This long stretch of beach is ideal for sandcastles providing the English summer weather is kind to us.
- **Lancaster Market** – If you are after some locally produced food (potted shrimps from Morecambe Bay, Lancashire cheese, Lancashire sauce, and smoked fish), there are many stalls at the outdoor Charter market on Wednesday and Saturday.



Lancaster canal (left) and The Ashton Memorial (right)

If you have your own transport:

- **Old Holly Farm** – Located on the A6, 5.5 miles from the University, this farm offers the opportunity to meet their baby lambs, chicks and calves alongside other farmyard animals as well as an indoor play area, café and farm shop.
- **The Pudding House, Wallings Farm** – Located close to the A6, 5.5 miles from the University, the pudding house boasts homemade, fresh food including the best ice-cream sundaes to be found. Choose from a wide range of flavours, and visit the farm animals. N.B. Don't panic if you don't have transport - we have our very own Wallings farm ice-cream shop on campus.

A little further afield:

- **Liverpool and Manchester city centres** can be reached within 1 – 1.5 hours by rail from Lancaster. Here you can visit a fantastic selection of museums, theatres, shops and parks.
- **The Lake District** can easily be reached within 40 – 45min by rail from Lancaster. Here you can explore the area walking, cycling, or splashing about in one of Britain's breath taking spaces.



View from Catbells, The Lake District

CONFERENCE SCHEDULE

Wednesday, August 23, 2017

8.30 to 9.00 Registration

9.00 to 9.15 Opening remarks

9.15 to 10.15 **KEYNOTE: OLIVIER PASCALIS** (Chair: Gert Westermann)

On the Linkage Between Face Processing, Language Processing, and Narrowing During Development

SESSION 1: PRENATAL DEVELOPMENT (Chair: Eugenio Parise)

10.15 to 10.45 Manuela Stets, Silvia Rigato, and Karla Holmboe

Foetal and neonatal heart-rate, maternal depression level, and infant temperament: Correlations in a longitudinal study

10.45 to 11.15 Vincent Reid, Kirsty Dunn, Robert Young, Johnson Amu, Tim Donovan, and Nadja Reissland

The utility of light derived stimuli for investigating visual perception in the human fetus

11.15 to 11.45 Coffee break

SESSION 2: LANGUAGE DEVELOPMENT I (Chair: Rebecca Frost)

11.45 to 12.15 Jacqueline Laws

Usage patterns of derivational suffixes in preschool children: A corpus-based approach

12.15 to 12.45 Ingeborg Roete, Marisa Casillas, Stefan Frank, and Paula Fikkert

The influence of input statistics on children's language production decreases over time

- 12.45 to 13.15 Natalie Boll-Avetisyan, Tom Fritzsche, and Carolin Jäkel
Recognition of vowel-initial words in continuous speech at 11 months: Evidence from German
- 13.15 to 14.15 Lunch Break
- 14.15 to 16.15 Poster Session 1
- 15.45 to 16.15 Coffee Break
- SESSION 3: GESTURE AND COMMUNICATION** (Chair: Michelle McGillion)
- 16.15 to 16.45 Ed Donnellan, Michelle McGillion, Katie Slocombe, and Danielle Matthews
Do prelinguistic vocalisations and gestures predict later language because they are early instances of intentional communication?
- 16.45 to 17.15 Wiebke Paetzold and Ulf Liszkowski
Does communication induce object representation in infants?
- 19.30 onwards Conference Dinner at The Sun Café (advance booking required)

Thursday, August 24, 2017

8.30 to 9.00 Registration

9.00 to 10.00 **KEYNOTE: DANIEL SWINGLEY** (Chair: Katie Twomey)

What Infants Know and Don't Know About Their Language

SESSION 4: MODELLING CATEGORISATION (Chair: Sylvain Sirois)

10.00 to 10.30 Gert Westermann and Katherine Twomey

A neurocomputational model of curiosity-based learning in infancy

10.30 to 11.00 Arthur Capelier-Mourguy, Katherine E. Twomey, and Gert Westermann

A modelling account of the effect of adding a label when learning counter-intuitive categories

11.00 to 11.30 Coffee Break

SESSION 5: LANGUAGE DEVELOPMENT II (Chair: James Brand)

11.30 to 12.00 Matt Hilton, Julia Brase, Nivedita Mani, and Gert Westermann

The case of the frightful fliwa: How emotional cues during labelling affect children's word learning

12.00 to 12.30 Gerlind Grosse, Cornelia Schulze, Michael Tomasello, and Napoleon Katsos

Three-year-old children make some, but not all inferences based on informativeness

12.30 to 13.00 Michelle McGillion, Julian Pine, Jane Herbert, and Danielle Matthews

A randomised controlled trial to test the effect of promoting caregiver contingent talk on language development in infants from diverse SES backgrounds

13.00 to 14.00 Lunch Break

SESSION 6: LABELLING OBJECTS AND ACTIONS (Chair: Louah Sirri)

14.00 to 14.30 Kin Chung Jacky Chan and Gert Westermann

Sounds and categorization: Do communicative auditory signals really facilitate category formation in 6-month-olds?

14.30 to 15.00 Hanna Marno and Dan Sperber

Pragmatics vs. novelty in a label assignment task

15.00 to 15.30 Jean Mandler

How Infants Talk About Motion Without Verbs

15.30 to 16.00 Coffee Break

SESSION 7: SOCIAL DEVELOPMENT (Chair: Diana Tham)

16.00 to 16.30 Tal-Chen Rabinowitch and Andrew Meltzoff

Swinging in synchrony enhances collaboration between 4-year-olds

16.30 to 17.00 F. Cansu Pala and Charlie Lewis

A novel assessment of emotion-regulation: Children's understanding of emotion-regulation is tied to social understanding and executive control

17.00 to 19.00 Poster Session 2

18.00 to 19.00 Reception

Friday, August 25, 2017

8.30 to 9.00 Registration

9.00 to 10.00 **KEYNOTE: GYÖRGY GERGELY** (Chair: Eugenio Parise)

The Pragmatic Sense: Communicative Mind-Reading without Language

SESSION 8: THEORY OF MIND (Chair: Silke Brandt)

10.00 to 10.30 Maria Zajackowska and Natalia Banasik

"Why does mommy say such things?" Irony comprehension and theory of mind in four-year-olds

10.30 to 11.00 Sylvain Sirois, Erik Gustafsson, and Julie Brisson

The role of learning in infants' prediction of others' action goals

11.00 to 11.30 Coffee Break

SESSION 9: ELECTROPHYSIOLOGY OF SEMANTIC PROCESSING
(Chair: Vincent Reid)

11.30 to 12.00 Katharina Kaduk, Eugenio Parise, Benjamin Taylor, Stefanie Hoehl, Kirsty Dunn, and Vincent Reid

The trajectory of semantic representation: From encoding to consolidation - an interplay of N400 and alpha desynchronization

12.00 to 12.30 Katharina Antognini and Moritz M. Daum

Toddlers show mu-suppression during auditory verb processing

12.30 to 12.45 Awards and Closing Ceremony

12.45 to 13.45 Lunch Break

POSTER PRESENTATIONS

Session 1: Wednesday, August 23, 14.15 to 16.15

1. Alice Skelton, Gemma Catchpole, Joshua Abbott, Jenny Bosten and Anna Franklin
Tuning into colour: What infant colour perception tells us about perceptual development
2. Silvia Panella Peral
Identifying and Categorising Social Looks in Infants aged 12-14 months.
3. Vivien Radtke, Tanya Behne and Nivedita Mani
Does the quality of infants' language input shape infants' response to language?
4. Elena Hoicka, Merideth Gattis and Burcu Soy
Developing a parent report measure of social cognition from birth to 3 years
5. Priya Silverstein, Eugenio Parise, Gert Westermann and Teodora Gliga
The role of ostensive and referential cues in infant object memory
6. Cornelia Schulze, Gerlind Grosse, Mutsumi Imai, Noburo Saji and Henrik Saalbach
How do children construct the color lexicon? A developmental and comparative study of concept formation
7. Laura-Ashleigh Bird and Melissa Allen
Learning from Digital Media: An Atypical Perspective
8. Samuel Forbes and Kim Plunkett
The role of labels in understanding contextual information
9. Christian Kliesch, Vincent M. Reid, Anna L. Theakston and Eugenio Parise
Anticipation of familiar, unexpected and novel actions in ostensive and non-ostensive contexts in 7-month-old infants
10. Helen Buckler and Elizabeth Johnson
The impact of input variability on the earliest stages of lexical acquisition

11. Iain Jackson, Eugenio Parise, Vincent Reid and Anna Theakston
Agents vs patients: How is infants' attention distributed in two-participant causal events?
12. Marina Bazhydai, Gert Westermann and Eugenio Parise
Information Seeking and Social Referencing in Infants
13. Carolin Konrad, Katharina Sommer, Laura La Rocca, Silvia Schneider and Sabine Seehagen
State-dependent memory in 9-month-old infants
14. Jasmin Alian, Helena Lapinleimu and Suvi Stolt
Associations between early communication skills at 1;0 and language performance at 2;0 in typically developing Finnish children
15. Julia Brehm, Anja Gampe and Moritz M Daum
Scope of credibility: selective learning across domains and the cognitive mechanisms thereof
16. Eva Berglund and Karin Edlund
Morpho-phonological skills in Swedish 2;3-2;5-year-old children with low versus high vocabularies
17. Henriette Schneider-Hassloff, Annabel Zwönitzer, Anne Katrin Künster, Margot Popp, Thomas Gruber, Ute Ziegenhain and Markus Kiefer
EEG theta oscillations in a right fronto-temporo-parietal network are associated with children's executive function skills and the dyadic quality of the mother-child interaction
18. Christine Michel, Ezgi Kayhan, Sabina Pauen and Stefanie Hoehl
Just have a look at that! Infants' overt following of eye movements
19. Sébastien Forestier and Pierre-Yves Oudeyer
A Unified Model of Speech and Tool Use Early Development
20. Shirley Cheung, Silke Brandt, Eugenio Parise and Gert Westermann
Speech perception and the brain: Exploring the flexibility of the bilingual perceptual narrowing using fNIRS brain-imaging

21. Rianne van Rooijen, Eline Bekkers, Lisa van der Tier, Donna de Visser and Caroline Junge
Maternal speech facilitates novel word learning
22. Katherine Twomey, Elle Hart, Charlotte Rothwell and Gert Westermann
Learned labels increase similarity in 10-month-old infants' category representations
23. Sarah F. Schoch, Sina Boschert-Hennrich, Oskar G. Jenni, Reto Huber and Salome Kurth
Sleep, development and maternal cognition in 3-month-old infants
24. Anna Babarczy, Tamas Kaldi and Andrea Balazs
Perspective taking and implicature derivation in 4 to 8 year-old children
25. Mikako Ishibashi and Izumi Uehara
Children's scale errors: Its relationship to semantic knowledge and pretending behaviors
26. Melanie Otto, Carmen Deffner, Laura Walk and Katrin Hille
Measures of Working Memory and Theory of Mind from 36 to 48 Months
27. Angela Griminger, Carina Lüke, Ute Ritterfeld, Ulf Liszkowski and Katharina Rohlfing
Individual differences in the early use of pointing-speech-combinations in 14- to 16-month-olds
28. Kensuke Sato and Takeshi Kishimoto
The effect of pragmatic cues on preschoolers' expectation about trustworthiness of others' pointing

Session 2: Thursday, August 24, 17.00 to 19.00

1. Louah Sirri, Vincent Reid and Eugenio Parise
The effect of words and sounds on conceptual representation for 9-month-old infants
2. Ingrida Balčiūnienė
The Early Stages of Morphology Acquisition in Twins: Autonomous or Universal Rules?
3. Stephanie Powell and Elena Hoicka
Reported Preschooler Creativity Unrelated to Everyday Touchscreen Use
4. Padraic Monaghan, James Brand and Rebecca Frost
Combining multiple information sources for word learning: Computational and behavioural studies
5. Renata Di Lorenzo, Rianne van Rooijen, Carlijn Van den Boomen, Caroline Junge, Anna Blasi and Chantal Kemner
Emotional face processing in 5-month-old infants: A functional near infrared study
6. Hanna Marno, Szilvia Linnert, Gert Westermann and Eugenio Parise
EEG Evidence of Label- and Visual-Based categorization in 9-month-old infants
7. Takeshi Kishimoto
Do index-finger pointing by caregivers promote the production of index-finger pointing by infants?
8. Ermanno Quadrelli, Stefania Conte, Viola Macchi Cassia and Chiara Turati
Temperamental traits affect emotional expression processing of static and dynamic faces: An ERP study with 7-month-old infants
9. Nayeli Gonzalez-Gomez
Early language development under difficult circumstances: Exploring maturational and environmental factors

10. Diana S Y Tham, Alison Rees and J. Gavin Bremner
Spatially and synaesthetically congruent sounds support young infants' perception of object continuity across occlusion
11. Bethany Wainwright, Melissa Allen and Kate Cain
Facilitating word learning and symbolic understanding in typically developing infants and children with developmental disorders: The role of iconicity
12. Nicole Sturmhöfel, Anika Fäsche, Melanie Otto and Petra A. Arndt
How does screen media use influence toddlers' social-emotional development?
13. Rachael Davis, Michael Thomas and Tony Charman
Predicting and validating clinical outcomes of autism from at-risk infants.
14. Katharina Kaduk, Livia Freier and Vincent Reid
The modulation of motor systems before and after the acquisition of new actions, verbs and non-action sounds at 24 months of age: A training study
15. Manuela Stets, Karla Holmboe and Silvia Rigato
Cortical Responses to Mothers and Strangers in 4-Month-Old Infants
16. Julia Brehm, Carlijn van den Boomen, Emily Jones, Ricarda Braukmann, Jannath Begum Ali, Luke Mason, Elodie Cauvet, Chantal Kemner and Mark Johnson
Automatic Artifact Rejection in Infant EEG
17. Han Ke, Quoc C. Vuong and Elena Geangu
Children's Emotional Neural Response to Congruency of Point-light Body Motion and Lexical-semantic Information
18. Marlene Spangenberg and Kim Plunkett
Frequency Effects during Spoken-Word Recognition in Infants
19. Arthur Capelier-Mourguy, Katherine Twomey and Gert Westermann
Categories with divergent feature diagnosticity and salience: how a label helps
20. Sarah Eiteljörge, Maurits Adam, Birgit Elsner and Nivedita Mani
Early preferences in word and action learning

21. Rodrigo Dal Ben, Débora Souza and Jessica Hay
Speech segmentation and cross-situational word learning in parallel
22. Viktoria Csink, Helena Calle, Denis Mareschal and Teodora Gliga
The specific effect of violation of expectation on infants' learning
23. Olivia Whalen, Frini Karayanidis, Alison Lane and Linda Campbell
The role of infant and maternal factors on the early development of infant cognition
24. Carmen Deffner, Melanie Otto, Henriette Schneider-Haßloff and Katrin Hille
Enhancing Executive Functions in Infants and Toddlers in Daycare Settings
25. Marina Loucaides, Katherine Twomey and Gert Westermann
The effect of labelling on infants' novel object exploration.
26. (Presented by Olivia Whalen) Carly Mallise, Frini Karayanidis, Alison Lane, Vanessa Murphy and Linda Campbell
An Investigation of Infant Temperament and Maternal Parenting Stress as Early Markers for Atypical Development within the First Year of Life
27. (Presented by Olivia Whalen) Alix Woolard, Alison Lane, Linda Campbell, Frini Karayanidis and Titia Benders
The Effect of Infant Temperament on Maternal Infant-Directed Speech
28. Burcu Soy and Elena Hoicka
The relationship between humour development and social cognition from 3 to 47 months
29. Jolanta Golan, Rachel George, Melanie Vitkovitch, Derek Moore and Elena Kushnerenko
Speech Processing in the Noisy Environment
30. Rianne van Rooijen, Renata Di Lorenzo, Caroline Junge, Carlijn van den Boomen and Chantal Kemner
Gaze processing in the infant brain; an fNIRS study

KEYNOTE ABSTRACTS

Wednesday, August 23, 2017

Olivier Pascalis, Université Grenoble Alpes, France

On the Linkage between Face Processing, Language Processing, and Narrowing during Development

From the beginning of life, face and language processing are crucial for establishing social communication. Studies on the development of systems for processing faces and language have yielded such similarities as perceptual narrowing across both domains. In this talk, I will review several functions of human communication, and then describe how the tools used to accomplish those functions are modified by perceptual narrowing. I will conclude that narrowing is common to all forms of social communication. I will argue that during evolution, social communication engaged different perceptual and cognitive systems—face, facial expression, gesture, vocalization, sound, and oral language—that emerged at different times. These systems are interactive and linked to some extent. In this framework, narrowing can be viewed as a way infants adapt to their native social group.

Thursday, August 24, 2017

Daniel Swingley, University of Pennsylvania, USA

What Infants Know and Don't Know About Their Language

Languages work using conventions that implicate discrete symbolic parts, such as speech sounds, words, and arrangements of words. How do babies learn these parts? The usual account is that language learning starts with perceptual learning of consonants and vowels, and continues with discovery of words made of these sounds, followed by determination of what these words mean. I will make the case that this account is wrong, and that actually infants learn these categories in parallel profiting from structure at each level.

Friday, August 25, 2017

György Gergely, Central European University, Hungary

The Pragmatic Sense: Communicative Mind-Reading Without Language.

Ostensive communication is a species-unique form of epistemic cooperation that relies on specialized ostensive-referential behavioral signals (such as words or non-verbal deictic gestures like pointing) to manifest and convey the relevant informative intentions of communicative agents to their addressee. The recognition of ostensive communication induces the Pragmatic Stance in humans whereby they employ context-sensitive pragmatic inferences to recover the relevant informative intentions that the communicative agent intends to manifest by her communicative actions in the particular context.

In my talk I shall summarize evidence (Csibra & Gergely, 2009; Gergely & Jacob, 2012) showing that several key aspects of humans' special adaptedness to recognize and interpret ostensive referential communication (the pragmatic sense) are already present in young preverbal infants who exhibit evolved sensitivity to ostensive behavioral signals (such as eye-contact, infant-directed speech, and turn-taking contingent reactivity). Such ostensive signals activate the Pragmatic Stance in infants leading them to interpret the communicative agent's subsequent acts as manifestations of her referential and informative intentions that attempt to convey new and relevant information for the addressee to infer.

I shall present new evidence showing that when observing novel behavioral interactions between unfamiliar agents from a 3rd-person perspective, 10- and 13-month-old infants can recognize turn-taking contingent exchange of variable signal sequences as a cue to identify the interaction as involving ostensive communicative transfer of relevant information between communicative agents. This abstract cue induces 10-month-olds to attribute communicative agency and referential intention as demonstrated by their referential gaze following of the agent's object-directed orientation response. Furthermore, in a non-verbal false belief looking time paradigm, we also demonstrate that when pragmatic inferences are sufficiently supported by contextual information, 13-month-olds can attribute the corrective informative intention and infer the relevant informative content transmitted by the turn-taking exchange of non-verbal sound sequences by a knowledgeable agent to correct the false belief of a naïve agent about the current location of a previously displaced object.

Together, these studies show that non-verbal ostensive behavioral cues allow preverbal infants to recognize communicative agency and interactions, to perform context-sensitive pragmatic mindreading inferences to identify the intended referent, and to infer the intended informative content conveyed by the communicative exchange in the given context. I'll conclude that humans' evolved pragmatic inferential capacity for communicative mindreading is already present in young infants who can infer communicative transmission of relevant information without and even before acquiring language.

PAPER ABSTRACTS

Wednesday, August 23, 2017

SESSION 1: PRENATAL DEVELOPMENT

Manuela Stets, Silvia Rigato, and Karla Holmboe

Foetal and neonatal heart-rate, maternal depression level, and infant temperament: Correlations in a longitudinal study

In a longitudinal study on two major aspects of infant cognitive development (attention and social cognition), we are tracking 60 infants from the last trimester of pregnancy to 9 months of age using a range of methodologies such as behavioural measures, eye-tracking, and EEG/ERP. Moreover, maternal depression and infant temperament are assessed (Putnam et al., 2014) using well-validated questionnaires such as the Beck Depression Inventory (2nd revision). First results indicate that infant negative affect is strongly related to mothers' depression level shortly after birth. In fact, a raised maternal depression score within the first weeks after birth is positively correlated with infant negative affect at birth ($p < .004$), at 4 months ($p < .004$), and at 6 months ($p < .03$). This indicates the importance of maternal mental health in this sensitive period shortly after birth and its impact on infant development.

Additionally, as pre- and post-natal heart-rate have been used as additional measures to assess infant behaviour and cognition (e.g., Richards et al., 2010; DiPietro et al., 1996), we collected heart-rate data from the infants prenatally and at four time-points after birth. Foetal and neonatal heart-rate appear to be associated with infants' negative affect. While newborn heart-rate is negatively correlated with negative affect at birth ($r = -.33$, $p = .01$), prenatal heart-rate appears to be related to negative affect later on, i.e., at 6 months ($r = -.35$, $p = .02$).

Vincent Reid, Kirsty Dunn, Robert Young, Johnson Amu, Tim Donovan, and Nadja Reissland

The utility of light derived stimuli for investigating visual perception in the human fetus

It has long been known that the late term human fetus has the capacity to process perceptual information. The advent of 4D ultrasound technology now allows for the detailed assessment of fetal behavior. Recent modelling work has indicated a substantially greater luminance within the uterus than previously thought. Consequently, light conveying perceptual content could be projected through the

uterine wall, dependent on how light interfaces with maternal tissue. The viability of performing an experimental paradigm with fetal participants, based on visual stimuli, is not currently known. Newborn infants have shown a preference to engage with a top heavy, face-like stimulus when contrasted with all other forms of stimuli. We examined fetal head turns to visually presented upright and inverted face-like stimuli. Here we show that the late term fetus is more likely to engage with top heavy configural stimuli when contrasted to bottom heavy visual stimuli, in a manner similar to newborn perceptual capacities. This experiment shows that postnatal experience is not involved in the creation of top heavy visual preferences. It also illustrates the validity of delivering visual stimuli via light to the late term human fetus. This new technique provides a pathway for the assessment of prenatal visual perceptual capacities. This talk will also outline possible implications for our understanding of human development as a consequence of performing investigations into the visual capacities of the human fetus.

SESSION 2: LANGUAGE DEVELOPMENT I

Jacqueline Laws

Usage patterns of derivational suffixes in preschool children: A corpus-based approach

Derivational morphology is used to construct words by attaching affixes to a base, e.g., un-helpful. Morphological awareness in children has been shown to enhance vocabulary development and spelling performance, e.g., Berninger et al. (2010), Deacon & Bryant (2005) and McBride-Chang et al. (2005). Awareness of word structure is acquired predominantly during the school years and research has hitherto mainly focused on primary school children. The aim of the research reported here was to chart a detailed roadmap of the usage patterns of derived forms in monolingual English preschool children from their earliest utterances to the age of 5, when reading starts to affect language skills.

A child corpus of 400,000 tokens was compiled from the CHILDES database (MacWhinney 2000) so that speech samples from 2, 3, 4 and 5 year old children were equally represented (100,000 tokens per age group). An adult corpus containing the speech produced by caregivers in those same transcripts was also compiled (985,100 tokens). Forty-two suffix categories, ranging from low to high frequency in everyday spoken English (Laws & Ryder 2014), were identified from the Demographically-Sampled component of the British National Corpus (BNC). Frequency patterns of derivatives formed from the 42 suffixes were extracted from the child and adult datasets.

This paper presents the results of quantitative and qualitative analyses that examine the relative rates at which suffix category sizes increase over the preschool years as a function of the frequency patterns of derivatives both in the child's immediate speech environment and more generalised adult speech (BNC). The findings are evaluated in the light of research on Family Size effects (Ford et al. 2010) and also factors, such as Transparency of Meaning, Simplicity of Form and Productivity, which have been shown to facilitate the development of morphological awareness in children (Clark 1993).

Ingeborg Roete, Marisa Casillas, Stefan Frank, and Paula Fikkert

The influence of input statistics on children's language production decreases over time

Usage-based approaches to language acquisition (e.g. Tomasello, 2003) propose that children use multi-word utterances – chunks – to build up grammatical knowledge from recurring patterns in their linguistic input. We investigate the changing influence of this statistical, chunk-based learning on children's language production over time using the CAPPUCCINO model (McCauley & Christiansen, 2011). This model simulates child language production using chunks extracted from caregivers' speech.

We selected orthographic transcriptions of conversations between 6 North American children and their caregivers, by sampling transcripts at 6-month intervals between 1;0 and 4;0 (Providence; Demuth, Culbertson, & Alter, 2006). The model parsed caregivers' utterances for each child by comparing the transitional probabilities between words to a running average transitional probability, making splits between word chunks when the transitional probability between two words dropped below the current average. At the same time, the model also tracked the transitional probabilities between these discovered chunks. After training the model, we simulated children's sentence production by reconstructing the utterances they actually used in the transcript from the chunk-to-chunk probabilities detected in the caregivers' speech.

The number of child utterances that were reconstructed correctly based on transitional probabilities between chunks in the caregivers' speech decreased over time ($\beta = -0.720$, $SE = 0.157$, $p < 0.001$). However, the number of child utterances that contained words or chunks the caregivers did not use, increased ($\beta = 0.547$, $SE = 0.064$, $p < 0.001$). In other words, these results indicate that, over time, children's speech less directly imitates chunk sequences in their caregivers' speech, partly because their chunk combinations become more inventive. We discuss how these findings fit within broader usage-based approaches to language acquisition.

Natalie Boll-Avetisyan, Tom Fritzsche, and Carolin Jäkel

Recognition of vowel-initial words in continuous speech at 11 months: Evidence from German

Infants' early word segmentation abilities favour consonant-initial (CV) over vowel-initial syllables (VC). Under a phonetic view (Mattys & Jusczyk, 2001; Seidl & Johnson, 2008), word boundaries are easier to detect in CV compared to VC words because a word onset is acoustically more saliently marked by consonants (especially plosives). Under a phonological view (Babineau & Shi, 2014), a universal bias for CV syllables is at play early in development. Studies conducted so far have only investigated English- and French-learning infants. German offers an interesting comparison because compared to English the number of vowel-initial words is higher. If input frequency is yet another relevant factor, German-learning infants should be able to segment vowel-initial words earlier than their English-learning peers, for whom segmentation without specific prosodic cues could not be shown until the age of 13.5 months (Nazzi et al., 2015).

The present study investigates whether German-learning infants are able to represent vowel-initial words and segment them from continuous speech. Using a HPP setup, we tested 40 11-month-olds (age range: 10.6–11.5 months). Each infant was familiarised with different tokens of either a vowel-initial (e.g. uger) or consonant-initial nonword (e.g. luger). At test, infants heard two types of text passages (composed entirely of nonwords). One type contained the familiarised target embedded in a nonword carrier (e.g. tiluger), the other a novel nonword (e.g. panotel). Other factors influencing word segmentation such as metrical stress and prosody were kept constant. Results revealed that infants preferred passages containing the familiarised target ($p < .05$) without an influence of the familiarisation (vowel- or consonant-initial) and no interactions. This suggests that German-learning infants segment vowel-initial words at an earlier age than English-learning infants. The study highlights the relevance of cross-linguistic comparisons of infant behaviour and input characteristics for gaining a better understanding of early language acquisition mechanisms.

SESSION 3: GESTURE AND COMMUNICATION

Ed Donnellan, Michelle McGillion, Katie Slocombe, and Danielle Matthews

Do prelinguistic vocalisations and gestures predict later language because they are early instances of intentional communication?

Language, both spoken and signed, is the hallmark of human communication, and is a highly specialized and efficient form of intentional communication. Prior to the onset of language, infants often engage in behaviours such as vocalising and gesturing, thought to be communicative precursors to language proper. It has been demonstrated that the frequency and onset of prelinguistic vocalisation and gestures predict later language abilities (e.g. McGillion et al., 2016, Bates et al., 1979). However, it remains an empirical question as to whether infant's prelinguistic vocalisations and gestures predict later language because they represent an infant's first attempts to intentionally communicate, or because they are markers of infants' phonological and motoric development necessary for speech.

We coded vocalisations, gestures and gesture-vocal combinations produced by 61 infants during naturalistic play at home with their primary caregiver at both 11 and 12 months. We investigated whether infants coordinated gaze to their caregiver's face with these behaviours as this is thought to indicate an intention to communicate (Bates et al. 1975). We also investigated whether these behaviours predicted infants' expressive vocabulary at 15 and 24 months and whether gaze coordinated instances of each behaviour were better predictors than the behaviours alone. This would be expected if the predictive relation holds because they are early instances of intentional communication.

Specific types of vocalisations, gestures and combinations were predictive of later vocabulary. However gaze coordinated versions of these behaviours were better predictors in only a limited number of cases. Therefore, there is limited scope to conclude that prelinguistic vocalisations and gestures predict later language because they are early instances of intentional communication. Along with these results, we will also present data from ongoing investigations into the amount and type of caregiver response that these behaviours elicit and the role these play in scaffolding early language development.

Wiebke Paetzold and Ulf Liszkowski

Does communication induce object representation in infants?

We know from behavioral studies that infants follow and react to points towards occluded toys at the end of the first year. Up to this point, however, these findings have not been validated by physiological or neurophysiological markers, so how do we know what infants are actually processing when they crawl towards a hidden toy?

In this talk, I will present findings from an ongoing series of experiments where we applied eye tracking and EEG to get a closer look at point comprehension and object representation in infancy.

In a first set of studies, we used eye tracking to track infants' gaze behavior as well as record their pupil size. Change in pupil size is a highly sensitive measure of arousal, so we tracked infants' arousal over different visual scenarios that contained communicative acts as well as the appearance – or lack thereof – of interesting toys. Our findings imply that by 12 months of age, infants anticipate the appearance of an object if its location is highlighted by a pointing gesture beforehand.

In another set of studies, we investigated gamma band oscillations in the infant EEG. Activity in the gamma band (20-60 Hz) in infants has been correlated with object binding and representation of occluded objects, so we used this measure to look at how infants represent an object that is communicated to them. We found that 10-months-old infants had increased activation in the gamma band over frontal and temporal regions when (a) an object was occluded and (b) they saw an actor point to an occluded object. These results point towards early object representation following referential communication.

I will close with the implications these findings have on how we think about point comprehension in infancy and beyond.

Thursday, August 24, 2017

SESSION 4: MODELLING CATEGORISATION

Gert Westermann and Katherine Twomey

A neurocomputational model of curiosity-based learning in infancy

Infants are curious learners who drive their own cognitive development by imposing structure on their learning environment as they explore. Nevertheless, in many experimental studies infants are more seen as passive recipients of information and are shown predetermined stimuli for fixed amounts of time. Here we explore the difference between these types of learning in a series of neurocomputational models. All models are trained on a categorization task consisting of eight stimuli with varying features. A first model replicates previous empirical data showing that the order in which infants are presented with the stimuli in a familiarization tasks affects their ability to form categories. Subsequent models implement a curious learner and autonomously choose the next stimulus from which to learn. We explore different metrics by which the model selects this information, such as choosing the stimulus that is maximally different from the current stimulus, or choosing the stimulus from which the model can maximally learn at this point in time. We demonstrate that

optimal learning emerges when the model is able to maximize its subjective stimulus novelty relative to its internal states, depending on the interaction across learning between the structure of the environment and the plasticity in the learner itself, and this learning is as good as the best learning in a model simulating a non-exploratory experimental situation. The most successful model, while maximizing subjective novelty depending on its current state, chooses stimuli that are objectively of intermediate complexity, replicating a 'Goldilocks effect' observed in infant studies. In this way the model provides a mechanistic account of intrinsically motivated exploratory learning in infants.

Arthur Capelier-Mourguy, Katherine E. Twomey, and Gert Westermann

A modelling account of the effect of adding a label when learning counter-intuitive categories

Infants form multidimensional categories from a young age, bringing together visual, haptic, and spatial features, amongst others, including labels. Hitherto, it remains unclear how labels interact with other features. Where empirical results might not always clearly point to one explanation, modelling can help us to evaluate different explanations and to make predictions or fitting existing data.

We use a 3-layered auto-encoder neurocomputational model to predict results for an empirical study addressing the question of the role of labels during categorisation. The study consists of a categorisation task for categories that are constructed so that feature salience and feature diagnosticity are either aligned or in conflict. Each stimulus consists of 5 features, each feature has 5 different values. The salience of a feature is represented in the model as an active attentional bias towards this feature following the well-known ALCOVE model. Half of the models receive a label accompanying the visual object description and the other half only receive the visual description of the exemplars. The quality of categorisation is assessed by successful reproduction by the model of the prototypical exemplar. Based on previous work, the nature of the label (referential vs. feature) is represented by the label either being a goal on the output layer only, shaping perception via error backpropagation, or as an input on the same level as other features.

With a feature label, the model should increase attention weights to it, and possibly perform poorly when the label is removed. With a referential label, the model should backpropagate the error from the label to increase attention weights towards other diagnostic features, going against the perceptual salience. Inspection of the internal representations developed by the model in each condition will enable us to gain

insights into the mechanisms by which labels and other features interact during category learning.

SESSION 5: LANGUAGE DEVELOPMENT II

Matt Hilton, Julia Brase, Nivedita Mani, and Gert Westermann

The case of the frightful fliwa: How emotional cues during labelling affect children's word learning

The current study set out to examine whether the emotional expression of a speaker during object labeling affects children's learning of this object-label association. 36-month old children (N=32) took part in an eye-tracking task in which they saw an onscreen actor repeatedly look at and label a series of six novel objects. Each object was presented alongside a novel and unnamed competitor. Some target objects were labeled consistently with a positive, excited emotional expression (e.g. "WOW, a Fliwa!"). Some objects, however, were labeled consistently with a negative, disgusted emotional expression (e.g. "YUCK, a Fliwa!"). In a control condition, objects were labeled with a neutral emotional expression. We found that children's attention to the labeled object was modulated by the emotional expression of the labeler. Overall, children looked less to the target object in both positive and negative emotional conditions than in the control condition, suggesting that an emotional reaction to the target object prompted more scene scanning. Importantly, however, children showed a slight increase in attention to the target object in the positive emotion condition in comparison to the negative emotion condition, which could be evidence of stronger encoding of the word-object association. Interestingly, the relation between attention to the object during labeling and retention was more complex. Overall, these data suggest that the emotion conveyed during object labeling can affect children's attention to referents, with possible knock on effects for word learning. It is therefore critical to further elucidate the critical role that factors such as emotional valence of labeling cues can play in modulating the processes that support language development.

Gerlind Grosse, Cornelia Schulze, Michael Tomasello, and Napoleon Katsos

Three-year-old children make some, but not all inferences based on informativeness

Even though children possess a wide range of communicative competencies in place by the age of two, a number of previous studies have found them to show limited competence with certain types of pragmatic inferences based on informativeness (so-called 'scalar implicatures') until the age of 5 ½ years. In the present experiment we

developed a novel, more ecologically valid paradigm and explored children's performance in this setting while considering two factors: the saliency of the alternative (mention of the stronger alternative term before or after encountering the critical term) and the context dependency of the inference (ad-hoc, e.g. 'a car' vs. 'a doll and a car' or scalar, e.g. 'all apples' vs. 'some of the apples'). We tested three- and five-year-old children as well as adults.

Most notably, we found that three-year-old children can draw ad-hoc inferences (i.e. in the 'ad-hoc version' mean = .81, $p < .01$). Also, their reaction time latencies in the unambiguous underinformative condition for both ad-hoc and scalar expressions indicate a more general sensitivity to informativeness at this age (pairwise comparison: $p < .001$).

However, surprisingly, children were at chance in selecting the correct box in both the strong and the weak term condition in the scalar version of our task. Only at five years of age do they master scalar inferences in this same paradigm.

We found that previous exposure to the more informative term turned out to be helpful in drawing the implicature in the weak term condition and that this was so across age groups and implicature types. We also found significant differences between the two implicature types.

We propose that children's failures in previous studies are due, not to deficient inferential capabilities but rather to methodological difficulties, semantic underspecification or additional item-specific processing demands such as quantifier domain restriction.

Michelle McGillion, Julian Pine, Jane Herbert, and Danielle Matthews

A randomised controlled trial to test the effect of promoting caregiver contingent talk on language development in infants from diverse SES backgrounds

Early language skills are critical for later academic success. Lower socio-economic status (SES) children tend to start school with limited language skills compared to advantaged peers. We test the hypothesis that this is due in part to differences in caregiver contingent talk during infancy (how often the caregiver talks about what is in the focus of the infant's attention). In a randomised controlled trial with high and low SES families, 142 11-month-olds and their caregivers were randomly allocated to either a contingent talk intervention or a dental health control. Families in the language intervention watched a video about contingent talk and were asked to practise it for 15 minutes a day for a month. Caregiver communication was assessed at baseline and after one month. Infant communication was assessed at baseline, 12, 15,

18 and 24 months. At baseline, social gradients were observed in caregiver contingent talk to their 11-month-olds (but not in infant communication). At post-test, when infants were 12 months old, caregivers across the SES spectrum who had been allocated to the language intervention group engaged in significantly more contingent talk. Lower SES caregivers in this intervention group also reported that their children produced significantly more words at 15 and 18 months (Figure 1). Effects of the intervention did not persist at 24 months. Instead expressive vocabulary at this age was best predicted by baseline infant communication, baseline contingent talk and SES. A social gradient in children's communication emerges during the second year of life. A low-intensity intervention demonstrated that it is possible to increase caregiver contingent talk and that this is effective in promoting vocabulary growth for lower SES infants in the short term. However, these effects are not long lasting, suggesting that follow-up interventions may be necessary to yield lasting benefits.

SESSION 6: LABELLING OBJECTS AND ACTIONS

Kin Chung Jacky Chan and Gert Westermann

Sounds and categorization: Do communicative auditory signals really facilitate category formation in 6-month-olds?

Previous research has claimed that both labels and novel communicative signals (such as beeps used in a communicative context) can facilitate object categorization in 6-month-olds, and that such effects can be attributed to their communicative nature. On the other hand, the auditory overshadowing hypothesis suggests that auditory input disrupts concurrent visual processing (and thus, categorization) in infants, with more familiar auditory signals interfering less. Therefore, two questions emerge: (1) do communicative auditory signals truly facilitate categorization in 6-month-olds when compared to silence; and (2) can the comparable influence of labels and novel communicative signals be explained by familiarity with these auditory stimuli? The present study addressed these questions by employing the familiarization/novelty-preference paradigm and testing 6-month-olds' categorization (N=28) in silence and in the presence of prefamiliarized tone sequences during familiarization. Consistent with the auditory overshadowing hypothesis, the results showed that infants can form categories in silence and the comparable effects of labels and novel communicative signals could be due to familiarity. These results suggest that the effect of familiar auditory signals on categorization in infants may not be facilitative. These results warrant a reinterpretation of the results of previous studies, such that labels and familiar auditory signals, due to familiarity, do not facilitate, but also not disrupt, category formation in infants, but less familiar auditory signals disrupt categorization.

Yet, whether familiar auditory signals alter the way in which infants form categories requires further research.

Hanna Marno and Dan Sperber

Pragmatics vs. novelty in a label assignment task

Children typically apply a novel label to a novel object, rather than to a familiar object; a phenomenon called Mutual Exclusivity (Markman et al., 2003). A recent explanation is that children tend to associate novel stimuli together (Horst et al., 2011). We show that pragmatic factors may override novelty. In our study two-year-old children first played with a novel object together with E1. Then E1 left the room and E2 brought another three novel objects for the child to manipulate on his/her own. Finally, E1 came back and requested the child to give her the 'Bitye'. Most children chose the first object, with which they had a common history with E1, even though it was the least novel. This suggests that children understand a novel word by considering to which object the speaker is most likely to have intended to refer.

Jean Mandler

How Infants Talk About Motion Without Verbs

Young infants attend to motion even more than to the objects making the motion. So why in many (although not all) languages are words about motion later to appear than words for objects? I discuss this much studied phenomenon, emphasizing the earliest words in English, and showing that motion actually is referred to in several ways other than verbs. Because expressing actions in English typically requires more than one word (e.g., go out, come in, etc.) newly verbal infants find other ways to talk about what most interests them. I use as examples how often heard words like hi are used to express coming in and up to express a request to be picked up.

SESSION 7: SOCIAL DEVELOPMENT

Tal-Chen Rabinowitch and Andrew Meltzoff

Swinging in synchrony enhances collaboration between 4-year-olds

During the first years of their lives young children undergo tremendous social development, rapidly acquiring new skills that enable them to engage and collaborate with peers. One important form of interaction between children at this age and later on is music. A growing body of evidence suggests that musical interaction can enhance

social behavior both among adults and among developing children. A feature of music particularly effective in modulating positive social interaction is synchronous motion, the temporal alignment of movements between individuals. In order to understand the contribution of synchronous motion to developing children's ability to jointly perform collaborative tasks, we devised a swing-like apparatus, on which pairs of 4-year-olds underwent an experience of either synchronous or asynchronous movement. Participants subsequently performed various tasks either jointly or in isolation, and the effects of synchrony on collaboration both as a dyad and as separate individuals were analyzed. We found that children experiencing synchronous movement performed the joint tasks more efficiently and more rapidly than the asynchrony group or a baseline group of children who did not undergo any treatment. We also revealed that the synchronous experience led to more prominent intention communication between participants, which possibly facilitated the improved joint performance. In contrast, individual measures of social behavior were comparable between synchronous and asynchronous children. These results reveal an important role for musical interaction, and particularly synchrony, during social development and suggest potential paths for intervention and for fostering collaboration among children, a crucial milestone in child development.

F. Cansu Pala and Charlie Lewis

A novel assessment of emotion-regulation: Children's understanding of emotion-regulation is tied to social understanding and executive control

The understanding of emotional displays in early childhood emerges at age 3 and grows at age 4 and 5 in a way that children are able to match emotional reactions to their sources. The understanding of the discrepancy between the emotional expression and the true feelings is an important step towards self-regulation. To explore such ability, children were presented with short vignettes, in which a character's anticipation for an outcome of the situation was not met but he or she was expected to alter emotional expression due to social norms. These stories aimed to assess children's grasp of the emotion-regulation and was called Scale of Understanding of Regulation of Emotions (SURE). Children whose age ranged from 3- to 5-years-old were tested in a study (N=120) in which the performance in SURE was compared with the domains of social understanding and behavioural control which were assessed through four types of behaviour: the child's responses to a positive event and a negative event and responses in a range of conflict inhibition and delay inhibition tasks. The results show that children as young as 4-years-old performed above chance across the new SURE test, showing that they were able to attribute regulated emotional displays for story characters which did not match their true feelings at an earlier age than is suggested in the literature. The child's understanding

of the possibility that how you look may not identify how you feel emerges at the same time as their ability understanding false belief. Moreover, the cognitive tasks correlated with conflict inhibition but in multiple regressions the sole unique contributor to the variance in behavioural control was SURE performance which may indicate that this skill might be crucial for preschoolers to gain control of their thought and actions.

Friday, August 25, 2017

SESSION 8: THEORY OF MIND

Maria Zajackowska and Natalia Banasik

"Why does mommy say such things?" Irony comprehension and theory of mind in four-year-olds

Comprehension of verbal irony is an example of pragmatic competence in understanding non-literal language that has been studied for over 30 years. Yet, the results are inconsistent as to the age when this competence is acquired. So far, there has been little research on the understanding of ironic utterances in Polish-speaking children. Both theory of mind and the ability to comprehend nonliteral language may require a process of reasoning based on understanding the discrepancy between information about a certain element of the world provided by salient evidence and the actual state of the world. (Ackerman, 1983; Filippova & Astington, 2008; Winner & Leekam, 1991).

The presented study aims to answer the question of whether children are able to comprehend irony as early as when they are four years old and to observe whether there is a relation between the results of irony comprehension tasks and theory of mind tasks. In the sample, thirty 4-year-old preschool children speaking Polish were tested with the Irony Comprehension Task (Banasik & Bokus, 2013) and the Reflection on Thinking Test (Białocka-Pikul, 2012). In the Irony Comprehension Task, children are presented with twelve stories - six of them contain an ironic utterance and six contain literal statement said by one of the characters in the story. The results showed that 4-year-olds scored higher in decoding the speaker intended meaning behind an ironic utterance than in decoding the meaning of the non-ironic (neutral) statements. There was no relation found between the ability to understand irony and the development of the theory of mind (ToM). Also, an analysis of children's narratives was conducted to observe how children explain the intention of the speaker who uttered the ironic statement.

Sylvain Sirois, Erik Gustafsson, and Julie Brisson

The role of learning in infants' prediction of others' action goals

The ability of infants to infer others' goals in order to predict their actions has been the object of substantial scrutiny. According to the "direct matching hypothesis", action understanding results from a mechanism mapping an observed action onto its motor representations, possibly involving mirror neurons (Iacoboni et al., 1999). An alternative "learning hypothesis" suggests that repeated observation of behavioural patterns allows infants to integrate standard behaviours and, in turn, predict others' actions (Catmur, Walsh, & Heyes, 2009).

In order to contrast these two hypotheses within the area of goal understanding, 42 12-month-old infants (22 male, 20 female) were shown a video in which objects moved to a target (either a hand or a bucket). The objects moved either through self-propelled motion (SPM) or were carried by a human agent (HA). All infants were first familiarized with one of the four video conditions (target x motion), then tested using a 2 (motion) X 2 (target) factorial design. We recorded infant gaze to identify any proactive goal-directed eye movement (PGDEM). We also recorded pupil diameter as an additional dependent measure. Pupil dilation reflects cognitive arousal, which could index mismatches between infants' predicted goals and observed test events.

Infants exhibited PGDEM in the HA but not in the SPM conditions. However, pupil dilatation was higher for SPM than HA. This study suggests that novelty of self-propelled events could be sufficiently captivating to disrupt trajectory learning. Our work itself does not deny a role of a mirror neuron system (if any) in action understanding. Rather, it highlights a role for online learning that must be factored in when studying cognitive abilities in infants. Finally, we do not show effects related to the target of motion (hand or bucket). This may not disprove but certainly questions the "goal directedness" assumed to be assessed in such tasks.

SESSION 9: ELECTROPHYSIOLOGY OF SEMANTIC PROCESSING

Katharina Kaduk, Eugenio Praise, Benjamin Taylor, Stefanie Hoehl, Kirsty Dunn, and Vincent Reid

The trajectory of semantic representation: From encoding to consolidation - an interplay of N400 and alpha desynchronization

The present study combines event-related brain potentials (ERP's) and event-related oscillations (ERO's) to investigate semantic representation of newly acquired nouns at two time points. Twenty 10-11 month-old infants first experienced a 6-minute social live interaction in which an experimenter introduced and labeled two novel objects. We investigated infants' retention for the newly acquired nouns and objects immediately after training and with a 24-hour delay. First infants were primed with the words from the learning phase via loudspeakers. Shortly after, one of the two objects appeared from behind an occluder on a computer screen. The word-object pairs were either congruent or incongruent. Our results suggest that new information transforms to a more long-term representation over time. This was evident via the observed N400 ERP component for incongruent word-object pairs following the 24-hour delay. We further focused on two neural markers thought to index information encoding (theta) and recruitment of knowledge (alpha). We found alpha band suppression for congruent word-object pairs over posterior channels. Both alpha and the N400 were only evident in the delayed retention test. Further, a correlation between the two correlates was found, suggesting that this specific alpha frequency recruits the knowledge system at 10-11 months. This implies that alpha and N400 may index similar cognitive mechanisms, namely the processing of semantics. In addition we also examined differences in attentional mechanisms between the immediate and delayed retention phase. Once more, the Nc negative central component was greater for incongruous word-object pairs only 24-hours later. Given these consistent findings, this study highlights the importance of offline consolidation and proposes that semantic representation in memory can only be indexed over time.

Katharina Antognini and Moritz M. Daum

Toddlers show mu-suppression during auditory verb processing

Verbs hold a crucial role within the language domain, since they describe relations and processes, without which we cannot express what happens to us or other people. Therefore, verbs are an inherent part of social interactions, and serve also as cues to predict future behaviour, especially, future actions of others. Action and verb processing are interrelated on a behavioural level in adults (Fischer & Zwaan, 2008) and in toddlers (Gampe & Daum, 2014; Gampe, Brauer, & Daum, 2016). Furthermore, in adults, the sensorimotor system is involved in this interrelation. However, the development of the neural interrelation early in life is less well studied.

Here, we examined the role of the sensorimotor system for action and verb processing in toddlers, who are in an early stage of verb acquisition. We investigated, whether the sensorimotor system is active during the auditory processing of verbs in toddlers of 18 and 24 months of age ($n = 33$). In addition to video clips of means-end actions,

we acoustically presented action verbs and pseudoverbs. We measured the suppression of the mu-rhythm (6-9 Hz), by means of electroencephalography (EEG). The results showed a significant suppression of the mu-rhythm during the processing of verbs (left central electrode cluster, $t(32) = -3.18$, $p = .003$; right central electrode cluster, $t(32) = -4.08$, $p < .001$) and observed actions ($t(32) = -9.13$, $p < .001$). However, the suppression of the mu-rhythm was not specific to the processing of action verbs, but was also found in response to pseudoverbs. This study suggests that, already in early language development, the sensorimotor system is involved in the processing of verbs and actions. The function of the sensorimotor system is however not yet as specialized as in adults.

POSTER ABSTRACTS

Session 1: Wednesday, August 23, 2017

1. **Alice Skelton, Gemma Catchpole, Joshua Abbott, Jenny Bosten and Anna Franklin**

Tuning into colour: What infant colour perception tells us about perceptual development

Perceptual development is the result of both low-level sensory processes and experience related factors (e.g, Timeo et al, 2017). Here we present two studies of infant colour perception which provide insight into how low-level processes (i.e. early sensory encoding of colour) and experience (i.e. the chromatic environment) contribute to the development of colour perception. In study 1, the relationship of infants' sensitivity to colour and the distribution of colours in natural scenes was investigated by measuring colour discrimination thresholds of infants (4-6 months, N=42) and adults (N=15) by recording eye-movements on a chromatic target detection task. In study 2, the underlying mechanisms of infant colour categorisation were investigated using a novelty preference procedure (4-6 months, N=179). In study 1, infants' sensitivity to hue was poorer for blue and yellow hues than others around the hue circle and was 'tuned' to the distribution of colours in natural scenes, yet less so than in adults. In study 2, the pattern of novelty preference across hues indicated that infants divide the colour spectrum into five categories, and four of these categories relate to the colour processing pathways of the retina and lateral geniculate nucleus. Infant colour discrimination and categorisation reveals both the contribution of low-level processes and experience related mechanisms. We discuss to what extent infant colour perception informs our understanding of perceptual development in other domains.

Funded by European Research Council funded project ('CATEGORIES',283605) to AF.

2. **Silvia Panella Peral**

Identifying and Categorising Social Looks in Infants aged 12-14 months.

Social looking is an integral part of any infant's affective and social development. Looking at faces forms the first elements of social interaction and reciprocity that evolves into more complex dimensions. A type of social look is Social Referencing, which alludes at the ability to use other person's

emotional expression to interpret a situation and to regulate behaviour . Social referencing allows infants to gain an understanding of the world by a means of seeking and gathering information. Nonetheless, this phenomenon, which has been studied mainly through laboratory and semi-naturalistic experiments, constitutes only one type of social looking behaviour. With the aim of examining the different types of social looks, Clyman et al.,(1986) studied pre-term infants and formulated eight operational distinctions of child-initiated social looking behaviour describing different degrees of social interactions between the infant and the adult. This study not only attempted to explore the different types of social looks in infants but aimed to bridge the gap between laboratory and natural methods of research social looking behaviour. Yet little is still known about the types of social looks infants display during social interactions in natural situations. What types of looks infants initiate during interactions with caregivers and peers when there are no manipulated variables in place is yet to be explored.

This paper aims to identify and categorise the different types of social looks that infants, aged between 12-14 month initiate during free-play time in early years settings. By video recording infants in natural and familiar settings during times of social interactions with caregivers and peers, I aim to identify and categorise an in-depth nomenclature of social looking behaviour that will contribute to the existing knowledge of how infants seek and use information from others to inform their own understanding of the world.

3. Vivien Radtke, Tanya Behne and Nivedita Mani

Does the quality of infants' language input shape infants' response to language?

Several studies suggest that infants prefer listening to infant-directed speech (IDS) relative to adult-directed speech (ADS) (Segal & Newman, 2015). However, the reasons underlying this preference are still unclear (Golinkoff et al, 2015). In an ongoing study with 6- (n=20) and 13-month-olds (n= 16), we investigate whether infants' preference for IDS varies according to the kind of input they receive from their mother. First, mothers were recorded telling a familiar story in ADS and, on a different day, in IDS. Second, a preferential-listening task recorded the amount of time infants' spent listening to the same stimuli in IDS and ADS. Third, in an eye-tracking experiment, we measured the speed and accuracy with which infants followed the gaze of an actor speaking IDS or ADS (cf., Senju & Csibra, 2008).

Preliminary results suggest the following patterns: a) 13-month-olds follow the gaze of someone speaking both ADS and IDS, while 6-month-olds do not b) 6-month-olds who show less of a preference for IDS relative to ADS (in the preferential listening task) follow better the gaze of someone speaking ADS c) 6-month-olds of mothers who use shorter ADS sentences show less of a preference for IDS relative to ADS and 6-month-olds of mothers who use higher pitch in ADS positively impacts their ability to follow the gaze of someone speaking ADS. In addition, we found numerous developmental differences in the preference and gaze following across 6- and 13-month-olds which suggests an increasing flexibility towards ADS later in life. Taken together, the data suggest that the preference for a particular register manifests in increased attention to the gaze of someone speaking in this register, while the correlations with maternal input suggest that the physical characteristics of maternal ADS may increase the salience of this register for infants.

4. Elena Hoicka, Merideth Gattis and Burcu Soy

Developing a parent report measure of social cognition from birth to 3 years

While social cognition has traditionally been measured with lab tasks (e.g., Carpenter, et al., 1998), recently, Tahiroglu et al (2014) have developed the Children's Social Understanding Scale for 3- to 5-year-olds. They found parents reliably report socio-cognitive development. To examine earlier socio-cognitive development, we have created a parent-report measure of social cognition from birth to 3 years, the Early Social Cognition Scale (ESCS).

In study 1 (exploratory, N=230) parents of 0- to 47-month-olds completed the 23-question ESCS online. Questions determined children's level of social cognition, e.g., "Does your child follow where you point to look at the same things as you?" and, "Does your child understand what it means for others to make mistakes? E.g., that they dropped a plate by accident." One item did not correlate with the total score, "Does your child like to look at faces?" since it was at ceiling, so was dropped. The remaining 22 items correlated with the total score with Spearman's $\rho > .3$, $p < .05$. Scale reliability was excellent, KR20=0.95. The ESCS correlated strongly with age, Pearson's $r = 0.86$, $p < .001$.

In study 2 (confirmatory, N=228), scale reliability was again excellent, KR20=0.93, and again, the ESCS correlated strongly with age, Pearson's $r = 0.82$, $p < .001$.

A subset of children from the above studies were tested for test-retest reliability. Children (N=48) had similar scores 6 months later, Pearson's $r=0.56$, $p<.001$, $df=45$, controlling for age. Children (N=24) also had similar scores 12 months later, Pearson's $r=0.66$, $p=.001$, $df=21$, controlling for age.

A subset of children from the above studies were tested for inter-observer agreement by having both parents separately complete the ESCS. Both parents gave similar scores to children (N=32), Pearson's $r=0.85$, $p<.001$, $df=29$, controlling for age.

The final stage will involve comparing the ESCS to lab tasks for 84 children.

5. Priya Silverstein, Eugenio Parise, Gert Westermann and Teodora Gliga

The role of ostensive and referential cues in infant object memory

Ostensive-referential communication is argued to be pivotal for learning in infancy (Csibra & Gergely, 2009), and even to have a specific effect on what infants learn about objects. Yoon, Johnson & Csibra (2008) found that after viewing an ostensive pointing scene ('Hey baby', actress pointing to object, occluder covering object, occluder revealing a change), 9-month-olds detected object identity changes more than object location changes. But after viewing a non-ostensive reaching scene, infants detected object location changes more. These results were interpreted as ostension boosting identity encoding. However, the relative contribution of ostensive and referential signals cannot be concluded from this experiment.

In experiment 1, we will conduct a direct replication of the previous study, comparing ostensive pointing and non-ostensive reaching. In experiment 2, we will add two new conditions: ostensive reaching and non-ostensive pointing. Infants will see action videos where an actress performs actions towards a novel object. We will use an eye-tracker to investigate change detection (either of object identity or location), as well as where infants are looking during the action scene. Each infant will see six test scenes: two action conditions (ostensive reaching, non-ostensive pointing) and three different outcomes (no change, identity change, location change).

If the effect observed in Yoon's study is due to ostension boosting object identity encoding, we will observe both ostensive conditions causing longer looking times for the object's identity change. If the effect is due to

referentiality boosting object identity encoding, we will see both pointing conditions causing longer looking times for the identity change. If it is the combination that drives the effect, we will only see longer looking times for the identity change in the ostensive pointing condition. Results from this study will help differentiate the roles of these cues, and how they contribute to infant learning and memory.

6. Cornelia Schulze, Gerlind Grosse, Mutsumi Imai, Noburo Saji and Henrik Saalbach

How do children construct the color lexicon? A developmental and comparative study of concept formation

The meaning of a word and the boundaries of that meaning are determined by the meaning of the words belonging to the same semantic domain. This means that children need to learn a cluster of words in the same semantic domain and delineate the boundaries among them (Saji et al., 2011). This is particularly critical for color words, as compared to object names, because the continuous visible color spectrum does not have natural partitions.

The present study investigates 1) how adult German speakers delineate the boundaries between 153 color patches and 2) how 3 – 9 year-old children discover the boundaries of color names. In a later step, German data will be compared to Japanese and US-American data of the same experiment.

Data collection is currently ongoing. We are testing 26 German speaking participants of each of the following age groups: adult, 3-, 5-, 7-, and 9-years. In a cross-sectional behavioral observation study, participants were presented with 93 (153 for adults) color patches one by one in a random order, and were asked “What color is this?” by the experimenter. Each color patch was presented only once. Participants observed the color patches on a gray background under standardized lighting conditions.

For adult data, we calculated the distances between the color names and compared categorization patterns between age groups using a multi-dimensional scaling analysis. For the set of 153 items we found a 3-dimensional solution ($S1 = 0.25$, $RSQ = 0.94$), where the differentiating dimensions correspond roughly to brightness, warmth and saturation. We expect to find similar results in German children as were found in Japanese children (Saji et al. in press). Even 3-year-old Japanese children

could map color words to its typical referents. But at the same time, they struggled to delineate the boundaries between neighboring color words.

7. Laura-Ashleigh Bird and Melissa Allen

Learning from Digital Media: An Atypical Perspective

Difficulties with communication and social functioning are hallmarked characteristics of Autism Spectrum Disorder (ASD; Wing & Gould, 1979; American Psychiatric Association, 2013). Many language interventions are now being delivered via digital technology such as tablets in the classroom (Ward, 2015), however evidence for their effectiveness remains scarce and contradictory. In addition, how children potentially engage with digital technology, and the effect this has on learning has not yet been explored. The present research compares how children with ASD learn novel words from iPads vs. traditional storybooks, in a naturalistic story format. Two groups of children between 4-11 years participated; children with ASD were compared to a second group of children with other developmental disorders in a between-subjects design (book or iPad condition). In the course of a story book interaction, children heard 2 novel words 4X times each. Word learning was assessed using a referent selection task immediately, and again after a 24-hour delay. Social engagement with the task and experimenter was also assessed using observations of experimental footage. Preliminary results showed word learning occurred at a similar level between books and iPads for both participant groups. However, an advantage for iPad-based learning over traditional books was found when disengagement from the task was controlled for. Social engagement measures revealed an increase in medium-directed attention towards the iPad, but an increase in pointing towards the book. This suggests children are more focused when content is presented on an iPad, however engage more socially when using traditional books. Results will be discussed in terms of the role of engagement with technology for learning in atypical populations.

8. Samuel Forbes and Kim Plunkett

The role of labels in understanding contextual information

Infant word learning and categorisation is aided by contextual information, including shape, size, and colour, which shapes their understanding of the concept. For example, the contextual information about a car could be that it has wheels, that it can be driven, and that it has a certain shape; this is information necessary for inclusion into the car category. Colour is a further

piece of contextual information, which may not matter in the example of a car, but is crucial in the case of certain words, such as “banana.”

Previous research has found that contextual information can be used to distribute attention in toddlers. Previous work found that twenty-four month old toddlers fixated the colour related distractor when they heard a term with an inherent colour, for example fixating a yellow bowl upon hearing the term “banana.” This finding highlighted the importance of contextual information.

The present study expands on previous work done by examining two age groups, twenty-four month-olds, and nineteen month-olds, in order to examine whether age and acquisition of colour terms affects distribution of attention based on the contextual information. Participants were assessed with a two-picture eye-tracking task.

The results show that in the target-present trials and the semantic distractor trials, both age groups perform similarly, but in the colour distractor trials, only the 24 month-old group regularly attended to the colour-related distractor. When analysed based on their knowledge of the colour term, only those who were reported to know the colour term regularly fixated the colour-related distractor.

This study suggests that labels play an important role in the understanding of contextual information, and suggests that for infants, knowing that a banana is yellow may first require them to understand the meaning of “yellow.”

9. Christian Kliesch, Vincent M. Reid, Anna L. Theakston and Eugenio Parise
Anticipation of familiar, unexpected and novel actions in ostensive and non-ostensive contexts in 7-month-old infants

When learning about others’ actions, infants interpret actions as goal directed (Hunnius & Bekkering, 2010; Reid et al., 2009) Infants are also sensitive to ostensive communication (Csibra, 2010). When infants are addressed ostensively, they expect the content of the communication as relevant, meaningful and generalisable (Csibra & Gergely, 2009).

Hunnius and Bekkering (2010) found that infants can anticipate familiar head- and mouth-directed actions (e.g. putting a cup to the mouth), but fail to anticipate unfamiliar actions (putting the cup to the ear) even after several

observations. However, adults are able to anticipate unexpected action outcomes after a few exposures.

In the study presented we investigated whether infants learn to anticipate unexpected action outcomes when they are addressed ostensively. This effectively replicates Hunnius and Bekkering (2010), with the addition of a communication manipulation: Prior to each action demonstration, the actor addressed the infant either ostensively, or non-ostensively. To control for previous knowledge of the actions, we included an additional condition involving two unfamiliar objects which participants either moved to the mouth or the ear. We also measured their pupil dilation (c.f. Hepach & Westermann, 2016) to investigate whether infants' learning is modulated by differences in arousal after communication or seeing unexpected action outcomes.

Currently, we have tested 20 7-month-old infants in a mixed design, pending analysis. We hypothesised that infants might learn to anticipate novel action outcomes in ostensive contexts, but (c.f. (Hunnius & Bekkering, 2010) not in non-communicative contexts. Ostensive communication might also facilitate the remapping of familiar action outcomes to new goal locations. This study can potentially show how ostensive communication drives the interpretation of novel information in the context of already known information.

10. Helen Buckler and Elizabeth Johnson

The impact of input variability on the earliest stages of lexical acquisition

During the first year of life infants' first word-form representations develop. By six months old infants recognise their own name and other frequent words (Bergelson & Swingley, 2012; Mandel, Jusczyk, & Pisoni, 1995). Models of developmental speech perception assume that early word-form representations arise from tracking distributional patterns in the input (Werker & Curtin, 2005). Infants with multi-accented input encounter speakers with different phonemic distributions, yet little is known about how input variability affects the development of the earliest lexical representations.

Here we investigate the impact of exposure to multiple accents on word-form representations at 6 months. We investigate whether exposure to accent variability affects the specificity of word-form representations and infants' ability to cope with surface form variation by measuring infants' sensitivity to

mispronunciations of their own name. Two groups of monolingual infants participated. Mono-accented infants (N=24) had parents who spoke Canadian English, and multi-accented infants (N=24) had extensive exposure to other varieties of English (e.g. a British- or Spanish-accented parent).

Using the Head-turn Preference procedure, infants' listening times to correct pronunciations and mispronunciations of their name were compared (e.g. CP=Sammy vs. MP=*Simmy). Infants were predicted to listen longer to CPs than MPs if they recognised their name and noticed the mispronunciation. We find a significant interaction of Accent Group (mono- vs. multi-accented infants) and Pronunciation (CP vs. MP), $F(1, 46)=4.67$, $p=.036$. Mono-accented infants listen longer to CPs (M=12.35s) than MPs (M=10.68s), $t(23)=2.33$, $p=.03$, indicating recognition of their name and preference for the CP than MP. Multi-accented infants (N=24), however, display no preference for CPs (M=11.35s) over MPs (M=12.15s), indicating greater acceptance of surface form variation. Multi-accented infants' vowel representations are apparently less well specified than their mono-accented peers'.

This study exposes important differences in early word-form representations and highlights the impact of input variability on early lexical acquisition.

11. Iain Jackson, Eugenio Parise, Vincent Reid and Anna Theakston

Agents vs patients: How is infants' attention distributed in two-participant causal events?

By the end of the second year, infants demonstrate a bias for mapping the first noun in a sentence to the agent of a causal event (Gertner, Fisher, & Eisengart, 2006). Younger infants in their first year also show a similar bias towards agents over patients in simple dynamic events, for example focussing on the chaser when one geometric shape appears to chase another (Galazka & Nyström, 2016). However, successful language acquisition relies on infants' ability to establish mappings between abstract components of events (such as the thematic roles of agent and patient, for example) and the linguistic means of expressing them (Mandler, 2004). Thus, infants must first learn to encode the roles and identities of both agent and patient, and the causal relations between them.

In the current work we presented 30 monolingual, English-learning, 13-month-old infants with animations of simple causal interactions between two participants. By systematically varying different components of the events we

assessed infants' sensitivity to changes in the identity of agents and patients, the action performed by the agent, and reversals of the thematic roles of agent and patient. We will present eye tracking data to explore how attention is distributed between event participants in each instance, and discuss these results in the context of infants' developing sensitivity to linguistically relevant event cues.

12. Marina Bazhydai, Gert Westermann and Eugenio Parise

Information Seeking and Social Referencing in Infants

Social referencing is among the early communicative tools available to preverbal infants for seeking emotional guidance when uncertain, asking for help and placing instrumental requests (e.g., Walden & Ogan, 1988). In addition, social referencing may be one of the mechanisms for active, curiosity-driven learning, serving an interrogative, information-seeking function (e.g., Goupil, Romand-Monnier, & Kouider, 2016).

The goal of the proposed set of experiments is to understand whether 11-month old infants use social referencing for engagement or for information-seeking in the presence of uncertainty. Experiment 1 will look at whether infants use social referencing when presented with incongruent as opposed to congruent information. Infants and their caregivers will face a screen showing an occluder, which subsequently reveals a familiar object (e.g., a ball, a cat). Caregivers will be instructed to label the hidden object before it is revealed (e.g., "Look, there is a ball!"). The object appearing from behind the occluder will be either congruent or incongruent with the provided label. We hypothesize that social referencing will increase in incongruous trials. This first study will help establish whether social referencing is an index of intentional information-seeking in the presence of uncertainty. In Experiment 2, the caregiver will be instructed to act as either an informant (information condition) or a social partner without providing any specific information about the objects (engagement condition). We hypothesize that social referencing will increase in the information condition, which would support its proposed interrogative function (e.g., Southgate, Van Maanen, & Csibra, 2007). However, if infants are driven to engage social partners (but not necessarily to seek information), we should see equal amounts of social referencing across both conditions. Together, this work will provide detailed insights into the function of social referencing in early infancy.

13. Carolin Konrad, Katharina Sommer, Laura La Rocca, Silvia Schneider and Sabine Seehagen

State-dependent memory in 9-month-old infants

Infant memory in the first year of life is highly specific. Even small changes in the external context (e.g., the room) can disrupt memory retrieval (Hayne, 2004). In adults, memory retrieval is not only dependent on external, but also on internal cues (e.g., physiological state, Miles & Hardman, 1998). However, to our knowledge, state-dependent memory has not been tested in infants yet. The aim of the present study was to examine the effect of being in different versus same state during encoding and retrieval on memory in 9-month-old infants.

In an ongoing experiment, infants were randomly assigned to two experimental conditions or a baseline control condition (N = 83). Infants in the congruent condition were in the same state at encoding and retrieval (active or quiet). Infants in the incongruent condition were in a different state at encoding and retrieval (e.g., active at encoding and quiet at retrieval). States were induced through 5-min active or quiet playtime directly before encoding and retrieval. Memory was assessed using a deferred imitation paradigm (Barr et al., 1996) with a 15 min delay between demonstration (encoding) and test (retrieval). Infants in the baseline control condition only saw the stimuli during the test session to assess spontaneous production of any target actions.

There was a significant main effect of condition on the mean number of target actions produced at test, $F(2, 80) = 4.95, p = .009$. Bonferroni post-hoc tests indicated that only infants in the congruent condition performed a significantly higher number of target actions at test than infants in the baseline-control condition, $M_{diff} = 0.79, p = .025$. Furthermore, they performed significantly more target actions than infants in the incongruent condition, $M_{diff} = 0.66, p = .032$.

Infant memory seems to be highly state-dependent. This has important implications for understanding childhood amnesia.

14. Jasmin Alian, Helena Lapinleimu and Suvi Stolt

Associations between early communication skills at 1;0 and language performance at 2;0 in typically developing Finnish children

Background. The development of early communication/language skills, e.g. early symbolic gestures and receptive vocabulary, may predict later language performance. The present study aimed to analyze the associations between the early communication/language skills at 1;0 and receptive/expressive language performance at 2;0.

Methods. This study is part of a larger study (N=105). The present subgroup includes 27 full-term children from monolingual Finnish-speaking families. The Finnish versions of Communication and Symbolic Behavior Scales, Developmental Profile (CSBS–DP) and the MacArthur Communicative Developmental Inventory (MCDI; the long form) were used to measure early lexicon (receptive/expressive) and communication skills at 1;0. Receptive and expressive language skills were assessed using the Reynell Developmental Language Scales III (RDLS III) –test at 2;0. Information on the background factors was also collected.

Results. Children who received high total score in CSBS–DP also got high total score in RDLS III ($r=.534$, $p=.005$). Additionally, significant correlations were found between the receptive language scores in CSBS–DP and RDLS ($r=.558$, $p=.003$) but also between the expressive language scores of the same methods ($r=.547$, $p=.003$). Also the MCDI total scores (Fenson et al., 2007; Lyytinen, 1999) correlated significantly with RDLS III total scores ($r=.673$; $p=.000$). The significant correlations were also found between the number of receptive words in MCDI and the receptive language score in RDLS ($r=.493$, $p=.009$), the MCDI total gesture summary scores and RDLS receptive ($r=.691$, $p=.000$) and expressive ($r=.459$, $p=.021$) language scores. The correlation between the MCDI expressive vocabulary score and RDLS expressive language scores ($r=.369$, $p=.058$) were close to significance.

Conclusions. The correlation co-efficient values of CSBS-DP and MCDI were parallel. However, the CSBS–DP is shorter and easier to use than MCDI. It might be thus suitable for early screening. On the other, the MCDI method provides more detailed information on early language development.

15. Julia Brehm, Anja Gampe and Moritz M Daum

Scope of credibility: Selective learning across domains and the cognitive mechanisms thereof

Already at the age of 14 months, children begin to selectively learn novel information from people they trust over those they do not. This trust can be

driven by the familiarity of the person they are learning from, their normative behavior, and also their competence in a certain domain. To process information selectively based on other peoples' competencies, children have to learn that competencies are usually not domain-general but rather domain-specific. To date, little is known about how, and when, the ability to discriminate between domain-specific competencies develops. Furthermore, the cognitive mechanisms behind selective learning are only starting to be investigated and are therefore still hardly understood. To examine these open issues, we will conduct one behavioral, and one EEG study in preschoolers at two, three and four years of age. In the first study, children will be randomly assigned to one of four conditions, a model being either competent or incompetent in one of two domains (action or language). Afterwards all children will be taught both novel actions and novel words from these models and learning will be assessed using eye-tracking and behavioral measures. We expect, that children at two years of age, will still employ a domain-general account of selective learning, neither learning actions nor words from the incompetent model, independent of competence domain. Contrary, the oldest age group is expected to already have switched to a domain-specific strategy, learning selectively based on the models (in)competence domain. Second, we will investigate the cognitive mechanisms underlying selective learning, which are, up until now, largely unknown. We are planning to investigate attentional processes during the demonstration of incompetence, the presentation of novel information and the later recall of that information using EEG. This will help to better understand the mechanisms in processing competence and selective learning.

16. Eva Berglund and Karin Edlund

Morpho-phonological skills in Swedish 2;3-2;5-year-old children with low versus high vocabularies

The Swedish language provides special morpho-phonological challenges. It is, like Danish (Bleses et al 2008), a vowel rich language and it also uses quite a few consonant clusters. Swedish has also a fairly complex morphology. Regarding nouns Swedish has for instance arbitrary gender (utrum & neutrum) and expresses plural in five ways. Regarding verbs there are four types of verbs and for instance there are six spoken active voice forms for each verb. This is the task facing toddlers.

In this study, we describe how two groups of children in a narrow age-span handles the task to acquire the Swedish sound structure and what aspects of the grammar they express morphologically and syntactically.

Participants were 9 children 2;3-2;5 years old, four girls and five boys, with vocabularies in the -25th and 90th- percentiles measured with the Swedish version of MacArthur-Bates Communicative Development Inventories. The children were then recorded at home in typical natural situations (during meals, clothing, play and book-reading) and five minutes from each activity (or replaced activities in some cases) were transcribed. In total, there were 20 minutes of transcriptions per child. Transcriptions were first done orthographically (using the CHAT system), and the use of nouns, verbs, auxiliaries, and pronouns were identified. Utterances with examples of the four word-classes were phonetically transcribed.

The results compare the sound-structures used by children in the two groups, in particular regarding place and manner of production. The way children handle consonant clusters is also described for instance regarding substitutions and omissions. In regards to morphology, we describe what particular forms children use.

The design, comparing young children between vocabulary groups, may yield insights into Swedish language development which are of use for pedagogical purposes in early child care.

- 17. Henriette Schneider-Hassloff, Annabel Zwönitzer, Anne Katrin Künster, Margot Popp, Thomas Gruber, Ute Ziegenhain and Markus Kiefer**
EEG theta oscillations in a right fronto-temporo-parietal network are associated with children's executive function skills and the dyadic quality of the mother-child interaction

Executive functions (EF) are a set of cognitive control abilities which are associated with academic achievement and health throughout life. They are related to the functioning of frontal, parietal and occipital brain areas that are maturing throughout childhood at different rates. Behavioral research suggested that children's EF were associated with parenting quality and child attachment security. Recently we showed that modulations of the ERP component N2 in a fronto-parieto-occipital network might partly underlie these associations. Oscillatory dynamics in the EEG theta band have been related to the communication between neural networks that are involved in

cognitive control. Their association with children's EF and parenting quality is still unknown.

With this study we tested in 4-to-6-year old healthy preschool children (N=27) how emotional availability in the mother-child dyad was associated with behavioral and electrophysiological correlates for response inhibition (a core executive function) in a Go/Nogo task using spectral power analysis in the time-frequency domain (applying nonparametric permutation analysis of continuous wavelet transforms).

Our data showed that the Go/Nogo task significantly modulated children's spectral power in five distinct clusters that encompassed oscillations in the delta, theta and alpha bands in mainly right-lateralised fronto-central and -temporo-parietal brain regions. A high dyadic quality of the mother-child interaction was associated with a larger Go-Nogo difference in the theta band over right fronto-temporo-parietal brain areas (i.e. a higher spectral theta power in the Nogo condition). This effect was also related to a better delay of gratification and a better response accuracy (more Go hits). In addition, maternal autonomy-support was associated with oscillations in the delta, theta and alpha bands in a fronto-central cluster.

Our results suggest that parenting qualities are related to oscillatory dynamics in neural circuits that underlie EF. These data further support the notion that parent-child interactions shape neurocognitive development underlying EF.

18. Christine Michel, Ezgi Kayhan, Sabina Pauen and Stefanie Hoehl

Just have a look at that! Infants' overt following of eye movements

Gaze direction of others serves as an important signal guiding infants' attention. Already 3-month-olds are able to follow the joint movement of head and gaze of a person (D'Entremont, 2000). The ability to follow isolated eye movements seems to emerge around 12 months of age or later when studied in live situations (Moore & Corkum, 1998; Tomasello, Hare, Lehmann, & Call, 2007). However, results from computer-based studies suggest that infants' attention is covertly shifted by eye movements of another person already at 3 to 4 months of age (Hoehl, Wahl, & Pauen, 2014; Hood, Willen, & Driver, 1998).

The current study aims at investigating whether 4-month-olds are able to follow eye movements in a simple computer-based setup. Recently, an interactive eye tracking study found that 4-month-olds follow another person's head and gaze movement spontaneously and enhance this behavior dependent on the reward they experienced for doing so (Michel, Pauen, & Hoehl, 2016, March). We adapted this paradigm containing of a baseline, training and test phase. In each trial, infants saw the face of a woman turning her eyes to the side looking at one object and away from another object. If infants are sensitive to isolated gaze cues, we expected longer looking times to the cued than to the not cued object in baseline. During training, we rewarded gaze following behavior: whenever infants looked at the cued object, it started to move lively. The final test phase was identical to baseline. If reward influences gaze following behavior, infants shall reinforce this behavior from baseline to test. In addition to looking times, we will analyze pupil dilation. If infants link the cue with the reward, we expect enhanced pupil dilation in response to the cue after the experiment as compared to the beginning of the experiment. Data acquisition is under way.

19. Sébastien Forestier and Pierre-Yves Oudeyer

A Unified Model of Speech and Tool Use Early Development

Some studies hypothesize that there might be a strong interdependence between speech and tool use development in the first two years of life. To help understand the underlying mechanisms, we present the first robotic model learning both speech and tool use from scratch. This model focuses on the role of mechanisms of autonomous body babbling in free play, combined with imitation learning. It relies on two algorithmic ingredients: goal babbling and a modular object-based representation of task spaces. We show that agents learn in a unified manner 1) how to use their arm to grab a toy, or to grab a stick and use it as a tool to retrieve a toy, 2) how to use their vocal tract to produce speech sounds, and leverage these vocal skills to use the caregiver as a tool to bring a specific toy within reach. We show the development of context-dependent preferred strategies for retrieving toys (hand, stick, speech). The grounded exploration of toys also accelerates vocal learning of accurate sounds for toy names.

20. Shirley Cheung, Silke Brandt, Eugenio Parise and Gert Westermann

Speech perception and the brain: Exploring the flexibility of the bilingual perceptual narrowing using fNIRS brain-imaging

Learning language requires neural resources, which involves building dedicated networks in the areas of the brain responsible for speech perception. The cost to build elaborate representations of native languages is the decline in sensitivity to the others (Werker & Tees, 1984). This process, also defined as perceptual narrowing, has been found to occur quite early in development, between 6 and 9 months, where infants have shown commitment to native language(s) before their first birthday. The following studies examine the essence of perceptual narrowing and whether its onset could be prolonged as a function of bilingualism.

Study 1 determined if monolingual participants detected phonemic changes in native and non-native languages and where the changes were processed in the brain (i.e. left or right hemisphere). We used functional Near-Infrared Spectroscopy (fNIRS) to measure oxy- and deoxyhemoglobin concentrations at the cortex during native and non-native phonemic discrimination tasks in 10-12-month-olds. Thirteen English-monolingual infants and a native English-monolingual adult control (N = 13) participated in an auditory phonemic discrimination task. Both age groups were presented with minimal-pair word contrasts in English, Mandarin, and Hindi. We predict that monolingual infants and adults process native (i.e. English) contrasts with left hemispheric dominance and show little to no detection for non-native contrasts.

The aim of Study 2 is to address the flexibility of the perceptual system in bilingual infants during the period where perceptual narrowing has taken place in monolinguals. Bilingual infants are predicted to show differential activation patterns to the non-native contrast compared to monolinguals. Study 2 is ongoing, testing Mandarin-English bilingual 10-12-month-old infants and a bilingual adult control on the same procedure as Study 1. Testing a contrast (i.e. Hindi) that is non-native to the bilinguals' phonemic repertoire will allow us to find out whether bilingualism can prolong the perceptual narrowing time window.

21. Rianne van Rooijen, Eline Bekkers, Lisa van der Tier, Donna de Visser and Caroline Junge

Maternal speech facilitates novel word learning

For language acquisition, the maternal voice is special. It is the only voice that neonates have most experience with and prefer over any other voice. Children further process her voice faster and increase activation in brain

areas related to language and attention. But does this advantage also extend to novel word learning?

We use eye-tracking to test two-year-olds' ($n=127$) word-learning abilities (design closely followed Ma et al., 2011). Since the beneficial effects for maternal speech is typically examined either via live speech (with the experimenter functioning as control; e.g. Parise & Csibra, 2012), or via pre-recorded stimuli (with the maternal stimuli presented once to the mother's child, and once to an unfamiliar child as control; e.g. Barker & Newman, 2004), we tested the advantage of mother's voice in both situations. Results show that voice familiarity indeed matters for novel word learning (significant interaction: $F_{1,123}=4.78$, $p=.03$): children who learn from maternal speech look significantly longer at target than distracter ($F_{1,65}=11.5$, $p=.001$), whereas children who learn from unfamiliar speakers do not ($F_{1,59}<1$). While the advantage for maternal speech is more pronounced in the live setting than in the prerecorded version, this difference did not reach significance (See Figure 1).

We are further examining whether speaker familiarity might also heighten children's level of engagement by tabulating how often children produced the novel words or pointed at the screen. Preliminary results (i.e. from live version) suggest that children are more likely to repeat words from a familiar speaker. Moreover, at the individual level we observed correspondences between both word production or pointing and their learning performances.

Thus our results confirm that children learn words more rapidly from their mother than from an unfamiliar person. It appears that maternal speech not only facilitates word learning, but also affects the child's engagement.

22. Katherine Twomey, Elle Hart, Charlotte Rothwell and Gert Westermann

Learned labels increase similarity in 10-month-old infants' category representations

Recently, Westermann and Mareschal (2014) proposed a new account of the relationship between labels and categories in infants' early representations. On this "compound representations" view, labels are initially represented separately from category exemplars, but over time become closely associated, exerting a "magnet"-like effect such that exemplars which share a label are represented more closely together – and therefore perceived as

more similar – than unlabelled exemplars. However, to-date this prediction has not been empirically tested.

To address this gap we asked parents of ten-month-old infants ($n = 16$) to read their child a storybook depicting two novel object categories, one with a label (tanzer) and one without, twice per day for a week. Infants then participated in an eye-tracked looking time task. In a silent familiarization phase they saw eight identical exemplars of the two trained categories; here, any differences in looking to the two exemplars must relate to the presence of a label in their stored category representation. Next, they saw a single preferential looking trial with two exemplars presented simultaneously, accompanied by the trained label (“Look! A tanzer!”).

Critically, during familiarization infants were looked least at the previously labelled exemplar, suggesting that they perceived it as more familiar than the unlabelled exemplar (Fantz, 1964). Since these differences in looking times were observed in a silent task, and can thus only be driven by the presence of a label in infants’ stored (not online) representations, the current study is compatible with accounts of labels’ representational status in which labels and categories are closely associated, and in particular offer the first empirical evidence for the compound representations account of representational development.

23. Sarah F. Schoch, Sina Boschert-Hennrich, Oskar G. Jenni, Reto Huber and Salome Kurth

Sleep, development and maternal cognition in 3-month-old infants

Objectives. Sleep is essential for the maturation of brain functions in animals. In humans, sleep behavior in the first years of life show high inter-individual variability. While sleep problems in early childhood have been linked to behavioral development, there is limited literature on the relationship in infancy. We examined associations between infant sleep with development, as well as with maternal cognition on infant sleep at age 3 months.

Methods. Sleep was monitored for 10 days in 28 healthy, breastfed infants (2.81 ± 0.2 mo, 18 male) using ankle actigraphy (Geneactiv) and paper-pencil sleep diaries. We analyzed actigraphy data by fine-tuning a published algorithm (Sadeh, 1995). Maternal cognition was assessed with the Maternal Cognitions about Infant Sleep Questionnaire (MCISQ). The Ages and Stages questionnaire (ASQ) was used for measuring infant behavior.

Results. The algorithm showed good agreement with the sleep diary (86%). There was a positive relationship between day-to-day variability of total sleep duration and the MCISQ score Anger, reflecting maternal feelings of anger and helplessness with the demands of the child ($r = 0.51$, $p = 0.006$; partial correlation factor 'personal-social, ASQ', $r = 0.57$, $p = 0.002$). Infants showing higher day-to-day variability in night sleep duration exhibited higher scores in personal-social development ($r = 0.44$, $p = 0.02$, ASQ). This relationship survived controlling for MCISQ Anger score ($r = 0.52$, $p = 0.006$). Mothers of infants who exhibited longer consolidated sleep periods had more concerns about Safety and sudden infant death ($r = 0.47$, $p = 0.012$).

Discussion. Day-to-day sleep variability was related to both maternal cognition and infant personal-social development. Our data suggests independency of the relationships infant sleep behavior - parental cognitions and infant sleep behavior - infant development. Further studies will examine the stability of these associations throughout the first year of life.

24. Anna Babarczy, Tamas Kaldi and Andrea Balazs

Perspective taking and implicature derivation in 4 to 8 year-old children

The study looks at perspective taking and implicature derivation in 4 to 8 year-old children. To be able to understand "speaker meaning" defined as a communicative intention different from what is directly encoded by an utterance, one must be able to shift between their own perspective and the speaker's perspective. We investigate whether children can use their Level 1 perspective taking ability, i.e., the ability to appreciate that an observer may have a different view from their own, to evaluate the pragmatic felicity of an observer's utterance.

A preschool group, a school group and adult controls took part in the experiment. Participants saw a stage divided into two fields. An Agent appeared in the centre and made eye contact with the participant. The Agent then disappeared and various objects appeared on both sides of the stage. Next, the agent reappeared on one or the other side and made a descriptive statement. The participant's task was to evaluate the statement on a three-point Likert scale. In perspective match trials, the statement had the same truth value and felicity from the participant's and the Agent's perspectives. In mismatch trials, the statement had the same truth value but differed in

felicity from the two perspectives. Participants' responses and eye movements were recorded.

The results revealed that the preschool group evaluated the statements based purely on their truth value disregarding felicity. The school group distinguished semantic truth from felicity and their answers reflected the Agent's perspective. Quite unexpectedly, however, adult controls did not take the Agent's perspective although they distinguished truth value from felicity. The eye gaze data show that while the children looked at the Agent more than at any other part of the screen, the adults' looks were predominantly directed at the side of the stage visible to the Agent.

25. Mikako Ishibashi and Izumi Uehara

Children's scale errors: Its relationship to semantic knowledge and pretending behaviors

Young children sometimes attempt to perform inappropriate actions without considering the size of an object. This phenomenon is known as a scale error (DeLoache, Uttal, & Rosengren, 2004). Previous studies have indicated that the scale error may arise from the identification of the object that does not include information about the specific miniature such as its tiny size (DeLoache et al., 2004). Some studies proposed that the occurrence of scale error could be suppressed by learning semantic knowledge about size (Grzyb et al., 2014). Another study discussed that growing conceptual knowledge might facilitate children's appropriate action selections such as pretending behaviors (He, Zhang, & Xu, 2015). However, few studies have examined whether the performance of pretending behaviors and language knowledge are different between children with and without scale error. Thus, this study investigated the relationship among children's scale errors, semantic knowledge, and pretending behaviors.

Participants were 34 children (M age= 23 months, SD = 7.1, Range = 15 to 35 months old) and their parents. Children's scale errors were measured by a scale error task. For pretending behaviors, a pretend play task was employed (Harris & Kavanaugh, 1993). Their parents completed the Japanese MacArthur Communicative Development Inventory (MCDI: Ogura & Watamaki, 2004) to estimate children's vocabulary size as the measure for semantic knowledge. Nine out of the 34 children performed at least one scale error. The children who showed scale errors got significantly lower scores on MCDI than those who did not show any scale error. However, any significant

difference was observed between the two groups with the scores in pretend play. These findings suggest that the occurrence of scale errors might be associated with children's vocabulary size, whereas it may not affect the occurrence of children's pretending behaviors.

26. Melanie Otto, Carmen Deffner, Laura Walk and Katrin Hille

Measures of Working Memory and Theory of Mind from 36 to 48 Months

Theory of Mind shows robust correlations with cognitive abilities in general (e.g., Wellman, Cross, & Watson, 2001, Zelazo, Frye, & Rapus, 1996) and executive function skills in particular (e.g., Carlson, Claxton, & Moses, 2015; Frye, Zelazo, & Palfai, 1995; Hughes, 1998a,b; Perner & Lang, 2000).

Executive Function (EF) is an umbrella term encompassing a set of cognitive functions (inhibitory control, working memory, cognitive flexibility, Miyake et al. 2000). They are necessary for goal-directed activity, shifting and directing attention. EFs predict social-emotional competences, academic success, stability in work and social life (e.g. Bierman et al., 2008; Duckworth & Seligman, 2005; Moffitt et al., 2011). Theory of Mind (ToM) is the awareness and understanding of the mental states of others and their effect on beliefs and behaviors (e.g., Goldman, 2012).

We show descriptive data of working memory (WM) and ToM in the age of 36-48 months. WM was measured by the digit span of HAWIK-IV (Petermann & Petermann 2008) for 125 children from 36 to 48 months. ToM was assessed for 108 children of this age group by a test that asked children to change their perspective in an every day kindergarten situation (Bischof-Köhler 2000).

Our results show a wide range in the ability of holding information in mind in the digit span among the age group, showing likewise a normal distribution. Whereas results in the ToM test show that children this young are merely capable of switching between perspectives. They are slightly becoming better if they are older (48 months). Being asked about their understanding of the ToM situation, children give various answers, some showing they are on the track of a ToM understanding.

As expected differences in the development of WM among the age group is already visible. During the ToM tests they perform low at a behavioral level.

27. Angela Grimminger, Carina Lüke, Ute Ritterfeld, Ulf Liskowski and Katharina Rohlfing

Individual differences in the early use of pointing-speech-combinations in 14- to 16-month-olds

Early gestural communication predicts later linguistic skills, both for typically developing children (Colonnesi et al., 2010) and children with developmental communication disorders (te Kaat-van den Os et al., 2015). Recent studies suggest that using multimodal communicative means, i.e. pointing together with verbal utterances, might be a better predictor of lexical skills than gestures only (Igalalada et al., 2015). However, pointing in language-delayed children (LD) has rarely been studied (Lüke et al., 2016; Vuksanovic & Bjekic, 2013). Given the close relation between early pointing and later language development we hypothesized that children with typical language development at 24 months (TD) make greater use of pointing together with words at an earlier age than same-aged LD children.

To elicit spontaneous pointing and verbal utterances, 14 monolingual German infants and their caregivers were observed longitudinally in a semi-naturalistic setting – a room decorated with objects and pictures (Liskowski & Tomasello, 2011). Each dyad was observed five times within a two-month period (biweekly), beginning when infants were 14 months old. To assess language development at 24 months, a standardized test was administered, according to which five children were language-delayed. Retrospective non-parametric analyses of infants' communicative behavior revealed no significant differences in the use of pointing-speech-combinations between TD and LD children when comparing them at single data points. However, when analyzing the gain of pointing-speech-combinations between 14 and 16 months of age, we found a difference between the TD and LD children ($Z=-1.81$, $p=.08$, alpha-level of $p<.1$ because of small sample size): While the TD children showed an increase of pointing-words-combinations across the two months, we observed a decrease of such combinations in the group of LD children. We conclude that children with different trajectories of language development might also differ in the way they combine gestural and verbal communicative means earlier in their development.

28. Kensuke Sato and Takeshi Kishimoto

The effect of pragmatic cues on preschoolers' expectation about trustworthiness of others' pointing

Previous studies (e.g. Palmquist & Jaswal, 2012) reported that preschoolers could not discriminate between knowledgeable and ignorant informants when they use pointing gestures. However, the experimental situations of these studies lacked pragmatic cues that should be included in usual communication. This study investigated the effect of pragmatic cues on preschoolers' expectation about trustworthiness of others' pointing. In the experiment, thirty-two children (ranged 3;7-4;5) watched a video featuring two females. On each trial, while one actor covered her eyes and faced to the back wall, the other actor placed a barrier in front of the four cups on the table and hid a ball in a cup. Children and the ignorant actor could not know which cup the ball was in. After the hider hid the ball and removed the barrier, the ignorant actor turn to the front. Children were randomly assigned to two conditions. In the order cue condition, the ignorant actors pointed to a cup first and the hider pointed to the other cup later. Actors pointed silently with neutral expressions. In the order and certainty cues condition, the ignorant actors pointed to a cup first with expressions and motions that looked unconfident while saying "Here?" Later, the hider pointed to the other cup confidently saying "No, here." After they pointed, the experimenter asked children "Who knows where the ball really is?" Children in the order and certainty cues condition chose the knowledgeable actor more frequently than chance level (3.13 of the four trials on average). Children in the order cue condition selected the knowledgeable actor on 1.88. These results indicated that if there are rich pragmatic cues preschoolers can discriminate between knowledgeable and ignorant pointers. The results also suggested that preschoolers expected pointers to be knowledgeable as a default when the pointers' intention was not obvious.

Session 2: Thursday, August 24, 2017

1. Louah Sirri, Vincent Reid and Eugenio Parise

The effect of words and sounds on conceptual representation for 9-month-old infants

There is accumulating evidence that shows infants prefer linguistic (e.g., words) over non-linguistic (e.g., sounds) stimuli, suggesting that from the early stage of language acquisition, words have privileged status (e.g., Vouloumanos & Werker, 2007; Ferry et al., 2010). Yet, it remains unclear whether verbal (words) and non-verbal cues (associated sounds) activate conceptual representations in a similar manner. Recently, Lupyan & Thompson-Schill (2012) have shown that adults recognize faster a target image (e.g., cat) when it is preceded by a verbal cue, such as a spoken word, compared to when it is preceded by non-verbal sound (e.g., meowing), indicating that in adults concepts are activated more effectively via verbal means compared to non-verbal means. The present study aimed to investigate whether the activation of conceptual representations referring to word-object is more efficient than that of sound-object association for young infants. Twenty-one 9-month-old infants participated in a primed intermodal preferential (IPL) task in which they listened to either a word (e.g., cow) or sound (e.g., mooing) followed by an image containing two objects (e.g., cow – telephone), a target and a distracter, while their looking times were being recorded. The results show that upon hearing the auditory stimulus (word versus sound), infants were faster in shifting their gaze to the target compared to the distracter, demonstrating a congruency priming effect. In addition, compared to words condition, infants were faster in shifting their gaze and looked longer at the target image when it was preceded by an associated sound, showing that for pre-verbal infants, conceptual representations are activated more quickly and efficiently by non-verbal cues as opposed to non-verbal labels. At present, another group of 12-month-old participants is taking part in the study to explore at which developmental stage words gain a special status as referential cues during language acquisition.

2. Ingrida Balčiūnienė

The Early Stages of Morphology Acquisition in Twins: Autonomous or Universal Rules?

A number of studies have evidenced specific linguistic characteristics that distinct between typical singletons' and twins' language acquisition. A data of English-speaking twins has highlighted particular difficulties in lexical diversity and syntactic complexity [1] but cross-linguistic longitudinal studies in singletons [2] allow us to presume that twins acquiring morphologically rich languages might face with even more difficulties.

The study was based on a data of Lithuanian, i.e. strongly inflecting language with a rich morphological system. The study* aimed at evaluating an early morphology acquisition in Lithuanian-speaking twins with a particular attention to manifestations of so-called 'autonomous' language.

A data of one typically-developing twin pair was collected according a methodology of longitudinal observation. The conversations (~24 hours) were recorded, transcribed, and morphologically encoded by means of the CLAN software. A data of four typically-developing singletons matching by biological age (2;5–3;5) and MLU rate were analyzed as a control data for comparison.

The results evidenced significant differences in lexical diversity but morphological measures (such as a structure of so-called miniparadigms) did not discriminate between the twins and the controls. In other words, the twins produced a great number of self-invented lexical units but their morphological structure followed the basis of spoken Standard Lithuanian. This may be treated as a manifestation of the «natural morphology» [2] and will be further discussed in the presentation.

*The study was supported by a grant No. LIP-020/2016 from the Research Council of Lithuania.

[1] Thorpe, K. (2006). Twin children's language development. *Early Human Development*, 82, pp. 387-395.

[2] Voeikova, M.D., Dressler, W.U. (2002). *Pre- and Protomorphology: Early Phases of Morphological Development in Nouns and Verbs*. München: Lincom.

3. Stephanie Powell and Elena Hoicka

Reported Preschooler Creativity Unrelated to Everyday Touchscreen Use

Touchscreen technology has developed substantially in recent years, resulting in increased prevalence in households and more preschoolers accessing and using devices such as tablet computers (Ofcom, 2016; Rideout, 2013). Educational products and apps aimed at young children claim to facilitate cognitive development, including creativity, which is viewed as an important psychological asset. However, earlier research from Vandewater, Bickham and Lee (2006) suggested time spent watching television was associated with less engagement in creative play. Conversely, Marsh et al., (2015) suggest touchscreens could be used to promote creativity, but this is limited by ethnographic research. Therefore the evidence base is mixed, limited, and requires updating.

This study is the first of two stages and explores how preschoolers' reported touchscreen use and creativity may be related using an online survey. Specifically, it examines novelty-seeking and problem-solving as aspects of creativity. Prior to data collection, a power analysis indicated 92 participants would be required to observe a medium effect size. The survey was distributed to parents of children aged up to 47 months through the 'Baby Loves Science' website. Participants were asked about their children's access to digital devices, touchscreen use on a typical day and their child's engagement in non-digital activities. To measure creativity, parents were asked about their child's novelty-seeking and problem-solving tendencies.

Early analyses from 122 respondents revealed no significant relationships between reported touchscreen use and creativity. Additionally, there were no relationships between these variables and non-digital activities. These findings suggest everyday touchscreen use does not influence preschoolers' creativity. Additionally, use of this technology does not displace non-digital activities, contrary to expectations following Vandewater et al., (2006). Further analyses regarding co-use with parents will take place in the upcoming months and will be outlined in the presentation. The upcoming lab-based stage of the research will also be briefly discussed.

4. Padraic Monaghan, James Brand and Rebecca Frost

Combining multiple information sources for word learning: Computational and behavioural studies

Conventional studies of language acquisition have typically focused on information present in terms of co-occurrences of words, either adjacent or non-adjacent. However, such a view chronically underestimates the potential

information available in the language learning environment for acquisition of structure. In the language learning situation there are multiple cues available that can converge to provide constraints, some of which are within the sentence, such as distributional information in terms of co-occurrences of words in sentences, as well as prosodic information that provides cues to phrase structure and the intended referring word: in about 50% of child-directed speech utterances the loudest word is the key word being communicated by the adult. In addition, paralinguistic information is also available, providing contextual or referential information about intended meaning, such as presence of possible referents and use of gesture by interlocutors, i.e., speakers often gesticulate toward the thing that they are talking about. Computational models of multiple cues in language learning have shown the great potential for various cues to assist in learning language structure. In this paper, I present an implemented computational model combines gestural, distributional, and prosodic information in order to learn relations between words and their meanings. The model shows that there is a cost of processing additional information from the environment but that this cost is offset by the benefits for acquisition that such variation of cues provides in naturalistic learning situations. Though the natural learning situation might be noisy and variable, combining cues results in reliable and robust learning. Behavioural studies of learning word-referent mappings support the computational modelling predictions, showing that performance is best when multiple but variable cues are present in the language learner's environment.

5. Renata Di Lorenzo, Rianne van Rooijen, Carlijn Van den Boomen, Caroline Junge, Anna Blasi and Chantal Kemner

Emotional face processing in 5-month-old infants: A functional near infrared study

Infants' ability to discriminate between emotional facial expression is crucial for the acquisition of important social information at a preverbal age. This ability develops rapidly over the first year of life (e.g. Leppänen and Nelson, 2006). Recently, a functional Near-Infrared Spectroscopy study (fNIRS; Nakato, Otsuka, Kanazawa, Masami, Yamaguchi, Ryusuke, Kakigi, 2011) demonstrated that the superior temporal sulcus (STS), a cortical area involved in the processing of facial expressions in adults, responded stronger to emotional faces than objects in 7-month-old infants, while no difference in the STS activity was found between angry and happy faces. The present study aimed to investigate whether 5-month-old infants (N=18) can discriminate

between emotional faces and object stimuli and whether emotions of facial expressions are differently processed at this age. During the experimental session, infants were passively watching blocks of happy or fearful faces (5s) followed by pictures of houses as baseline (minimum of 10s). Brain hemodynamic activity was recorded from the right hemisphere by using a 22-channel array. Preliminary results suggest that already at 5 months infants process emotional faces differently than non-face stimuli and show a bias for fearful versus happy facial expressions at one occipital channel. These outcomes could indicate that the network of brain regions involved in the processing of emotional facial expressions in adults becomes functional at this age.

6. Hanna Marno, Szilvia Linnert, Gert Westermann and Eugenio Parise

EEG Evidence of Label- and Visual-Based categorization in 9-month-old infants

Object categorization is an important aspect of cognitive development. Infants can form object categories in different ways: by grouping together objects that share common visual features, or by grouping objects that share a common label. This study aims to answer the question what happens when visual similarity and common labels are in conflict with each other in a categorization task. We designed an experiment where visual features of objects suggested the separation into two groups, but the verbal labels we taught to the participants suggested a different grouping. We tested 15 9-month-old infants with an EEG category oddball paradigm, where the oddball could occur either by considering visual similarity or by considering the shared label. Infants showed an alpha desynchronization (a signature of category oddball detection) only when they were presented with the label oddball, but not when they saw the visual oddball. However the visual oddball led to a P300 ERP component, indicating that infants also encoded visual similarities. These findings suggest that preverbal infants can use labels to form categories that override visual similarities and that labels may act as the basis for the formation of more abstract concepts.

7. Takeshi Kishimoto

Do index-finger pointing by caregivers promote the production of index-finger pointing by infants?

Are there any impacts of caregivers' pointing gestures on the production of index-finger pointing by infants? In two studies, I investigated the function of caregivers' pointing gestures on the developmental increase in the frequency

of infants' index-finger pointing. In Study 1, I replicated Liszkowski et al.'s (2012) study, wherein infants and caregivers engaged in 5-minute interactions in a decorated room. In Study 2, younger infants and their caregivers who participated in Study 1 were observed about 7 months later in a similar decorated room as in Study 1. Both studies showed that caregivers produced index-finger pointing more frequently than did younger infants, whereas older infants' index-finger pointing was comparable to caregivers'. In particular, Study 2 demonstrated that caregivers' contingent pointing—namely, index-finger pointing less than 6 seconds after young infants' pointing—led to an increase in infants' frequency of index-finger pointing 7 months later. In contrast, the frequency of index-finger pointing by caregivers did not predict the infants' frequency. These results suggested that caregivers' contingent pointing has the function of promoting the production of index-finger pointing by infants.

8. Ermanno Quadrelli, Stefania Conte, Viola Macchi Cassia and Chiara Turati
Temperamental traits affect emotional expression processing of static and dynamic faces: an ERP study with 7-month-old infants

The ability to process emotional expressions is paramount to social interactions. Two EEG components sensitive to emotion processing in infancy are the P400 and the negative central (Nc). Studies examining the Nc component highlighted the existence of an attentional bias towards fearful expressions at 7 months of age (Peltola et al., 2009) and a later emerging bias towards angry expressions at 12 months (Grossmann et al., 2007). Recent research indicates that individual differences in the quality of maternal sensitivity and in temperamental traits affect infants' neural responses to emotion expressions (Taylor-Colls & Fearon, 2015). This study aims to investigate how infants' temperamental traits (Negative Affect, NA; Surgency, SU) affect the neural processing of static and dynamic happy (HA), angry (AN) and neutral (NE) expressions. Event-related potentials to emotional faces were recorded from 7-month-olds assigned to either the static (N= 18) or dynamic (N= 18) condition. Repeated-measures ANOVAs for amplitude and latency values of the Nc and P400 were conducted with Emotion (HA, AN, NE) and Hemisphere (Left, Right) as within-subject factors, Condition (Static, Dynamic) as between-subject factor and temperamental scales as covariates. For what concerns the group differences, Emotion x Hemisphere x Condition interactions were highlighted for amplitude and latency Nc values (see Fig. 1). In the static condition HA elicited a right lateralized faster response compared to AN and NE. In the dynamic condition HA and AN elicited greater right

lateralized activation compared to NE. Additionally, an Emotion x NA interaction was observed for amplitude values of the P400. Higher NA scores were associated with larger P400 activation over occipital leads to AN expressions. The implications of the current findings for our understanding of the development of emotion processing will be discussed.

9. **Nayeli Gonzalez-Gomez**

Early language development under difficult circumstances: Exploring maturational and environmental factors

Two major developmental trajectories have been identified as markers of infants' specialisation on their native language. First, there is an increase in infants' ability to process native sounds and consequently, a preference emerges for the sequences that are either legal or have a high frequency of occurrence in their native language. Second, infants' ability to process non-native sounds decreases over time, a process known as perceptual narrowing. These processes of learning have been assumed to be "universal". However, the vast majority of developmental studies have relied on "convenience samples", consisting of infants born full term and from higher-SES families, which are, for the most part, unrepresentative of the larger population. There is thus no evidence as to how much the time course of learning is affected by maturational and environmental factors. The present project addresses this issue. To do so, we investigated early phonological development in cases where: a) maturation is following an altered timetable: infants born preterm; and b) the environment is different: infants from lower-socio-economic status families. The linguistic abilities of both populations have been found to lag well behind their advantaged peers during the school years. Three longitudinal studies explored infants' phonetic, prosodic and phonotactic development, respectively, at 7.5, 9, 10.5 and 12 months of age. Preliminary analyses for 28 infants showed no significant differences between the phonetic or the phonotactic development of the preterm and the full-term infants. However, a time-lag between preterm and full-term developmental timing for prosody was found. Socioeconomic status didn't have a significant difference on prosodic or phonetic development. Nevertheless, phonotactic development was affected by SES, infants from lower SES showed a preference for high-frequency sequences later than their more advantaged peers. Overall these results suggest that different constraints apply to the acquisition of different phonological subcomponents.

10. Diana S Y Tham, Alison Rees and J. Gavin Bremner

Spatially and synaesthetically congruent sounds support young infants' perception of object continuity across occlusion

As objects move, we track them and perceive their persistence even if other objects temporarily hide them. It has been showed that congruent moving sound enhances 4-month-olds' perception of continuity across occlusion in the case of an object moving on a horizontal trajectory (Bremner et al., 2012) but we do not know if the same is true of objects moving on a vertical trajectory. And another aspect of intersensory perception concerns the set of phenomena loosely identified by the term synaesthesia. Recently, it has been shown that 4-month-olds spontaneously associate pitch (sound) with height in the visual field. The present study aim to extend the Bremner et al. (2012) study to investigate the effects of two types of sound on infants' perception of vertical trajectory continuity. We presented a vertical moving object event using no sound (Experiment 1), spatially congruent sound (Experiment 2) and synaesthetic pitch-height congruent sound (Experiment 3a) and incongruent sound (Experiment 3b). In these studies, 68 (34 girls) 4-month-old infants are habituated to an event in which an object moves on a linear trajectory, passing behind a centrally placed occluder. Then, with the occluder removed, they are tested on continuous vs discontinuous object movement events. If they perceive the habituation trajectory as continuous they should look more at the discontinuous test event. This preference was shown in experiments with spatial congruent sound (Experiment 2; $F(1, 14) = 9.204, p = .009$) and synaesthetic congruent pitch-height sound (Experiment 3a; $F(1, 16) = 6.397, p = .022$) conditions. However, this was not found in the no sound ($p = .557$) or the incongruent pitch-height sound ($p = .481$) conditions. Overall, this suggests that the perception of continuity of an object moving on a vertical trajectory can be supported by both spatially and synaesthetically congruent sounds.

11. Bethany Wainwright, Melissa Allen and Kate Cain

Facilitating word learning and symbolic understanding in typically developing infants and children with developmental disorders: The role of iconicity

Iconicity is the extent to which an image/symbol resembles its referent. Prior work has shown that more visually iconic images help typically developing (TD) infants and children with autism spectrum disorder (ASD) to understand that pictures are symbols and refer to real world referents. The extent to which an image can be increased in iconicity is restricted in traditional picture

books, but a tablet device such as an iPad may open up learning opportunities by manipulating iconicity.

This study aims to investigate whether automatic and manual 3D rotation of objects on iPads enhances iconicity and word-picture-referent understanding in children with ASD and developmental disabilities and early typical development to a greater extent than 2D images. A sample of 48 TD infants, 48 children with ASD and 48 children with other developmental disabilities will participate in this study. Firstly, in the training stage, participants will view multiple coloured pictures of a novel object, either 2D, 3D automatic rotation or 3D manual rotation. These pictures will be named with an unfamiliar word by the experimenter. Following the training stage, participants will progress to the mapping and generalisation stages to assess symbolic understanding and transfer to real objects. Whether children restrict the novel word to the picture (associative response) or extend it to the picture (symbolic response) will be measured. Results will inform theories of symbolic understanding and word learning in typical and atypical development.

12. Nicole Sturmhöfel, Anika Fäsche, Melanie Otto and Petra A. Arndt

How does screen media use influence toddlers' social-emotional development?

The options of screen media use in early childhood have increased since smartphones, tablet- and desktop PCs have become part of everyday life. In line with McCombs' displacement theory (1972), increased screen media use might replace activities like playing with other children, which in turn nurture children's social-emotional development. Therefore, screen time guidelines recommend no or minor media use in early childhood (e.g. AAP, 2011).

International research investigated the impact of screen media use especially on toddlers' language outcomes (e.g. Tomopolous et al., 2010). Its impact on social-emotional outcomes has however not been examined before. In Germany, empirical research regarding this topic in general is scarce.

The present study investigates the influence of screen media use on toddlers' social-emotional skills at three time points (T1 age M=25.8; T2 age M=29.0; T3 age M= 30.9; SD always 7.3). Parents (N=95) and preschool teachers (N=95) were asked about toddlers' prosocial peer interaction and empathy with the ITSEA (Carter & Briggs-Gowan, 2006). Furthermore parents

evaluated toddlers' screen media use in minutes per day and teachers reported toddlers' stress-regulation with the observation sheet PERIK (Mayr & Ulich, 2007). Analyses controlled amongst others for toddlers' age and gender, mothers' education and family language.

First results based on parents' data showed that toddlers' prosocial peer interaction and empathy was higher at T2 when they used less screen media at T1. This was only true for those who started with lower peer interaction and empathy skills at T1. Results based on teacher data are currently being analysed.

According to the first results, children's screen media use plays a crucial role for their social-emotional development already in early childhood. Therefore, work with parents in day care centers should inform and raise awareness in view of potential consequences of increased media use in early childhood.

13. Rachael Davis, Michael Thomas and Tony Charman

Predicting and validating clinical outcomes of autism from at-risk infants.

Whilst individual behavioural predictors of developmental outcome have been widely studied in infants at-risk of developing autism, very few have examined the influence of multiple predictors, and no study to date has validated findings using data from an independent infant cohort. We analysed social, communicative, motor and environmental data using statistical regression models in infants (n=47) with a familial risk of autism at 7 and 14 months to identify factors that were predictive of diagnostic outcome (autism vs. no autism) at 3 years of age. No significant predictors of outcome were identified at 7 months. However, a combination of lower motor scores, communication skills and an environmental factor relating to parental socio-economic status measured at 14 months correctly predicted developmental outcomes, with an overall accuracy level of 80%, a sensitivity level of 72% and specificity of 90%. Whilst communication was a significant predictor in isolation, both motor and socioeconomic factors improved the predictive value of the model through interaction effects. We validated findings from the statistical model by utilising data from a second, independent cohort of infants (n=96) combined with coefficients from the original predictive model. The model directly validated initial findings, with an overall accuracy level of 83%, a sensitivity level of 59% and specificity level of 87%. This is the first study to present validation findings of behavioural predictors of autism where

developmental outcomes were not known prior to the generation of predicted outcomes from the statistical model.

14. Katharina Kaduk, Livia Freier and Vincent Reid

The modulation of motor systems before and after the acquisition of new actions, verbs and non-action sounds at 24 months of age: a training study

The aim of the present study was to investigate the early link between language and motor systems. We were specifically interested in examining the modulation of the alpha (μ) frequency band before and after the acquisition of new actions and verbs. We proposed that this novel pre-post training paradigm would give new insight into the relationship between motor activation and language acquisition. Our study is therefore composed of a pre-training assessment, a training phase, and a post-training assessment. Our primary predictions were: (1) Verb comprehension will result in motor activation as indicated by modulation of μ rhythms over frontal and central sites as a function of leaning experience. (2) In addition, we investigated whether the suppression of μ in response to action-related verbal material can be distinguished from desynchronization in response to non-verbal visual action stimuli. Moreover, if activation of motor areas is indeed specific to mechanism of action and language processing, non-verbal referents presented alone should not lead to similar effects in our post-test. The final sample consists of twenty monolingual English-speaking 2-year-olds. To test our primary hypothesis if novel auditory material will result in motor activation as a function of training and to test for any distinguishable differences in motor desynchronization between verbal and non-verbal referents, we first performed a 2 (Condition - Sound1/Novel Verb) x 2 (Time Point - Pre/Post-Training) x 2 (Hemisphere - Left/Right) repeated measures ANOVA. The analysis revealed a significant Condition x Hemisphere interaction, $F(1, 19) = 4.657, p = .044, \text{partial } \eta^2 = .197$. These results clearly point towards verb comprehension resulting in μ frequency desynchronisation, indicating motor processes are at play.

15. Manuela Stets, Karla Holmboe and Silvia Rigato

Cortical Responses to Mothers and Strangers in 4-Month-Old Infants

Infant face-processing has been the subject of many developmental psychology studies over the years. Some researchers investigated the neural underpinnings of the process of face-perception and -recognition as such (Halit et al., 2003), and identified the occipito-temporal N290 and P400 ERP

components as the precursors of the well-known adult face-sensitive N170. Others investigated whether infants show differential face-processing, i.e. modulation of such components, when presented with their mother or a stranger. For instance, Swingler et al. (2010) reported larger responses in the P400 and in the fronto-central Nc for mothers compared to strangers at 6 months. In a current longitudinal study on attention and social cognition, we are tracking over 60 infants from before birth to 9 months of age using a number of different methodologies. Among others, EEGs are recorded at four time-points after birth while infants are presented with their mother's face or with the face of another infant's mother (i.e., a stranger). Preliminary results (N=26) show that, at 4 months of age, while the N290 is more pronounced for mothers' faces, the P400 is larger for strangers. We expect those effects to change with age, possibly reflecting the infants' familiarity with their mother's face and allocation of attentional resources to stranger faces. We will be adding and analysing more data, including analyses of the Nc, as well as correlating our results with other measures from our study which will provide valuable information on inter-relations between early cognition and behaviour.

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16. Julia Brehm, Carlijn van den Boomen, Emily Jones, Ricarda Braukmann, Jannath Begum Ali, Luke Mason, Elodie Cauvet, Chantal Kemner and Mark Johnson

Automatic Artifact Rejection in Infant EEG

One of the most common techniques to assess brain activity in infants is electroencephalography (EEG). EEG is of great value for investigating early brain development across a number of fields. It has a high temporal resolution, and its non-invasiveness makes it easier to apply to small children, as opposed to e.g. fMRI. However, EEG is highly sensitive to noise resulting from for instance surrounding currents or movement of the child. This leads to increased difficulties discriminating signal from noise in infant EEG data.

Up to now, most researchers manually select parts of their data that contain artifacts. However, manual selection has two main disadvantages: it is very time consuming and subjective. In this project, we aimed to reduce these issues by developing artifact rejection analyses that are fast and transparent. Therefore, we built a semi-automatic artifact rejection pipeline for infant EEG data, with focus on oscillation power analyses. We will present data comparing manual coding of three different coders and the influence on possible results. To develop the pipeline, we are combining the overlap from the coders and best practices as suggested in the literature. The algorithm selects artifacts and present the results to the coder, who will be able to decide whether to accept these artifacts or not. If necessary further information on why the artifact was selected can be displayed. Any manual changes in rejection are stored automatically. To investigate the subjectivity and timing of this rejection pipeline, the same coders as before will revisit the datasets. We expect that inter-rater reliability will be higher and the time needed to code the data will be shorter with the semi-automatic than the manual rejection. The results of this project are of high interest to developmental researchers using EEG, who can apply the freely available pipeline to their own data.

17. Han Ke, Quoc C. Vuong and Elena Geangu

Children's Emotional Neural Response to Congruency of Point-light Body Motion and Lexical-semantic Information

Body motion provides rich emotional information in social interaction. Behavioural studies indicated that the ability of perceiving emotional information from human body has developed from early stage during development. Infants eye-tracking studies showed that 6.5-month-old infants are able to distinguish different emotions and match them with affective vocalizations (Zieber. et al., 2014). Pre-school children are also found being able to label emotional body video clips, indicating the body perception cognition continues developing during childhood (Nelson. & Russell, 2011) However, the neural mechanism of processing emotional body motion remains unclear. The present study aims to explore the development of neural mechanism underlying emotional body perception during childhood using electroencephalography (EEG). 6 point-light body motion video clips with emotional information of Happy and Angry were used as prime stimuli, being followed with audios in neutral tone saying Happy and Angry. Continuous EEG was recorded with a 128 electrodes Geodesic Sensor Net (EGI). ERPs time-locked to the audio stimuli onset were calculated. 50

children age from 3-6-years old were tested, 28 remained in the final analysis. The preliminary findings based on current data showed an Emotion X Congruency interaction on N3 amplitude, Congruency main effect and Emotion main effect was also found on N400 latency.

18. Marlene Spangenberg and Kim Plunkett

Frequency Effects during Spoken-Word Recognition in Infants

The time course of word frequency effects in spoken-word recognition has been well established in adults: participants are quicker at fixating high-frequency objects in a visual world paradigm than they are at fixating low-frequency objects (Dahan et al., 2001). However, less research has examined frequency effects in infants. In the current study, 30-month old infants were presented with two images of real-world objects which were accompanied by a sentence instructing them to look at a target object two seconds after image onset. One of the objects presented was a high-frequency word while the other object was of low frequency as determined using the SUBTLEX-UK child frequencies (van Heuven et al., 2014). Growth curve analysis of eye-tracking data revealed that infants fixated high frequency targets considerably earlier and more frequently than low frequency targets. Furthermore, infants preferentially fixated high frequency objects even before they were instructed to look at one of the two objects. The current findings confirm the existence of a word frequency effect in infants suggesting that high-frequency words are activated faster than low-frequency words. Furthermore, they imply that infants do not use a verification strategy during spoken-word recognition. During such a verification strategy, infants would name the objects presented prior to hearing the target word and then match this phonological code to the spoken speech input. Such a strategy should not be influenced by word frequencies (Dahan et al., 2001). Finally, the present data implies that 2-year old infants display an object familiarity preference for familiar high-frequency objects as compared to less familiar low-frequency objects when given no instructions.

19. Arthur Capelier-Mourguy, Katherine Twomey and Gert Westermann

Categories with divergent feature diagnosticity and salience: how a label helps

How do labels interact with objects in the process of category learning? This question has gathered a lot of interest, particularly in developmental psychology. Despite numerous studies and approaches, the role of labels in

categorisation is still unclear; some people argue that labels are one of the features of an object, whereas others consider labels to be referential for categories. More recently, a developmental shift from the former to the latter function has been argued, with the label transforming from feature to referent as learning progresses.

One way to decide between these two views is to study the interaction between a label and the other features of an object, and how this interaction changes both the participant's object representation and their categorisation ability. Specifically, one would expect a referential label to direct attention towards diagnostic features for the category. Although several studies have addressed this question, none has yet controlled both for the perceptual salience of features and the diagnosticity of each feature independently, leading to contradictory or ambiguous results.

We propose an eye-tracking study that allows us to control for these two factors. The stimuli consist of animal-like creature with 5 features, each feature having 5 different values. First, the saliency of individual features will be established through pre-tests to establish salience maps. Then, different categories are constructed in which diagnostic features are more or less salient. Participants will be shown exemplars from the categories and either hear a label ('Look, a geepee!') or a neutral sound. We predict that, if labels act as category referents, infants will direct more looks to diagnostic features when they are of low salience because the labels highlight the diagnostic features. In contrast, we expect no difference in looking between the label and sound conditions for categories in which diagnostic features are salient.

20. Sarah Eiteljörge, Maurits Adam, Birgit Elsner and Nivedita Mani

Early preferences in word and action learning

Successful communication often involves comprehension of both spoken language and observed actions. While even very young infants can learn associations between actions and objects (Hunnius & Bekkering, 2010) as well as between words and objects (e.g., Bergelson & Swingley, 2012; Mani & Plunkett, 2008), the extent to which infants preferentially associate objects with linguistic or non-linguistic information remains as yet unclear.

In the current, still on-going study, 12-, 24-, and 36-month-olds as well as adults participated in an eye-tracking word learning task consisting of a training and a test phase. In eight training trials, participants were presented

with two novel objects presented in motion accompanied by a novel label (e.g., blue object called “Tanu” moving up and down). Across twelve test trials, they were then tested on their learning of the different association dyads (word-object, action-object, word-action. In addition, vocabulary and fine motor skills were administered offline.

Preliminary analyses indicate that 12-month-olds learn action-object as well as word-object associations while older children develop a preference for words. In addition, the results of the adults will give an indication whether that preference still holds in adulthood. So far, these results are in line with previous research suggesting that words appear to be highly relevant markers in early language acquisition. It could be that the actions’ arbitrariness (similar to the sound of words) adds to these results while goal-directed actions may include additional meaning (similar to the reference of words), and might therefore be easier to learn. This cross-domain comparison provides new perspectives for current theories on both word and action learning.

21. Rodrigo Dal Ben, Débora Souza and Jessica Hay

Speech segmentation and cross-situational word learning in parallel

Robust evidence suggests that subtle statistics from linguistic input influence early language development. Specifically, research, primarily with English-learners, suggests that infants track statistics to both find word boundaries in continuous speech and to map words to referents across ambiguous trials. It remains unclear, however, whether or how these two processes occur together, or how these processes function in non-English learners. Here, we aim to investigate how word segmentation and cross-situational learning interact across four experiments conducted with native speakers of both Brazilian Portuguese and American English. To our knowledge statistical learning has never been investigated in Brazilian Portuguese listeners. In Experiment 1, we investigate whether statistical-based speech segmentation supports subsequent cross-situational learning. Adults (Brazilian and American) will first hear a continuous artificial language where between-syllable transitional probabilities (TP) provide the only cue to word boundaries. Following familiarization, participants will complete a cross-situational word learning task, where, on any given trial, the labels (i.e., words, TP=1, and part-words, TP=.33) will be ambiguously paired with novel objects. If statistical-based speech segmentation supports word learning, we expect to see greater learning for the words relative to the part-words. In

Experiment 2, will we test whether adults can simultaneously track transitional probability cues and learn ambiguous label-object mappings; Participants will be presented with two objects at a time while listening to the artificial language, creating an ambiguous mapping between words and objects. Following familiarization/cross-situational learning we will test both speech segmentation and word learning. In Experiments 3 and 4, we will replicate Experiments 1 and 2 with Brazilian and American infants. The proposed studies will help advance current understanding of the processes involved in early language development and inform future studies on statistical language learning in speakers of different languages.

22. Viktoria Csink, Helena Calle, Denis Mareschal and Teodora Gliga

The specific effect of violation of expectation on infants' learning

It has recently been demonstrated that violation of expectation enhances infants' learning of a new auditory property of the object. In addition, it has been suggested that infants do not show superior learning about a new object following the violation event. (Stahl & Feingenson, 2015). However, it is not clear whether infants would also show enhanced learning about objects that participated in the event, but did not violate their expectations.

In this experiment 12-month-old infants are presented with two unfamiliar objects, one of which disappears either expectedly or unexpectedly, while the other object remains stationary (Wynn & Chiang, 1998). Looking times and pupil dilation are measured in order to establish infants' surprise at the disappearance event.

Infants are then taught a new auditory property of either the object that has been manipulated, or the other object. The study investigates the specific effect of violation of expectation on learning: namely whether infants only show better learning about the object that has disappeared unexpectedly, despite only having visual exposure to the other object directly following the violation. Testing is ongoing and data analysis will be completed by the time of the conference.

23. Olivia Whalen, Frini Karayanidis, Alison Lane and Linda Campbell

The role of infant and maternal factors on the early development of infant cognition

Good cognitive control is associated with greater coordination of cognition and affect, which in turn permits individuals to better monitor social and emotional arousal with deliberate reasoning, rational decision making and goal directed behaviour. A longitudinal study conducted by Moffitt et al. (2011, PNAS 108(7), pp2693-2698) confirmed a causal relationship between early cognitive control ability and later adaptive/maladaptive outcomes, whereby individual levels of self-control in childhood were highly predictive of real-world outcomes in adulthood, including physical health, substance abuse, wealth and criminal behaviour. Cognitive control emerges in early childhood and continues to develop throughout adolescence and early adulthood. Yet little is known about how the foundations of cognitive control develop in infancy. Individual differences in attentional control in infancy have been shown to be predictive of cognitive control in childhood, however a vast majority of research on infant attention has focused on describing achievement at different stages, rather than individual differences. The present study uses eye-tracking tasks to comprehensively assess early cognitive ability and attention in infants aged 6 months and 12 months. Tasks are designed to assess smooth pursuit, habituation, joint attention and visual expectation. We are looking at how individual variability in infant attention relates to child development (as measured by the Bayley Scales), mother-child attachment and social interaction, infant temperament and sensory abilities, as well as maternal physical health, mental health, parenting stress and executive functioning. Preliminary data from the tasks will be reported. As cognitive control shows continuation from infancy into adulthood, understanding the early environmental influences on infant cognition has the potential to inform interventions that assist in the healthy development of children.

24. Carmen Deffner, Melanie Otto, Henriette Schneider-Haßloff and Katrin Hille
Enhancing Executive Functions in Infants and Toddlers in Daycare Settings

Executive Functions (EF) serve to control and regulate our behavior and thoughts in order to pursue goals and act appropriate in different situations (Miyake et al. 2012, Drechsler 2007). They are important for successful living (Moffitt et al. 2011). Enhancing those abilities the sooner the better seems right. A study is proposed to find out whether EF can be enhanced in the first three years of life and whether EF-development can profit from qualitative daycare settings.

There is evidence for the malleability of EF for the preschool years (e.g. Diamond et al. 2007) and the impact of different caregiving environments on earlier EF development (e.g. Matte-Gagne et al. 2012, Bernier et al. 2010). Promoting EF in children this young is challenging, e.g. concerning their preverbal and acting learning. Further their developing, but not yet stable, abilities require a rapid adaption of the caregiving environment (Hendry et a. 2016).

Based on our successful training concept for children between 3 and 6 years, the idea is to rethink training of EF on professional levels like attitude (e.g. Berthelsen & Brownlee 2007), dialog and interaction (e.g., Gärtner et al. 2016), structures and developmentally appropriate activities like symbolic play (Bordova & Leong 2008).

The evaluation includes the collection of data on child EF-development. A combination of cognitive behavioral tests and possibly EEG will be run to obtain an answer to the question whether EF can be promoted through an appropriate daycare setting and beyond the impact of genetic predispositions.

25. Marina Loucaides, Katherine Twomey and Gert Westermann

The effect of labelling on infants' novel object exploration

Children learn their first object names by associating the items they see with words they hear. Understanding how children link words with objects will offer important insight into cognitive development. One significant aspect of learning word-object associations is the way in which children interact with objects. For a full understanding of infants' object exploration it is important to explore where exactly children look during labelling tasks, whether they use different explorational styles during physical interaction or passive observation, and whether language level affects the learning of new labels.

This study used head-mounted eye-tracking to investigate how children at 24 months (N=24) interact with novel objects. Participants were assigned to a physical interaction group, in which they handled objects for 30s each, and to a no physical interaction group, in which only the experimenter handled the objects. Within each of these conditions half of the novel objects were labelled by the experimenter with novel labels, (e.g., Look, a blicket!), and half of the objects were unlabelled. Following this session and a five-minute break, the experimenter tested children's retention of label-object mappings

by presenting the labelled objects and asking children for each in turn (e.g., Which one's the blicket?). Parents also completed a vocabulary inventory (UK-CDI).

We predict that the label and no-label events may show two different visual explorational styles in both the interaction and no interaction condition, and that physical interaction with the objects will facilitate label learning compared to the no physical interaction condition. The vocabulary level is expected to interact with successful labelling events, so that children with high vocabulary level would be more likely to recall the correct labels during the testing session. This research will enhance our understanding of early cognition by demonstrating how children's interaction with their environment affects their word learning.

26. (Presented by Olivia Whalen) Carly Mallise, Frini Karayanidis, Alison Lane, Vanessa Murphy and Linda Campbell

An Investigation of Infant Temperament and Maternal Parenting Stress as Early Markers for Atypical Development within the First Year of Life

There are a number of known early risk factors that can shape the trajectory of a child's development, such as poor perinatal outcomes (e.g. prematurity) and maternal postpartum depression. However, less is known about how early infant temperament and maternal parenting stress relate to infant development in later infancy. Research suggests these factors may be an early marker for neurodevelopmental disorders (e.g. Autism Spectrum Disorder). However, to date, there is no prospective study directly examining this link. Hence, the aim of this longitudinal study is to investigate how infant temperament and maternal parenting stress interact across the first year of life, and predict, in early infancy, atypical development at one year of age. Participants will include Australian mothers and their infants, tested at 6 weeks, 6 months and 12 months from birth. The predictor variables include infant temperament (measured by the Carey Temperament Scales) and maternal parenting stress (measured by the Parenting Stress Index – Short Form). The outcome variable, atypical development, will be measured by the First Year Inventory. Preliminary findings will be presented. It is expected that this research will assist in closing the gap in the literature, by increasing the knowledge of how infant temperament and maternal parenting stress change across the first year of life, and how they may relate to atypical development in infancy. This knowledge, in turn, could assist clinicians to target those at

increased risk for early intervention, which may subsequently enhance child outcomes.

27. (Presented by Olivia Whalen) Alix Woolard, Alison Lane, Linda Campbell, Frini Karayanidis and Titia Benders

The Effect of Infant Temperament on Maternal Infant-Directed Speech

Mother-infant interaction is a mediator of early development in the first year of life. One way the mother influences her baby is through infant-directed speech (IDS), which is a unique speech register used by adults when speaking to young babies. Potentially the most salient aspect of IDS in terms of affect and attention regulation are pitch contours, which relate to the trajectory of pitch. Research shows that IDS, and in particular pitch contours, influence infant affect and attention, but little is known about the influence of infant characteristics such as temperament on IDS. Temperament in infancy refers to behavioural differences in infant reactivity and regulation. Infant temperament has been suggested to be stable throughout childhood, thus it is assumed it would have an impact on the way mothers and their babies interact. The aim of the current study is to investigate the influence the infant can have on the mother-infant interaction. Specifically, we will investigate the influence of infant temperament on maternal IDS.

The current study will recruit infants from two infant development studies which both assess infants at 6 months and 12 months of age, as maternal pitch peaks in terms of affective salience at these ages. We will assess mother-infant dyads interacting for 15 minutes in a laboratory setting, where infant temperament and maternal IDS can be measured via video and audio recordings. Mothers will also be given self-report questionnaires regarding their infant's temperament.

It is predicted that infant temperament will affect maternal IDS, and in particular maternal pitch contours. It is expected that an 'easy' infant temperament will be related to more positively affective pitch contours, and a 'difficult' infant temperament will be related to soothing/prohibitive pitch contours.

28. Burcu Soy and Elena Hoicka

The relationship between humour development and social cognition from 3 to 47 months

Humour development has been investigated in the last 50 years. Infants develop smiling at 4 months (Sroufe & Wunsch, 1972); use clowning, such as head shaking, between 7 and 12 months (Reddy, 2001); distinguish humorous and sincere intentions at 15 months (Hoicka & Wang, 2011); distinguish joking and pretending between 16 and 24 months (Hoicka & Butcher, 2016); create their own jokes between 24 and 36 months (Hoicka & Akhtar, 2012) and comprehend irony between 36 and 48 months (Angeleri & Airenti, 2014).

Social cognition is a broad area focusing on human thinking and social behaviour (Ric, 2015). Specifically, developmental psychologists are interested in how young children come to understand other's mind and mental states. A previous study shows the neural relationships between humour processing and social cognition (Samson, 2008). Also, another study shows that social cognition training program increase humour abilities in school-aged children with developmental disorders (Gevers, Clifford, Mager & Boer, 2006). The purpose of the current study is to examine the relationship between the development of humour and social cognition in typical children.

Participants will be the English-speaking parents of 3-to-47-month-olds all over the world. They will complete the Early Humour Survey and the Early Social Cognition Survey online at <https://babylovesscience.com/> We have over 150 participants so far, but are aiming for 200 participants to examine the data longitudinally. Once the first stage of data collection is complete, we will run a correlational analysis between humour and social cognition scores, and do a partial correlation to control for age if it correlates with other variables. We expect that there should be a significant positive correlation between humour and social cognition. This is the first study to focus on the link between humour and social cognition from the first year.

29. Jolanta Golan, Rachel George, Melanie Vitkovitch, Derek Moore and Elena Kushnerenko

Speech Processing in the Noisy Environment

Infants can selectively attend to their mother's voice, even among background distractors. However, can they process speech sounds when they compete with equally salient auditory stimuli?

Twenty infants, aged between 5 and 7 months participated in our study. They sat on their parent's lap watching a silent cartoon, while the sounds were

played in the background. They were exposed to two simultaneous auditory streams.

The saline EEG net was used to collect ERP responses to auditory change in each of the streams. The change in the speech sounds was recorded between phonemes /ba/ and /da/, while the tone stream involved a change in frequency between 100 and 300 Hertz.

Infants in our study were able to process change in both the speech and non-speech streams. This indicates that infants are able to process speech sounds, even if they attend to other competing sounds in the environment at the same time. This extends previous research suggesting that they can ignore irrelevant auditory information when processing speech. Our study shows that they can attend to and assess all auditory information from the environment and process speech even if it is placed among other competing sounds.

30. Rianne van Rooijen, Renata Di Lorenzo, Caroline Junge, Carlijn van den Boomen and Chantal Kemner

Gaze processing in the infant brain; an fNIRS study

Eye contact and mutual gaze have high social importance and are involved in many learning processes. From birth onwards, infants are focused on the eyes (Farroni et al., 2002). Moreover, 5-month-old infants and even newborns show a gaze cueing effect (Farroni et al., 2000; 2004), which means that even the youngest infants are able to shift their attention in response to an eye movement. Yet, which brain areas are involved in gaze cueing in infants is still unclear. We aim to explore which brain areas are involved in this process by conducting an fNIRS study, a suitable measure for infant brain imaging.

We tested 10-month-old infants (n= 30) with a gaze cueing paradigm in a block design. The task consisted of two types of trials, which were either congruent (eye gaze in the direction where the target will appear) or incongruent (eye gaze in the opposite direction of where the target will appear). As a baseline, we used a period of 10s in between blocks in which we showed a screensaver. Brain activation was measured with a 22-channel array over the right hemisphere, which covered pre-frontal areas to occipital areas.

Data are not yet analyzed, yet we expect to find significant hemodynamic responses for congruent trials compared to incongruent trials in channels over areas involved in processing social information and attention. These are for example the superior temporal sulcus (STS) and the temporoparietal junction, and more prefrontal areas.

This would be the first infant brain imaging study which looks into the brain areas involved in gaze cueing, and we expect that the data of this study can provide valuable information about the brain mechanisms behind this important process.

Notes

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