Lancaster Conference on Infant and Child Development (LCICD 2016)
August 25-27, 2016

ORGANISATION

Organisation committee: Kirsty Dunn, Lynne Hargreaves, Katharina Kaduk, Christian Kliesch, Uschi Mason, Eugenio Parise, Alison Rees, Joanne Spring, Diana Tham, Gert Westermann

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Facebook: https://www.facebook.com/LCICD/
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IMPORTANT INFORMATION

Location

- The conference will take place in the Lancaster University Management School (building 52 on campus map, https://www.lancaster.ac.uk/maps/campus.pdf).
- Keynotes and paper presentations will take place in Lecture Theatre 1.
- Poster presentations will take place in the Hub area, i.e. the large social space adjacent 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 no. 33 on the campus map) priced at £5 each. The cheapest option (£3 per day) will be to park at Alexandra Park Visitor as this is on the edge of campus.
- **In the City:** The bus station is situated on Damside Street in the City Centre. Buses (services 2, 2A, 3, 4, X4, 42) leave for the University every five minutes on weekdays and most services also stop at Common Garden Street. Additionally, the 3A and X4 bus services run every 30 minutes between the Railway Station and the University (Monday to Saturday daytimes; hourly on Sunday afternoons and evenings).
- **On Campus:** Due to maintenance work at the University Underpass, all buses drop off and collect passengers outside the Chaplaincy Centre (building no. 24 on the campus map). Additionally, services 3 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 8:30 and 9:00 on Thursday, Friday, and Saturday as well as during coffee breaks.

Coffee breaks, lunch, and reception

- Coffee breaks (Thursday, Friday, Saturday), the evening reception (Thursday), and lunches (Thursday, Friday, Saturday) will take place in the Hub area.

Social events

- Thursday, August 25, 2016: 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.
- Friday, August 26, 2016: Conference dinner
  - This year's conference dinner will be hosted at **The Church Street Chop House** from 19.30. The restaurant is located at 74 Church Street, Lancaster LA1 1ET.
  - The Church Street Chop House combines the local Butcher's excellent reputation for quality produce with a menu boasting a mix of traditional and modern dishes (http://www.churchstreetchophouse.co.uk).
  - The conference dinner is not included in the registration fee. Advance booking is required via the Online Store (http://online-payments.lancaster-university.co.uk).

Internet access

- To access the Visitor Wi-Fi network, simply select the "LU-Visitor" network, then follow the registration screens.
- 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 town centre are recommended, especially for larger groups.

Options on Campus

- Café 21 — Nice vegetarian, vegan, and gluten-free food, great views, but 15-min walk from venue and slow service.
- Pizetta Republic — Good restaurant for those who like pizza, late opening times. Good for coffee, too.
- Grizedale Café Bar — Famous for Stone Willy's pizzas and hot wraps as well as dinky dipping hot donuts with a choice of sprinkles and sauces.
- 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 Lounge — Restaurant on campus, right next to our venue. Good food though slow service. Also good place for a sit-down coffee.
- The Mill (Flyde College) — A great choice of fresh toasties and sandwiches or for something more filling, try the burgers and burritos. They serve "Primal Feast burgers, with two to choose from weekly including camel, alpaca, elk and kangaroo." Open for dinner, too.
- The Trough of Bowland (College) — Traditional homemade pie served with potatoes and vegetables from 12.00pm. Open for dinner, too.
- Trevor (Furness College) — Freshly ground coffee, whole-leaf brew tea and a variety of cakes with gluten-free options.
- Wibbly Wobbly Burger — Good burger place, not on the campus map, simply follow directions to Grizedale College. Open till 11pm.
- 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).
- **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 Café** — Nice restaurant, Mediterranean cuisine. They also run Sun Pizza, a good pizza restaurant in the same street. (25 Sun Street, 01524-846252).
- **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** — Vegetarian dishes from local, organic and fairtrade produce in a quirky café with whitewashed walls. One of our favourite lunch spot. Open till 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 recently 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

SCHEDULE

8.30 to 9.00 Registration

9.00 to 9.15 Opening remarks

9.15 to 10.15 Keynote: Larissa Samuelson
      Biased vocabulary + visual attention and memory processes = a
      shape bias: A Dynamic Neural Field Model.

    SESSION 1: ACTION UNDERSTANDING *(Chair: Vincent Reid)*

10.15 to 10.45 Birgit Elsner
      Do verbal cues given by the model influence young infants'
      imitation of goal-directed actions?

10.45 to 11.15 Laura Maffongelli, Katharina Ledergerber, and Moritz M. Daum
      The neural processing of syntactic violations of action sequences in
      5- to 7-month-old infants: an ERP investigation.

11.15 to 11.45 Coffee break

    SESSION 2: COMPUTATIONAL MODELING *(Chair: Katie Twomey)*

11.45 to 12.15 Sébastien Forestier and Pierre-Yves Oudeyer
      Curiosity-Driven Development of Tool Use Strategies.

12.15 to 12.45 *Olivia Guest* and *Kim Plunkett*
      Representational Re-description in hSOMs.

12:45 to 14:00 Lunch Break

    SESSION 3: Language Acquisition I (Chair: *Rebecca Frost*)

14.00 to 14.30 *Katherine Twomey* and *Gert Westermann*
      Labels shape infants' object representations.

14.30 to 15.00	Tom Fritzsche and Barbara Höhle *The detection of grammatical gender dependencies in German learning 24-month-old children.*
15.00 to 15.30	Amy Bidgood, Thea Cameron-Faulkner, Michelle Peter, Samantha Durrant and Caroline Rowland *The role of showing and pointing in the vocabulary growth of children aged 8-15 months.*
15.30 to 16.00	Coffee break

SESSION 4: CULTURE & SOCIALISATION (*Chair: Kirsty Dunn*)

16.00 to 16.30	Caspar Addyman and Frank Wiesemann *Good night, good morning: How sleep quality affects infants' morning mood.*
16.30 to 17.00	Josephine Ross and Mandy Urquhart-Yilmaz *The socialisation of self: Investigating the link between autonomous parenting and early mirror self-recognition.*
17.00 to 19.00	Poster Session 1
18.00 to 19.00	Reception

Friday, August 26, 2016

8.30 to 9.00	Registration
9.00 to 10.00	Keynote: Jochen Triesch *Learning where to look: infants and robots.*

SESSION 5: LANGUAGE ACQUISITION 2 (*Chair: Gert Westermann*)

10.00 to 10.30	Joseph Butler, Cátia Severino, Marina Vigário and Sónia Frota *When prosody matters! Developing word segmentation abilities in European Portuguese learning infants.*
10.30 to 11.00	Jelena Sucevic, Nadja Althaus and Kim Plunkett *Influence of learning schedules on infant category learning.*

11.00 to 11.30   Coffee break

SESSION 6: COMMUNICATION & EMOTION *(Chair: Alison Rees)*

11.30 to 12.00   Peiwen Yeh, Elena Geangu and Vincent Reid
                      *Mapping developmental changes in the integration of emotion
                      perception from bodily expressions and affective sounds.*

12.00 to 12.30   Erik Gustafsson, Julie Brisson, Dominique Mailloux, Marc Mainville,
                      Christelle Beaulieu and Sylvain Sirois
                      *Do Infants Recognize Engagement in Social Interactions? The Case
                      of Face-to-Face Conversation.*

12.30 to 13.00   Christine Michel, Pauen Sabina and Stefanie Hoehl
                      *Follow me! Infants' ability to learn about the referential nature of a
                      cue.*

13:00 to 14:00   Lunch Break

14.00 to 16.00   Poster Session 2

15.30 to 16.00   Coffee Break

SESSION 7: COLOUR LEARNING *(Chair: Gemma Taylor)*

16.00 to 16.30   Samuel Forbes and Kim Plunkett
                      *The Development of Colour Word Knowledge in Infants and
                      Toddlers.*

16.30 to 17.00   Jessica Horst, Katherine Twomey, Anthony Morse, Rosie Nurse and
                      Angelo Cangelosi
                      *Toddlers and Robots Learn More Object Names When Everything
                      They See Together is the Same Colour.*

19.30 onwards   Conference Dinner at The Chop House Restaurant (advance
                      booking required)

Saturday, August 27, 2016

8.30 to 9.00   Registration

9.00 to 10.00   Keynote: Luca Bonatti
                      Precursors of logical reasoning in prelinguistic infants.

SESSION 8: LANGUAGE ACQUISITION 3 *(Chair: Eugenio Parise)*

10.00 to 10.30   Sónia Frota, Joseph Butler, Shuang Lu and Marina Vigário
                      *Infants' perception of native and non-native pitch contrasts: tune,
                      pitch accent or tone?*

10.30 to 11.00   Matt Hilton, Katherine E. Twomey and Gert Westermann
                      *FaceTime: Shy children's increased attention to faces and its effect
                      on word learning.*

11.00 to 11.30   Coffee break

SESSION 9: GOAL ATTRIBUTION *(Chair: Gavin Bremner)*

11.30 to 12.00   Richard O'Connor and James Russell
                      *Directing actions at hidden objects: first- and third-person
                      Understandings.*

12.00 to 12.30   Iain Jackson and Sylvain Sirois
                      But that's possible! Infants, pupils, and impossible events.

12.30 to 13.00   Sylvain Sirois and Julie Brisson
                      *Goal attribution in infants: When pupil dilation shows what looking
                      times do not.*

13.00 to 13.15   Awards and Closing Ceremony

13:15 to 14:15   Lunch Break

POSTER PRESENTATIONS

Session 1: Thursday, August 25, 2016

1. **Estefania Domínguez-Martínez, Eugenio Parise, Benjamin M. Taylor and Vincent Reid**: *Understanding the causes of (dis)agreement of the current infant ERP editing methods*

2. **Han Ke and Elena Geangu:** *The Development of the Neural Correlates of Body Schema Processing During Childhood*

3. **Christian Kliesch, Vincent Reid, Anna Theakston and Eugenio Parise:** *Infants' understanding of teleological actions after ostensive communication*

4. **Iris Nomikou, Giuseppe Leonardi, Joanna Rączaszek-Leonardi and Katharina J. Rohlfing:** *"Getting into synch": the development of mutuality*

5. **Manuela Stets, Silvia Rigato and Karla Holmboe:** *Replicability of Findings in Infant Attention Research*

6. **Beatrix Labadi and Luca Bakody:** *Shared sensory experiences modulates understanding others in childhood*

7. **Isabel Quiroz, Manuela Stets, Karla Holmboe and Silvia Rigato:** *Association between prenatal measures and postnatal life*

8. **Alena Galilee, Joseph P McCleery and Chrisy Stefanidou:** *Neural mechanisms of speech versus non-speech detection and discrimination in children with autism spectrum disorder*

9. **Elena Serena Piccardi, Marco Lunghi and Francesca Simion:** *Visuo-spatial orienting triggered by biological motion walking direction: ERP evidence from 6-month-old infants*

10. **Reyhan Furman, Paula Marentette and Elena Nicoladis:** *Individual Differences in Children's Iconic Gesture Use: The role of cognitive abilities and personality*

11. **Laura Boundy, Anna Theakston and Thea Cameron-Faulkner:** *Intention or attention before pointing: Do infants early hold out gestures reflect evidence of a declarative motive?*

12. **Katharina Ledergerber, Laura Maffongelli and Moritz M. Daum:** *Differential impacts of action language on action prediction in infants and toddlers*

13. **Gemma Taylor, Padraic Monaghan and Gert Westermann:** *Children's verb learning from touchscreen apps*

14. **Liam Blything and Kate Cain:** *Children's processing and comprehension of*

complex sentences containing temporal connectives: The influence of memory on the time course of accurate responses.

15. **Tatiana Yudina:** *The role of experience in the early development of prosocial responses.*

16. **Iain Jackson, Anna Theakston, Eugenio Parise and Vincent Reid:** *Agents, patients, and actions: What is encoded in 12-month-olds' perceptions of dynamic events?*

17. **Ayumi Sato, Tomomi Sato, Cahrlie Lewis, Yumiko Ishikawa, Yu Saito, Shoji Itakura and Etsuo Horikawa:** *The message is in the medium: Electronic vs. paper picture-books influence joint attention in mother-infant interaction*

18. **Alison Rees, Sylvain Sirois and Alison Wearden:** *Maternal prenatal DHA intake and infant performance on a free-play attention task at 22 months*

19. **Wiebke Pätzold, Sriranjani Karthik and Ulf Liszkowski:** *Neurophysiological measures of object representations following occlusion and communication*

20. **Emma Ward, Jan Buitelaar, Ricarda Braukmann and Sabine Hunnius:** *Perception and expectations in young children at-risk for Autism Spectrum Disorder (ASD)*

21. **Zoe Flack and Jessica Horst:** *Two Sides to Every Story: Children Learn Words Better From Single Page Displays*

22. **Youn Mi Cathy Lee and Hyun-Joo Song:** *Influence of Foreign Language Experience on Early Language Development*

23. **Diana Su Yun Tham, Gavin Bremner, Dennis Hay and Pei Jun Woo:** *Females come first in the development of the other-race effect in infants.*

24. **Miriam Beisert and Moritz Daum:** *Learning different kinds of tool use actions in early childhood*

25. **Tomoko Tatsumi, Julian Pine and Ben Ambridge:** *The effect of input frequency on children's production of morphologically complex verb forms in Japanese*

Session 2: Friday, August 26, 2016

1. **Maurits Adam and Birgit Elsner:** *Cross-domain influences of early word and action learning*

2. **Ebru Ger, Nazlı Altinok, Ulf Liszkowski and Aylin Kuntay:** *What predicts infants' pointing frequency at 12 months?*

3. **Christiane Patzwald, Maike Schiller and Birgit Elsner:** *The influence of speech-action relatedness on 24-month-olds' selective imitation*

4. **Silvia Rigato, Milla Grigorova, Manuela Stets and Helge Gillmeister:** *The emergence of face- and body-selective brain signatures in infants*

5. **Maria Crespo Llado and Elena Geangu:** *Individual differences in the neural correlates of infants' responses towards other baby's cry and laughter*

6. **Alexandra Marquis and Margaret Moulson:** *Put on a happy face! Infant's ability to discriminate happy, angry, and sad from fearful facial expressions using a Fast Periodic Visual Stimulation (FPVS) paradigm*

7. **Shirley Cheung and Gert Westermann:** *Developmental differences in phonemic perception between monolingual and bilingual infants*

8. **Kirsty Dunn, Vincent Reid, Young Robert, Johnson Amu and Nadja Reissland:** *The Prenatal Concept of number: Further Evidence of Visual Processing of Information before Birth.*

9. **Hanna Schleihauf, Sabina Pauen and Stefanie Hoehl:** *Does group membership affect overimitation in preschoolers?*

10. **Louah Sirri, Vincent Reid and Eugenio Parise:** *The evocative power of words for 9-month-old infants*

11. **Alice Skelton, Jenny Bosten and Anna Franklin:** *Comparison between infant and adult colour discrimination using an automated eye-tracking method.*

12. **Miriam Langeloh, David Buttelmann, Susanne Grassmann, Sabina Pauen and Stefanie Hoehl:** *Did you expect that? Neural correlates underlying selective imitation in infants*

13. **Stefania V. Vacaru, Johanna E. van Schaik and Sabine Hunnius:** *Facial mimicry in three-year-old children and its modulation by attachment security*

14. **Damaris Bartz and Dagmar Bittner:** *L1-acquisition of finiteness in German ABER-clauses*

15. **Alshaimaa Abdel Wahab, Allegra Cattani and Caroline Floccia:** *Measuring Exposure to English in Bilingual Children between 12- 24 months: a comparison of existing questionnaires*

16. **Eleanor Smith, Vincent Reid, Trevor Crawford and Megan Thomas:** *Understanding Sensory Processing in Early Development.*

17. **Janet Parsons, Rachael Bedford and Teodora Gliga:** *Looking but not learning: differences in gaze cue reading, visual attention and learning in 14 month old infants at risk for autism*

18. **F Cansu Pala and Charlie Lewis:** *The difference between the felt and displayed emotions: When do young children understand the necessity of regulating*

emotions?

19. **Jessica Massonnié, Pascal Bressoux, Maryse Bianco, Gwénaëlle Joët and Laurent Lima:** *Predictors of reading comprehension in first grade: results of a longitudinal study.*

20. **Marina Loucaides, Katherine E Twomey and Gert Westermann:** *The effect of labelling on infants' object exploration.*

21. **Arthur Capelier-Mourguy:** *Where's my label?! Studying how a missing label and other missing features are perceived*

22. **Rebecca Frost and Padraic Monaghan:** *How do high frequency words assist infants' language acquisition ?*

23. **Sophie Williams, Jane Oakhill and Jessica Horst:** *The end of the line: children learn more words from storybooks that do not rhyme*

24. **Francesco Margoni, Renée Baillargeon and Luca Surian:** *Infants expect subordinates to comply with an authority's but not a bully's instructions*

25. **Max Murakami, Jantina Bolhuis, Thorsten Kolling, Monika Knopf and Jochen Triesch:** *Look and Learn: A Model of Gaze Contingent Learning*

26. **Hannah Wilson, Gavin Bremner and Peter Walker:** *The Brightness-Weight Correspondence in Infants*

KEYNOTE ABSTRACTS

Larissa Samuelson (University of East Anglia, United Kingdom)
Biased vocabulary + visual attention and memory processes = a shape bias: A Dynamic Neural Field Model.

From roughly 24-months-of-age, children generalize novel names for novel solid objects to new instances based on similarity in shape (Landau, Smith & Jones, 1988). In this talk, I examine the mechanisms behind both the development of the "shape bias" and its manifestation in real-time via simulations in a Dynamic Neural Field model. In particular, I ask whether the same model that Samuelson et al. (2011) used to demonstrate the role of spatial memory in early word learning also produces a shape bias when taught a vocabulary with the same statistics as the early noun vocabulary. Five sets of simulations capture the emergence of the shape bias from the growing noun vocabulary; differences in the bias depending on specifics of the novel noun generalization task; acceleration of vocabulary development following the training of a precocious bias; and differences in the bias depending on the specifics of the trained words (Perry et. al., 2009), or individual differences in vocabulary (Perry & Samuelson, 2011). Findings support established links between the bias and the developing noun vocabulary and provide insight on connections between visual cognition and word learning biases. I argue the model compares favourably to existing models of word learning and the shape bias on several model comparison metrics (Sims & Colunga, 2013; Christiansen & Chater, 2001).

Jochen Triesch (Frankfurt Institute for Advanced Studies, Frankfurt)
Learning where to look: infants and robots.

Vision is an active process that relies on various kinds of eye movements to selectively process information from the environment moment by moment. Since infants acquire accurate control over their eyes comparatively early, many paradigms use eye movements as a window into infants' cognitive processes. But how do such processes drive our eye movements? And how do infants learn to control their eyes appropriately or even optimally? In this talk I give an overview over several lines of research studying these questions at different levels from basic aspects of binocular

vision to the discovery of agency and attention sharing. A central theme of our research is the close coupling between theoretical and empirical research. Computational models and robot simulations allow us to better understand and interpret infant data while also generating testable predictions for future experiments.

Saturday, August 27, 2016

Luca Bonatti (Universitat Pompeu Fabra, Barcelona)
Precursors of logical reasoning in prelinguistic infants.

Infants possess several mechanisms to solve domain-specific problems. However, little is know about infants' abilities to reason beyond these limited domains. I will present evidence that when they witness a scene not previously experienced, infants reason about it by applying basic logical principles. I will argue that such inferences are used to build strategies to inspect the scenes and make inferences to enrich knowledge. I will present data about the behavioral correlates of this inferential processes in infants and adults, focusing on the case of disjunctive reasoning.

PAPER ABSTRACTS

Birgit Elsner
Do verbal cues given by the model influence young infants' imitation of goal-directed actions?

Previous research has shown that social-communicative cues displayed by the model can help infants to identify the important aspects of observed actions (e.g., Gergely & Csibra, 2005; Southgate et al., 2009). Moreover, infants selectively reproduce either the observed movement or goal, depending on whether the demonstrated action had a salient action goal (resulting in infants' focusing on the goal) or not (focusing on the movement; e.g., Carpenter et al., 2005). In several studies, we presented 14- to 24-month-old infants or 3- to 5-year-old preschoolers with imitation tasks in which we varied the salience of action goals and the verbal information given by the model. For instance, the model verbalized either the action style or the end position during action demonstration, or both action components, or none of the components (cf. Elsner & Pfeifer, 2012). Results showed that preschoolers show a preference for reproducing the verbalized action component (movement or goal, respectively), especially when the demonstrated action did not have a salient action goal (see also Williamson & Markman, 2006; Wohlschläger et al., 2003). However, in infants, results were not so clear: The salience of the action goal seemed to have strong impact on infants' imitation, with infants reproducing the goal when a salient goal is present, but reproducing the movement when the action does not have a salient goal. In contrast, the verbal cues did not seem to influence infants' imitation. We will discuss these findings with regard to differences in action knowledge, verbal capacities, and social skills in infants as compared to preschoolers. In sum, the presented data will give further insight in the role of context conditions for infants' interpretation and reproduction of others' behavior.

Laura Maffongelli, Katharina Ledergerber, and Moritz M. Daum
The neural processing of syntactic violations of action sequences in 5- to 7-month-old infants: an ERP investigation.

Human behavior is a complex and continuous flow of information and relies on a hierarchical organization. This organization helps extracting critical information that serves both the anticipation and the understanding of action and language. Interestingly, the organization of the motor system shows interesting parallels with

that of language. Goal-directed actions, as well as sentences in language, can be sequenced in simpler units, which are organized according to a hierarchical plan (e.g., Fadiga et al. 2009). Both systems share the need to establish a correct temporal order determining the way in which single elements are grouped. Research in adults has shown that a manipulation of the action structure, that is, the action syntax, leads to a similar signature in the EEG as a corresponding violation of a processed sentence (Maffongelli et al., 2015). In adults, language and action knowledge are based on the life-time experience in both domains. In infants, in contrast, both domains are just emerging and it is thus possible to examine the processing of nascent knowledge structures, both separately and in context to each other. Whereas recent infant research focused primarily on the processing of the semantics of an action (meaning), we investigated the neural processing of the syntax of an action (structure) in infants at 5 to 7 months during the observation of action sequences. We presented action sequences in some of which two elements were swapped resulting in an incorrect sequence order. This violation occurred in the middle of an action. The action-goal could only be achieved when the right temporal order was maintained. Preliminary results show that a violation of this order elicits a frontal bilateral EEG negativity peaking at around 400 ms post-stimulus onset, suggesting that infants rely on structural regularities and that they are able to segment the action flow into discrete units.

Sébastien Forestier and Pierre-Yves Oudeyer
Curiosity-Driven Development of Tool Use Strategies.

The understanding of tool use development in young children is a key question for the understanding of the ontogeny of human cognition. For instance, the advanced control of multiple interacting objects requires mental transformations and planning operations which are fundamental to human cognition. Child development has been described as staircase-like successive stages [Piaget, 1952], but more recently, Siegler's overlapping waves theory described variability in a child's set of current methods to solve a problem. In a task where young children had to retrieve an out-of-reach object with a tool [Chen and Siegler, 2000], they showed that different strategies are concurrently used by children, and that the probability of using each strategy evolve over time.

In our work, we focus on the study of the evolution of these overlapping waves of behaviours in a robotic model and in particular on the use of concurrent strategies in a similar tool use problem.

An interesting approach to model autonomous life-long learning is the

implementation of curiosity-driven learning mechanisms in robotic setups. Such mechanisms have been argued to allow the self-organization of developmental trajectories similar to those found in infants [Oudeyer and Smith, 2014].

However, existing models have considered the learning of a single mapping between a motor space and a task space, but in the perspective of an open-ended development of reusable skills, and specifically in tool use, multiple interdependent and hierarchically organized task spaces should be available to the agent. We define such hierarchies of sensorimotor models that structure the sensory space, and we call Model Babbling the choice of model to explore this hierarchy.

We study how the intrinsic motivation in Active Model Babbling influences the evolution of overlapping waves of behaviours, and how the concurrent use of non-optimal strategies may ultimately lead to improved behaviours in more similar problems.

Olivia Guest and *Kim Plunkett*
Representational Re-description in hSOMs.

We present a type of network model, based on the self-organising map (SOM), that derives clusters in the input set at different levels of description (e.g., subordinate, basic, superordinate). The hierarchical structure of the self-organising map (hSOM) model allows for the emergence of both finer-grained as well as more global-level representations of the environment to which it is exposed. Thus, as a function of level within the hierarchy, more compressed or more detailed representations of the input can be accessed once trained. The hSOM model displays a developmental trajectory: a rudimentary structure is initially present throughout the levels. As a result of activation passing from lower to higher levels and training, the representations at each level become more refined, reflecting both novel and pre-existing distinctions in the input. Such a delay in learning imposed by constraints in the architecture provide an account of why certain categorical distinctions take longer to learn than others. The discovery and creation of, say, basic, subordinate, and superordinate representations to explicitly describe the environment can be seen as a form of representational re-description (Karmiloff-Smith, 1992). Direct access to the representations at each layer allows an easy way for both model and modeller to evaluate what the hSOM knows — for the former to carry out executive operations over perceptual and semantic knowledge, for the latter to gain a better understanding of the hSOM and the predictions/explanations it provides. This model can be seen as capturing the behaviour of a single perceptual pathway, in which low-level sensory input is incrementally organised into higher-level convergence zones using the similarity-in-

topography principle implemented by SOMs (Damasio, 1989; Simmons & Barsalou, 2003). Augmentation of this modelling work includes a dual-pathway version to further capture the developmental interactions of different modalities in conceptual processing.

Katherine Twomey and *Gert Westermann*
Labels shape infants' object representations.

As adults, language affects our cognition, a phenomenon known as linguistic relativity. However, when this relationship emerges is not known. Here, we trace its roots to infancy: infants incorporate labels into their object representations even before speech begins. Ten-month-olds were trained with two novel toys; critically, only one toy was named. In a subsequent eyetracking task in which the objects were seen in silence, infants showed evidence of having formed different representations for the named and unnamed objects. These data demonstrate that language shapes cognition from the outset.

Tom Fritzsche and Barbara Höhle
The detection of grammatical gender dependencies in German learning 24-month-old children.

Children become sensitive to grammatical gender mismatches around the age of 18-20 months (Cyr & Shi, 2013; van Heugten & Christophe, 2015). At 24 months they are able to use gender information to identify visual referents (Johnson, 2005; Lew-Williams & Fernald, 2007; van Heugten & Shi, 2009) and to represent abstract gender information (Melançon & Shi, 2015). These findings have been obtained from children acquiring French, Dutch, or Spanish – languages that mark two genders and no case. Does this generalise to German with its three genders and four case categories all of which affect the form of the determiner? We tested thirty 24-month-old monolingual German-learning infants in the head-turn preference paradigm, measuring how long they listened to grammatical and ungrammatical (i.e. gender-mismatch) combinations of determiners with highly familiar nouns. In addition, we obtained their vocabulary scores. Gender assignment in German is not entirely arbitrary but phonological or morphological cues are probabilistic in nature and can only be discovered in larger word corpora, which led Mills (1986) to postulate a connection between gender and vocabulary acquisition. Given the complexity of the German determiner system, we asked whether German-learning infants are sensitive to gender mismatches at 24 months – an age at which they start to produce determiners (Mills, 1986). Furthermore, we explored the relationship between the looking behaviour and vocabulary size. Results indicate that their looking times are affected by an interaction

of the factors grammaticality, vocabulary size, and trial position. Pairwise comparisons showed longer looking times for grammatical over ungrammatical combinations only for the infants with low vocabulary scores in the second part of the experiment. This suggests that German 24-month olds do not show a robust sensitivity to violations of gender dependencies. More data is currently being collected and will be presented by the time of the conference.

Amy Bidgood, Thea Cameron-Faulkner, Michelle Peter, Samantha Durrant and Caroline Rowland
The role of showing and pointing in the vocabulary growth of children aged 8-15 months.

The idea that language acquisition develops from children's early non-communicative abilities is central to many constructivist approaches (see Clark, 1993; Tomasello, 2003). Studies have investigated the increasing complexity of infants' gesture use (e.g. Cameron-Faulkner et al., 2015) or the relationship between gesture and vocabulary growth (e.g. Bates & Dick, 2002; Iverson & Goldin-Meadow, 2005). Others have investigated the effect of babble on language production (McGillion et al, in press). However, none have investigated all predictors together in the same children, so we cannot draw robust conclusions about the relative importance of each, or relationships between predictors.

The current study investigated if infants' showing and giving gestures predicted declarative pointing, if pointing predicted later receptive vocabulary, and if early vocal production predicted later expressive vocabulary. Eighty infants participating in the longitudinal Language 0-5 Project took part in structured 25-minute play sessions at 11 and 12 months, designed to elicit a range of gestures. Vocabulary was measured using the UK-CDI at both sessions and at 15 months. Vocal production measures were taken from LENA recordings and parental report of infants' babble.

Preliminary regression analyses (N=10) suggest infants' showing and giving gestures at 11 months predicted their declarative pointing at 12 months (R^2=0.30, $F_{(1,9)}$=3.37 p=0.10) and that declarative pointing at 11 months predicted receptive vocabulary at both 12 (R^2=0.66, $F_{(1,9)}$=15.70, p=0.004) and 15 months (R^2=0.51, $F_{(1,9)}$=8.45, p=0.020). We found no relationship between infants' early vocal production, measured either by parental report or by LENA child vocalisation counts, and expressive vocabulary.

In summary, our results show a line of predictive relationships: from hold-out and give gestures, through declarative points, to vocabulary growth. We discuss the

relationship between early communicative competence and the developing complexity of early gestures, and potential reasons why some gestures, in particular, may be predictive of later language growth.

Caspar Addyman and Frank Wiesemann
Good night, good morning: How sleep quality affects infants' morning mood.

Infant sleep problems are among new parents' greatest concerns and the importance of sleep quantity and quality for infant development is an under-researched topic. This project reports the results of studies conducted in São Paulo, Brazil, and London, UK. In the Brazil study mothers of 117 infants (53 female, mean age = 13.9 months, range = 2-27m) provided background demographic data, general information on their child's sleep and completed the appropriate version of the short infant behaviour questionnaire (IBQ-R, Rothbart & Gartstein, 2000; EBQ, Putnam & Rothbart, 2006). They also completed a 10-day sleep diary indicating the time babies went to sleep and woke up, night time wakes, feeds and diaper changes and the morning happiness and energy of their baby on a 10 point scale. Preliminary analysis indicated that overall infants were in bed for an average of 9h46 ± 1h12 and woke up happy (mean score 8.2 ±1.55) and energetic (mean score 7.2 ±2.50). A regression analysis showed that babies' morning energy level was positively affected by the number of night time wakings ($\beta=0.32$, $p<.001$) and total sleep ($\beta=0.42$, $p<.001$). By contrast, happiness was negatively affected by nighttime wakings ($\beta=-0.31$, $p<.001$) but showed an interaction between total sleep and diaper quality (total sleep: $\beta=0.13$, $p<.003$, interaction $\beta=-0.14$, $p<.02$). These patterns are shown in Figure 1. Sleep and morning mood were also affected by sleeping arrangements and infant temperament (not shown). Overall, the data showed a complex relationship between infant sleep quality and morning mood but that parents can potentially improve morning mood by minimising night-time disturbances and using more absorbent diapers.

A comparison study is currently underway in the UK and will be reported at the conference.

Josephine Ross and Mandy Urquhart-Yilmaz
The socialisation of self: Investigating the link between autonomous parenting and early mirror self-recognition.

Although the ability to self-recognise onsets universally by around the age of two years, there is growing evidence to suggest cross-cultural variation in the early emergence of self-awareness. Specifically, infants from autonomous cultures typically pass the mirror mark test of self-recognition earlier than infants from relational

settings. This advantage could mark the early socialisation of individualistic perspectives on self. Although the distinction between individualism and collectivism is well established in adults, there is little data to elucidate the development of these distinct perspectives. This is because self-recognition has traditionally been considered a fixed cognitive development rather than a social process.

Ross, Yilmaz, Dale, Cassidy, Yildirim, and Zeedyk (in press, Developmental Science) demonstrate that the autonomous advantage in self-awareness development is test-specific. When self-awareness was measured using an alternative method to the mirror mark test (the body-as-obstacle task), Zambian 15- to 18-month olds outperformed their Scottish counterparts. There were associations between distal parenting practises (favoured by Scots) and mirror self-recognition, and between proximal parenting practices (favoured by Zambians) and body-as-obstacle performance. This data implies that self-awareness tests vary in their cultural sensitivity, and that different socialisation practises can be associated with different performance profiles in self-awareness tests. However, it is an open question whether infants performed differently on the self-awareness tasks because of qualitative differences in early self-awareness.

If there are socialised differences in the quality of early selves, we should also see intra-cultural variation in self-awareness performance associated with distinct parenting practises. Since the environment is shared, this data would also help to rule out the contribution of non-self related differences (e.g. mirror familiarity). Measuring self-awareness and social interaction from 6 through to 24 months, we report an intra-cultural comparison of Scottish infants' performance on the self-awareness tasks, relating performance to infants' experiences of distal versus proximal parenting styles.

Friday, August 26, 2016

Joseph Butler, Cátia Severino, Marina Vigário and Sónia Frota
When prosody matters! Developing word segmentation abilities in European Portuguese learning infants.

Early word segmentation plays a crucial role in language acquisition, with previous studies showing variability in developing segmentation abilities across language and utterance contexts. Word position becomes crucial due to prosody and its properties, with words appearing at utterance boundaries easier to segment due to particularly salient cues (e.g., duration, pitch cues) than those in the middle. This paper is the first attempt to study emerging segmentation abilities in European-Portuguese (EP) learning infants and whether prosody constrains early word segmentation abilities. Unlike other languages, EP prosody shows mixed rhythm, and provides strong cues to intonational phrase (IP) boundaries, but not to lower boundaries. Monosyllabic word form segmentation was tested at 6, 9 and 12 months. At 6 and 9 months, segmentation abilities at the final IP boundary (sentence edge) and internally within the IP were compared. Segmentation at 12 months was tested at IP boundaries internal to the sentence, without the pause cue, and at word boundaries. At 6 months, infants only segment at the final IP boundary, but not IP internally, while 9 month-olds show evidence of developing segmentation abilities IP internally (Fig.1). Twelve month-olds segment at IP boundaries within the sentence, demonstrating similar behaviour, segmentation wise, to 6 month-olds at final IP boundaries, but are still unable to segment at word boundaries (Fig.2). These results show segmentation abilities in EP infants emerging around 6 months of age (as for English – Johnson et al., 2014), with further development evident throughout the first year. Additionally, these results show that prosody constrains early word segmentation, building upon, and going further than the edge vs internal sentence hypothesis, adding to existing knowledge of emerging segmentation abilities, and what cues constrain, or are utilised, during the development of this ability, in a prosodically 'atypical' language, EP, not previously studied for word segmentation.

Jelena Sucevic, Nadja Althaus and Kim Plunkett
Influence of learning schedules on infant category learning.

The ability to categorise objects based on their similarities and differences constitutes a primary foundation for semantic organization. In an experimental setting, characteristics of stimulus exposure strongly influence categorisation outcomes. For example, 4 to 6 months old infants are able to categorise objects presented in pairs, while having difficulty in extracting category information from objects presented one

by one (Oakes & Ribar, 2005). The aim of the current study is to explore further how these learning conditions influence infant category learning. The effects of sequential and paired familiarisation on category formation were examined using a standard familiarisation-novelty preference task in an eye-tracking experiment with 10 months old infants. Participants were presented with a set of novel objects consisting of two categories, with the overall amount of familiarisation time equated across the two conditions. Preliminary analyses revealed no novelty preference in the sequential condition, indicating no category was formed. Infants in the paired condition, by contrast, expressed a preference for the novel object, indicating that they formed two categories. These results replicate those of Oakes and Ribar (2005). However, as attentional preferences are dynamic in their nature (Houston-Price & Nakai, 2004), we considered whether the standard measure of novelty preference, expressed through an overall proportion of looking time, might be insensitive to potential effects of interest. In order to explore the time course of looking preferences, we conducted a growth curve analysis on the same dataset. This revealed that novelty preference is present in both groups of infants, i.e. infants in both experimental conditions extracted categorical information, though the latency and strength of the effects differed. In summary, this study shows that category formation is sensitive to learning conditions and demonstrates the importance of adopting more sensitive statistical approaches, such as multilevel modelling, to improve our understanding of infants' categorisation abilities.

Peiwen Yeh, Elena Geangu and Vincent Reid
Mapping developmental changes in the integration of emotion perception from bodily expressions and affective sounds.

Previous studies on emotion perception have demonstrated that increased sensitivity occurs during multisensory information processing when compared with unisensory information (van Wassenhove, Grant, & Poeppel, 2005). Even though body expressions have been shown to be an effective cue for conveying emotion (de Gelder, 2006), our understanding is relatively limited in terms of how emotions are processed via body expressions combined with vocal affective information. We therefore used event-related potentials (ERPs) to measure responses to the presentation of angry sounds with emotionally congruent or incongruent body expressions, and angry sounds presented in isolation in adults and 6.5-month-old infants. In adults, the N1, a negative ERP component for sensory processing (~100 ms after onset of sound), was significantly reduced in latency and amplitude for audiovisual pairs compared to a sound-only condition. This result suggests that emotion interaction from the two modalities occurs at an early stage of processing. The modulation of congruency effects were found either in facilitation or suppression within 200ms. With the same

paradigm, the infant data indicated differences between audio-only and audiovisual conditions around 300 ms after auditory onset in left-frontal regions (P350). A large negative component (N450) related to attention mechanisms in infants was elicited for the congruency effect. In sum, the current findings indicate that the capacity to integrate angry body and sound information has already developed at 6.5-months of age. It is also likely that different latencies separate processing for integrating modal information from emotional content. To further understand the neural maturation of the integration of emotion perception between these two age groups, we will conduct the same study with children (4- to 6-year-olds).

Erik Gustafsson, Julie Brisson, Dominique Mailloux, Marc Mainville, Christelle Beaulieu and Sylvain Sirois
Do Infants Recognize Engagement in Social Interactions? The Case of Face-to-Face Conversation.

This study explores 12-month-olds' understanding of face-to-face conversation, a key contextual structure associated with engagement in a social interaction. Using a violation-of-expectations paradigm, we habituated infants to a "face-to-face" conversation, and in a test phase compared their looking times between "back-to-back" (conceptually novel) and "face-to- face" (conceptually familiar) conversations, while simultaneously manipulating perceptual familiarity in a 2x2 factorial design. We also analyzed dynamic changes in pupil dilation, which are considered a reliable measure of cognitive load that may index processing of social interactions. Infants looked relatively longer at perceptual changes (new speaker positions) but not at conceptual change (back-to-back conversation), suggesting that face-to-face conversation may not elicit particular expectations, and so may not carry any particular conceptual significance. Moreover, on the first test trial, larger pupil dilation was observed for familiar conditions, suggesting that familiarity with perceptual features could enhance processing of conversations. Thus, this study undermines assertions regarding infants' conceptual understanding of the social signals underlying engagement. Infants may rather recognize such signals through their perceptual familiarity and associated positive feelings. This may then increase their engagement when observing and participating in others' collaborative activities, in turn allowing for the development of knowledge regarding others' intentions.

Christine Michel, Pauen Sabina and Stefanie Hoehl
Follow me! Infants' ability to learn about the referential nature of a cue.

The ability to follow another person's gaze is a crucial prerequisite of joint attention and language (Brooks & Meltzoff, 2005). However, little is known about how infants

acquire this behavior. Corkum and Moore (1998) hypothesized that infants learn to follow gazes through reinforcement: If infants follow the gaze of others, their attention is guided to an interesting sight in the environment. Based on this idea, we applied a gaze-contingent eye tracking paradigm measuring 4-month-olds' ability (10 female, mean age: 4 months 14 days) to learn about the referential nature of a cue through reinforcement. The study contains a baseline, training and test phase. In each trial, infants saw the face of a woman with a comic mouse to each side. The face turned to the side, looking at one and away from the other mouse. If infants are sensitive to gaze cues, we expected longer looking times to the cued than to the not cued mouse in baseline. During training, we rewarded gaze following behavior: whenever infants looked at the cued mouse, this mouse started to move lively. Test phase was identical to baseline. If infants learn through reward, they should enhance their behavior from baseline to test. A rmANOVA revealed longer looking times to the cued than to the not cued mouse in baseline and test, $F(1,20)=18.52$, $p<0.001$, $\eta p^2=0.49$. The more infants elicited gaze-contingent animations in training, the more they enhanced their preference for the cued mouse in test, $r=0.54$, $p=0.011$. Four-month-olds showed spontaneous gaze following behavior and enhanced it when being rewarded. However, we cannot conclude that this behavior originally was acquired through reinforcement learning. In a follow-up study we therefore test infants' ability to learn about the referential nature of a nonsocial cue whose direction they do not already follow in baseline. Data acquisition is under way.

Samuel Forbes and Kim Plunkett
The Development of Colour Word Knowledge in Infants and Toddlers.

For infants, a good strategy to learn about their surrounding world is to communicate with experienced speakers. Successful communication includes the comprehension of spoken language as well as observed actions. When a caregiver shows a new action to an infant, he or she will not only demonstrate the action for the infant to imitate, but will also use language to describe the action to the child. The infant, in turn, can use this information to learn about the action presented. There is evidence that verbal information presented during action demonstration indeed has an impact on infants' action processing and reproduction of that action. Therefore, information from the different domains might interact in social learning situations. The present research seeks to further enrich our knowledge about this interaction and investigates how different verbal information during action presentation influences subsequent action reproduction. In a video phase we will present 18- and 24-month-old infants with videos of two novel actions, each performed with an unfamiliar object, accompanied by verbal information. This information, depending on the experimental condition, will emphasize either the movement, the object acted upon, both, or none of it. Here, we

will track the infants' eye movements to examine how the verbal information influences infants' distribution of attention to the demonstrated actions. In a subsequent imitation phase, infants will act on real-life versions of the objects. We expect that the infants will integrate the verbal information into their cognitive action-representation, and therefore we expect differences in action reproduction between our experimental conditions. Furthermore, we will be able to investigate possible relations between eye movements/attention distribution and imitation behavior. The planned research will therefore shed light on mutual influences in the early development of language and action.

Jessica Horst, Katherine Twomey, Anthony Morse, Rosie Nurse and Angelo Cangelosi
Toddlers and Robots Learn More Object Names When Everything They See Together is the Same Colour.

Pointing is a robust predictor of infants' later language capacities (Colonnesi et al., 2010). Yet the predictors of the development of pointing frequency in the first year of infants' lives are not as well-known. Pointing development might be dependent on infant-driven competencies (Liszkowski & Tomasello, 2011) as well as the shaping of adults (Matthews et al., 2012). In the current study, we examine the fine motor and point following abilities of infants along with caregiver responsiveness in relation to later pointing frequency. 23 mother-infant dyads (12 girls) were examined at infants' 10 and 12 months of age. Infants' points and mothers' responses to these points were assessed via the decorated room paradigm (Liszkowski et al., 2012). The verbal and/or non-verbal responses mothers provided to their infants' points within 2 seconds were used to construe a maternal responsiveness measure. Responses were categorized as "relevant" if they were semantically relevant to the item infant pointed at, "non-relevant" if they were irrelevant, and "none" if the mother did not provide any behavior. Percentages of response categories were calculated by dividing the total number of responses in each category by the total number of infant points. Also, infants' fine motor development and ability to follow points were assessed via the Mullen Scales of Early Learning (Mullen, 1995) and a point following procedure adapted from Mundy (2003), respectively. Results showed that the frequency of infants' points at 12 months was significantly predicted by the percentage of relevant maternal responsiveness at 10 months, even when controlling for the frequency of infants' points, Mullen scores, and point following scores at 10 months ($F_{(5,17)}$= 3.908, $p < .05$, R^2= .54). This study demonstrates the prevailing effect of caregiver responsiveness over infants' own fine motor and social-cognitive abilities on the development of pointing within the first year.

Sónia Frota, Joseph Butler, Shuang Lu and Marina Vigário
Infants' perception of native and non-native pitch contrasts: tune, pitch accent or tone?

Infants' ability to distinguish between forms of phonetic variation that are relevant to meaning is essential for their language development. Little is known about the developmental course of infants' perception of pitch, particularity in the presence of segmental variability which entails the ability to extract and generalize contrastive patterns. Using single-bisyllabic utterances, Experiment 1 examined native discrimination of the statement (falling)/yes-no question (rising) tune by European Portuguese (EP)-learning infants, and demonstrated that both 5-6 (t(19) = 6.1, p<.001, d=1.474) and 8-9 month-old infants (t(19) = 4.42, p<.001, d=0.816) were able to discriminate the contrast (Fig.1). Experiments 2 and 3 addressed the question whether falling vs. rising contours would also be perceived in segmentally varied nonnative input. Experiment 2 tested EP-learning infants' perception of the lexical distinction between Mandarin Chinese Tone 1+Tone 4 and Tone 1+Tone 2. As noted for other languages [1], the EP and Mandarin pitch contrast shows similar contour shapes. However, differences in implementation arise from the different nature of tune versus tone, the latter having the syllable as its domain. Infants failed to discriminate the Mandarin contrast, both at 5-6 months (t(19) = .27, p=.79, d=0.06) and 8-9 months (t(19) = .86, p=.39, d=0.19). Experiment 3 tested EP-learning infants' perception of the falling/rising contrast in Japanese, a pitch accent language with bisyllabic words distinguished by HL and LH contours [2]. Unlike tone, but like intonation, the Japanese contrast has the bisyllabic-word as its domain. Although infants at 5-6 months failed to discriminate (t(23) = .17, p=.87, d=0.04), they were successful at 8-9 months (t(23) = 2.44, p<.05, d=0.45). These findings show that, beyond segmental variation, infants' perception of pitch is influenced by language experience as early as 5 months of age, and tune, pitch accent and tone are already differentially perceived in the first year of life.

Matt Hilton, Katherine E. Twomey and Gert Westermann
FaceTime: Shy children's increased attention to faces and its effect on word learning.

During early childhood, shyness is negatively correlated with measures of language development (e.g. Spere et al., 2004), and this may in part be due to shy children's reduced ability to learn words (Hilton & Westermann, under review). Shy children also attend more to faces than their less-shy peers (Brunet et al., 2009), so the current work examined whether this increased attention to faces may explain the effect of

shyness on children's word learning. 20-26 month old children (N = 32) took part in an eye-tracking study consisting of twelve onscreen trials. On each trial, one novel and two familiar objects were presented, as an onscreen actor looked at one of the objects and labelled it, using a pseudoword if the target object was novel. Each child's shyness score was then calculated from the shyness scale of the Early Childhood Behaviour Questionnaire (Putnam, Gartstein & Rothbart, 2006) which was completed by their parent. Results showed that overall, children reliably looked towards the object during labelling. As expected, shyness was positively related to looking at the actor's face, meaning that on average shy children showed sustained looking towards the face throughout a trial, while less-shy children shifted their attention towards the array of objects as the actor began labelling. Furthermore, less-shy children, but not shy children, showed an increase in looking at the target object in comparison to the two competitor objects. These findings suggest that shy children's increased attention to faces reduces their ability to attend to objects as they are being labelled. Looking at an object during labelling is a key factor in determining whether the word-object mapping will be learned (e.g. Yu & Smith, 2011), so shy children's increased attention to faces is a potential mechanism by which shyness affects language acquisition.

Richard O'Connor and James Russell
Directing actions at hidden objects: first- and third-person Understandings.

While infants show sensitivity to the continued existence of hidden objects in looking-times studies from 2.5m, they do not intentionally search for hidden objects until 8m. A proposed explanation is that searching for hidden objects requires forming expectations about how one's actions affect hidden objects. This is not required in looking-time studies. This proposal suggests that experiencing how one's actions affect hidden objects should lead to generalised improvements in searching.

7m infants (n=44) were taught to spin a turntable to bring back into reach a toy that was either behind an opaque screen (hidden), or behind a transparent screen (visible, but out-of-reach). Before and after this training infants performed a different search task in which a toy was hidden in a hiding-well. Infants who learnt to spin the turntable with the opaque screen showed greater improvement on the hiding-well task. We suggest this improvement was the result of infants experiencing the effects of their actions upon hidden objects, thus learning to direct actions at such objects.

This first-person experience of directing actions at hidden objects might impact infants' third-person understanding of other agents' actions: understanding hidden objects as goals of other agents' actions might emerge alongside intentional search. 5-13m infants (n=52) watched an agent repeatedly direct an action at one of two visible

objects. Both objects were then hidden by two screens, and the agent directed their action at either the old 'goal-object' or the second object.

There was no evidence that infants at any age looked longer when the agent changed goal, suggesting that infants did not interpret the agent's action as directed at a specific goal-object when the objects were hidden. Possible explanations include methodological problems, working-memory limitations, or that the first-person ability to direct actions at hidden objects does not support the third-person understanding.

Iain Jackson and Sylvain Sirois
But that's possible! Infants, pupils, and impossible events.

The violation of expectation paradigm is one of the primary tools used to study infants' understanding of the world around them. Typically, in these tasks, infants are familiarised with one version of an event before being presented with versions which differ along one or more dimensions of interest, such as the events' conceptual plausibility. Longer looking to impossible versions of events, where objects do not behave according to physical laws, is commonly interpreted as reflecting infants' ability to apply their existing knowledge and reason about the events presented to them. In the current study, we examine this assumption by exploring the role of learning during the task itself. The contributions of infants' conceptual knowledge and of online learning to looking behaviour are contrasted by switching the traditional approach on its head and familiarising infants to impossible events. Nine-month-old infants were presented with video clips of toy trains which either did or did not switch colour following a brief occlusion in a tunnel. Both looking times and pupil dilation were used as dependent measures in a factorial design, in which perceptual (novelty-familiarity) and conceptual (possible-impossible) variables were independently and jointly analysed. We show that infants, generally, reacted more to possible than impossible events following familiarisation. Furthermore, analysis of dynamic changes in pupil diameter whilst infants watched test events uniquely highlights the role of online learning in such tasks, and proves a finer-grained measure of information processing than traditional cumulative looking time measures. The discussion relates those findings to the general problem of measuring cognitive abilities in infants, from both a methodological and theoretical point of view.

Sylvain Sirois and Julie Brisson
Goal attribution in infants: When pupil dilation shows what looking times do not.

In her seminal work, Woodward (1998) showed that infants reacted to apparent changes in human-agent goals. Her data were used to suggest an early concept of

agency in infants. That work, and subsequent studies, are based on methods derived from habituation and rely on relative looking times as a dependent measure in what are know as Violation of Expectation (VoE) tasks. Methodological criticisms can be levied about such approaches in general (e.g., Heyes, 2014), and about Woodward's (1998) task in particular (Sirois & Jackson, 2007). In the current study, we replicate the original paradigm but add methodological controls as well as use pupillometry to complement looking time measures. We tested 30 9-month-old infants (15 girls; Mage = 282.9 days, SD = 8.10) on video sequences showing a hand, initially resting between two toys, grabbing one of them. After habituation, infants were shown (in random order) a sequence of four test events that varied target position and target toy. Results show that looking times failed to distinguish between the different test events. However, micro-analyses of gaze data highlight how hand motion, path, and location (but not target) influence how infants look relative to habituation trials, explaining Woodward's (1998) findings whilst eschewing the notion of goal attribution in infants. Similarly, pupil dilation shows an interaction between target and path, suggesting that babies react more to toys changing location as a function of hand trajectory. These findings highlight the role of online learning in VoE tasks that assess emergent social cognitive abilities. More generally, these data provide additional support to the growing concern that methodological issues (and, in particular, task-dependent arbitrary criteria for familiarisation and testing procedures in VoE studies) have manufactured an inaccurate understanding of the infant social and cognitive mind.

POSTER ABSTRACTS

1. Estefania Domínguez-Martínez, Eugenio Parise, Benjamin M. Taylor and Vincent Reid
Understanding the causes of (dis)agreement of the current infant ERP editing methods

One of the challenges when conducting infant event-related potential (ERP) studies is to identify artefact-free trials that can be included in the final ERP. Current methods for selecting valid ERP trials usually include a manual or an automatic editing step, as well as a combination of the two. In a previous study, we investigated the agreement between current infant editing methods and found that there is a low agreement between editors in terms of trials accepted due to noise in the EEG as well as a low agreement in the number of channels interpolated. The differences in the editing methods had also an influence on the final ERP morphology, as well as in amplitude and peak latency of the Nc component between conditions. The aim of the present study is to investigate further the reasons that led to the agreement –and disagreement- between editors. Variables that characterize the signal and the level of noise in the EEG are calculated in a trial by trial basis and advanced statistical methods such as generalised linear mixed effects models are applied to find which variables have the greatest influence in the agreement of the current infant editing methods. The results are intended to help shed light on how the current infant ERP editing methods can be improved and standardized within the infant ERP research field.

2. Han Ke and Elena Geangu
The Development of the Neural Correlates of Body Schema Processing During Childhood

It has been shown that observing body expressions evoked similar neural response in the human brain compared to those elicited by faces (Stekelenburg & de Gelder, 2004; Gliga & Dehaene-Lambertz, 2005). Similar to faces, processing body postures integrates to a certain extent information about the configurational relation between its different elements (Thierry et al., 2006; Righart & de Gelder, 2007). When this information is altered by changing the orientation of the bodies (i.e., upright vs inverted), bodies tend to be less accurately recognized. Particularly the ERP component N170 seems to be delayed and have a higher amplitude for the inverted bodies compared to the upright ones (Stekelenburg & de Gelder, 2004). However, the body inversion effect has been so far only investigated in adults. Although previous

studies show that there are developmental changes in the body schema processing in infants (Missana, Atkinson and Grossmann, 2014), it is yet unknown whether the associated neural mechanism continue to develop beyond infancy. The current study aims to reduce this gap by showing how the ERP components associated with body schema processing mature throughout childhood. Two- to 11-years-old children were presented with images of human bodies with a neutral posture and objects with a similar structure (i.e., hat stands). Both the bodies and the objects were presented with an upright and an inverted orientation, while continuous EEG was recorded with a 128 electrodes Geodesic Sensor Net (EGI). Preliminary results show that across all age group inverted body image evokes more positive amplitude in N170 component, and the amplitude of N170 decreased with age. This study provides a developmental account of the maturation of the body schema over childhood

3. Christian Kliesch, Vincent Reid, Anna Theakston and Eugenio Parise
Infants' understanding of teleological actions after ostensive communication

Infants interpret actions as goal directed (Hunnius & Bekkering, 2010) and are also sensitive to ostensive communication (Csibra, 2010). When ostensively addressed, infants perceive the informative content of the communication as relevant, meaningful and generalisable (Csibra & Gergely, 2009). In the following study we ask whether ostensive communication can change the interpretation of an arbitrary action in 9-month-old infants. We used N400 ERP component, sensitive to semantic processing, to answer this question.

Based on Reid et al. (2009), we measured the N400 ERP component in an expectancy violation paradigm. We investigated 9-month-old infants in a communicative condition and in a non-communicative control condition. In the communicative condition infants were presented with an actor addressing them ostensively (direct eye contact, infant directed speech) and subsequently performing an action that can have an anticipated or unanticipated outcome.

For the N400 we investigated a group of electrodes in the parietal area, similar to Reid et al. As the data showed no clear peaks, we ran an Anova for the 600-800ms time window mean based on previous research (Reid et al., 2009). We found a significant positive deflection for unexpected outcomes ($F(1,15) = 8.6$, $p = .01$). We did not find a significant communication-outcome interaction ($F(1,15) = 0.5$, $p = .40$). In addition to our hypotheses, we found a main effect of communication between 150-200ms, ($F(1,15) = 7.4$, $p = .02$).

We also analysed the frontal Nc-component, to investigate whether communication

facilitates action understanding through arousal. However, no significant interaction or main effects were observed (all p > .50).

The current paradigm did not confirm the hypothesis that ostensive communication changes the interpretation of actions in 9-month olds.

4. Iris Nomikou, Giuseppe Leonardi, Joanna Rączaszek-Leonardi and Katharina J. Rohlfing
"Getting into synch": the development of mutuality

Development is guided by processes constructed within interaction (e.g., Fogel, 1993; Wootton, 2005). We propose that early forms of mutuality arise within mother-infant interactions as part of coordinating with each other. This coordination entails the online mutual responding to each other's behaviour, which acts as a coupling mechanism, enabling mother and infant to enter an interaction and maintain or stabilise it (Rączaszek-Leonardi et al., 2013). In these interactions, gaze is one of the first and most important means of communication and coordination in parent-infant dyads, as it is the first dyadic system in which both mother and infant have almost equal control over the same behaviour (Stern, 1974). It allows the infant to take part in conversation and maintain his or her participation (Filipi, 2009). In the present paper, we argue that emerging patterns of mutual gaze constitute a form of coordination with which mutuality enters the interaction system. We used a longitudinal corpus of 17 German mother-infant dyads filmed during an everyday routine activity when the infants were 3, 6 and 8 months old. Adopting a mixed methods approach, we conducted qualitative analysis of the sequential organisation of gaze. We then coded the gaze behaviour of mother and infant and subjected the data to recurrence analysis (e.g. Warlaumont et al., 2010). Our findings indicate systematic differences across development: While the general similarity of gazing behaviour decreases with age, the behaviour of mother and infant becomes more tightly coupled, more structured around a predictable temporal pattern. We propose that mutual understanding may emerge from a gradual "getting into synch", a process of participation in co-actions which generate mutual experiences. As the skillfulness of the infants increases resources may become available enabling infants to establish mutuality outside of the dyad.

5. Manuela Stets, Silvia Rigato and Karla Holmboe
Replicability of Findings in Infant Attention Research

In recent years, the replicability of research studies in general, and psychological studies in particular, has been repeatedly examined. It has even been argued that

study results should be reproducible rather than merely replicable (see Drummond, 2009). Vast discrepancies have been found between results from adult studies reported in original articles and their respective replications undertaken for a collaborative project (see Open Science Collaboration, 2015). The question arises how reliably replicable results are that were reported from developmental psychology studies. In an attempt to replicate results reported for a spatial cuing paradigm (e.g., Richards, 2000, 2005), we collected pilot data from a group of 2- to 9-month-olds. We presented trials involving a central animation and different combinations of cues, gaps, and targets. We reproduced the commonly seen gap-/overlap-effect with delayed saccade onsets in the overlap condition relative to the gap condition. Moreover, for trials involving a cue occurring on the same side as the target and with a gap duration of 150ms, we found the previously reported facilitation of the target side (i.e., earlier saccade onsets) compared to trials with an incongruent cue and a gap duration of 150ms. However, as reported in earlier studies attempting to replicate the same findings, we did not reproduce the inhibition of return for congruently cued trials with a gap duration of 1000ms. In fact, keeping infants engaged in and attending to an empty screen for a full second without shifting gaze direction to the cued side or anywhere else showed to be rather challenging. Therefore, we urge researchers to caution when reading about similar results that others repeatedly fail to replicate.

6. Beatrix Labadi and Luca Bakody
Shared sensory experiences modulates understanding others in childhood

Recent studies have found evidence that the multisensory stimulation on body-awareness can be extended to face involving social-cognitive processes in adults. The shared sensory experience (e.g. seeing someone else's face being touched on one's own face simultaneously) elicits changes in the mental representation of self-other boundary. In our studies we examined the development of multisensory process elicited by the enfacement illusion. Exp 1 children (aged 3-, 4-, 5-, and 6-years) saw an unfamiliar face touched synchronously or asyncronously while feeling touch on their own face. We tested whether the synchronous multisensory stimulation facilitates the reading emotion of others (happy, fear, disgust). Findings supported that synchronous multisensory stimulation elicit changes in self-other boundaries, facilitates the recognition of emotions and the developmental shift emerged between age of 3 years and 4 years. Exp 2 we studied whether the shared sensory experiences between two people could alter the way peripersonal space was represented, and whether this alteration could be influenced the ability to take another person's viewpoint in perspective taking task. We measured the shared sensory experience effect in a perspective taking task varying first person perspective and third person perspective. Findings suggest that the multisensory integration of the peripersonal space can be

dynamically modulated by the social interactions with partners and contribute to the mechanism of social cognition such as understanding others' actions, and predicted better understanding others' perspective. The shared multisensory experiences between self and other, even in childhood, can change the perceived similarity of others relative to one's self which resulted a better emotion recognition and taking perspectives of others.

7. Isabel Quiroz, Manuela Stets, Karla Holmboe and Silvia Rigato
Association between prenatal measures and postnatal life

The study of foetal development has grown over the last decades (e.g., DiPietro et al., 1996, 2010), yet a great amount of research still needs to be done to uncover the associations between prenatal and postnatal life. Previous evidence (DiPietro et al., 1996) showed stability in foetuses heart-rate (FHR) and in the variability of the heart-rate (FHRV) during pregnancy starting at mid-gestation, and associations between these measures and infant temperament. In a more recent study, DiPietro et al. (2010) found an association between a measure of 'coupling' between FHR patterns and foetal movements (FM), and the neonatal development of the central nervous system. Another study (DiPietro et al., 2004) reported that coupling and FHR patterns are affected by the family's socio-economic status. In the currently on-going longitudinal study (N=60), we are recording FHR, FHRV, and FM during the last 6 weeks of pregnancy and collecting information on family's social background. Neonatal measures include heart-rate recording, a gap/overlap task, and the infant temperament questionnaire (IBQ-R-VS). Based on previous studies, prenatally, coupling between acceleration in FHR and the amount of FM is expected, and infants with lower socio-economic status are expected to have less coupling compared to those with high socio-economic status. Such prenatal measures are expected to affect the newborn's state of alertness as measured in the gap/overlap task, and a positive correlation between foetal and infant HR measures is also predicted.

8. Alena Galilee, Joseph P McCleery and Chrisy Stefanidou
Neural mechanisms of speech versus non-speech detection and discrimination in children with autism spectrum disorder

In the current study, we utilized a Rapid Auditory Mismatch (RAMM) paradigm in order to investigate event-related potential (ERP) responses associated with the detection and discrimination of speech and non-speech sounds in children with ASD. Specifically, we compared a group of 4- to 6- year old high-functioning children with ASD with typically developing (TD) children matched on gender, chronological age and verbal abilities. ERPs were recorded while children passively listened to pairs of stimuli

that were either both speech sounds, both non-speech sounds, speech followed by non-speech, or non-speech followed by speech. Control participants exhibited temporal cortex N330 match/mismatch responses reflecting speech versus non-speech detection, bilaterally, whereas children with ASD exhibited this effect only in the left hemisphere. Furthermore, while the control groups exhibited match/mismatch effects at approximately 600 ms (temporal P600, central N600) when a non-speech stimulus was followed by a speech stimulus, these effects were absent in the ASD group. These findings suggest that children with ASD fail to activate right hemisphere mechanisms, likely associated with social or emotional aspects of speech detection, when distinguishing non-speech from speech stimuli. Furthermore, the ASD participants failed to detect the change from non-speech to speech at a late cognitive stage of evaluation, when speech stimuli followed a non-speech sound. Together, these findings are consistent with the hypothesis that children with ASD rely more distinctly on physical stimulus properties versus social or emotional cues when distinguishing speech from non-speech sounds. We are currently collecting these RAMM ERP data from typically developing infants and toddlers at high versus low risk of developing ASD.

9. Elena Serena Piccardi, Marco Lunghi and Francesca Simion
Visuo-spatial orienting triggered by biological motion walking direction: ERP evidence from 6-month-old infants

The ability to detect social signals represents a first step to enter our social world. Behavioral evidence has demonstrated that early in life sensitivity to biological motion emerges (Simion et al., 2008), which later in infancy would enable more efficient orienting responses towards stimuli cued by the direction of motion than towards uncued stimuli (Bardi et al., 2015). Yet, from a developmental perspective, the functional meaning and neural underpinnings of this priming effect remain to be understood.

Our study aimed at addressing these issues by using a spatial cueing paradigm while recording EEG from 6-month-olds. Infants were presented with a point-light walker displayed at the center of a monitor, randomly facing to the left or to the right. This spatially-non-predictive cue was followed by a single peripheral target randomly appearing at a position congruent (valid trials) or incongruent (invalid trials) with the cue walking direction. We examined ERP responses to targets in valid and invalid trials and coded saccades by using an offline frame-by-frame coding procedure.

First, saccadic localization latency was affected by cue direction, as infants shifted their gaze faster toward targets appearing at congruently cued locations as compared

to incongruent positions. This priming effect replicated previous findings with a similar paradigm in an eye-tracker study (Bardi et al., 2015). Secondly, the priming effect was coupled with an enhanced P100 ERP component to targets in valid trials. This P100 validity effect might be explained by hypothesizing that the point-light walker would trigger covert orienting towards walking direction, yielding a gain control or selective amplification of sensory information in the visual pathways and a facilitation of oculomotor responses to stimuli appearing at attended locations.

Overall, results suggest that biological motion walking direction acts as a cue to orient visual-spatial attention in infancy, enabling sensory facilitation in processing potentially relevant information.

10. Reyhan Furman, Paula Marentette and Elena Nicoladis
Individual Differences in Children's Iconic Gesture Use: The role of cognitive abilities and personality

Considerable variation exists in how frequently people gesture as they speak. This variation has been mainly attributed to speakers' verbal and spatial skills. However, the nature of the relation remains unclear. For instance, individuals with poor visual and spatial working memory use more gestures[1]. In contrast, high spatial skills and low verbal skills have also been found to lead to more gesture use[2]. Finally, verbal, but not visuospatial skills have been found to negatively influence gesture frequency[3]. In addition to cognitive skills, personality traits- specifically extraversion and neuroticism- positively influence gesture production[4].

Speech and gestures develop in close relation throughout childhood[5,6,7,8]. Previous studies focused on the type of gestures that children use, and how these gestures relate to children's language or cognitive development. To date, no study has investigated why some typically developing children gesture more than others.

This study examines individual differences in children's frequency of iconic gesture use to determine whether they are related to differences in verbal skills, spatial abilities, personality traits, and memory abilities. To date, nineteen children aged 4 to 6 (mean age= 5;3) participated. Four tasks were used to elicit gestures. We measured children's verbal skills, spatial skills, memory, and personality traits using standardised tests.
Preliminary results show that higher frequency of iconic gesture use was related to higher verbal working memory, and poorer visuospatial short-term memory. In addition, gender also influenced gesture frequency such that being a girl was associated with an increase in iconic gesture use.

This is the first study to show that cognitive abilities play an important role in iconic gesture use during development. Our results extend previous findings on individual differences in adults' gesture production, and indicate that verbal and visuospatial memory abilities determine how frequently individuals use iconic gestures even at the age of 5.

11. Laura Boundy, Anna Theakston and Thea Cameron-Faulkner
Intention or attention before pointing: Do infants early hold out gestures reflect evidence of a declarative motive?

Gestures are the first signs of conventional communication within infants and can reflect various motives. Gestures with a proto-declarative motive display an understanding that others can share attention in an external referent. This is a uniquely human trait and has been linked to later language development (Cochet & Vauclair, 2010). It is still unclear when this proto-declarative motive develops within infant gestures. Previous research on early pointing suggests that declarative pointing develops around 12 months, however this may not reflect the earliest onset of this skill. Precursory gestures, such as showing a toy, may also reflect a declarative motive. The current study investigated the motives behind these earlier gestures, to establish whether from 10 months infants use 'hold out' gestures declaratively. Infants were placed in an experimental setting aimed at eliciting a 'hold out' gesture in a declarative context; the experimenter reacted to infant gestures in different ways, and the infants' responses were recorded. Results of a pilot study with 12-month-olds suggest that when the experimenter engaged in Joint Attention (i.e. shared interest and alternated gaze between the infant and the toy), infants displayed more hold outs across trials and higher levels of satisfaction. When the experimenter engaged just with the toy or infant alone, infants gestured less across trials and repeated their gestures more within trials. Furthermore, in the conditions where the experimenter did not display joint attention, there was an increased number of behaviours, including vocalisations, waving and throwing the toy, which appeared to be attempts to establish joint attention. Overall, these preliminary results suggest that gestures that emerge prior to pointing are socially motivated and used to share attention and interest with others. Here, we will compare these findings with those from findings with younger infants to cast light on the developmental trajectory of these behaviours.

12. Katharina Ledergerber, Laura Maffongelli and Moritz M. Daum
Differential impacts of action language on action prediction in infants and toddlers

Understanding other people's actions is a crucial skill for interaction in the social world. To infer action goals, humans can make use of cues from various domains, such

as first-hand action experience, observational experience with actions, or auditory cues like action-associated sounds or language. Research has demonstrated that these domains are interrelated, especially when perception and action were assessed via the suppression of the mu-rhythm. This project aims at investigating the neural interrelation between action and language, since there is very only little research in infants in this particular field. Two recent studies indicated an association between early action prediction and later language abilities on a neural level (Kaduk et al., in press) as well as an influence of action verbs on action prediction, measured through predictive gaze-shifts that is related to the infants' language skills (Gampe & Daum, 2014). Since predictive gaze-shifts are causally linked to the motor system, one would expect to find an impact of language on the sensorimotor activity during the processing of observed actions, reflected by the power of the mu-rhythm. This assumption will be tested in the proposed project. We will conduct an EEG study applying a combined time-frequency and event-related potential approach. Children between 12 and 24 months of age will be presented with spoken action verbs, after which a video depicting the labeled action will be shown. We will choose the action verbs with respect to familiarity and congruency to the action. Results are expected to show an impact of familiarity and congruency on the mu-rhythm and N400 response to subsequently observed actions. This impact is assumed to depend on the infants' age and thus language status. The proposed study will provide us with a deeper understanding of the development of the interaction between language and action and its neurophysiological underpinnings.

13. Gemma Taylor, Padraic Monaghan and Gert Westermann
Children's verb learning from touchscreen apps

Children live in a digital age, with around 80% of 2-4-year-olds having used a mobile device (Radesky, Schumacher & Zuckerman, 2015). However, while apps have considerable potential as a learning platform, such educational claims have not been tested experimentally (Hirsh-Pasek et al., 2015). Educational apps claim to teach children number, words and many other skills. In the present experiment, we investigate whether children can learn verbs from touchscreen apps. Typically, children produce verbs much later than nouns (Childers & Tomasello, 2002; Imai et al., 2008), potentially due to the transience of motion information (Monaghan et al., 2015). 3-4 year-old children are randomly assigned to an app or live condition. In both conditions, three novel actions are demonstrated. Each action is demonstrated in turn with four different objects and labelled with a novel label four times. In the app, four different pictures of the actions and one video are used for the action demonstration. Children's verb learning is tested using a three-choice pointing task and children are asked to reproduce each action with a novel object in an imitation test. Children's

performance on the pointing task will be compared to chance (.33) and children's performance on the imitation test will be compared to the spontaneous performance of a baseline group of children who did not see the action demonstrations either live or on the app. Approximately 12 children will be tested in each condition; at present we have a sample size of 11 participants so preliminary analyses are not possible at this stage. However, the results of this research will contribute to our understanding about the potential for touchscreen apps to aid children's vocabulary acquisition, and about whether children can learn from apps more generally.

14. Liam Blything and Kate Cain
Children's processing and comprehension of complex sentences containing temporal connectives: The influence of memory on the time course of accurate responses.

In a touch screen comprehension paradigm, we recorded 3- to 7-year-olds' (N = 108) accuracy and response times to two-clause sentences containing 'before' and 'after'. We manipulated whether the presentation order matched the chronological order of events: 'He finished his homework, before he played in the garden' (chronological order) vs 'Before he played in the garden, he finished his homework' (reverse order). The sentences were narrated to the children whilst they viewed animations of the actions in each clause. After each sentence, they were asked to select the event that happened last to assess their understanding of the temporal order.

Children were influenced by order: performance was most accurate when the presentation order of the two clauses matched the chronological order of events. Differences in response times for correct responses varied by sentence type: accurate responses were made more speedily for sentences that are associated with lower memory demands. An independent measure of memory predicted this pattern of performance.

These findings will be discussed in relation to knowledge of connective meaning and the processing requirements of sentences containing temporal connectives.

15. Tatiana Yudina
The role of experience in the early development of prosocial responses.

The existing data on empathy development during infancy and toddlerhood do not explain the motivational value of empathy for prosocial behavior at this age [Hoffman, 2000; Eisenberg, Strayer, 1987; Knafo et al, 2008; Dunfield, 2014]. The focus of this research is to understand the nature of the triggers inside the linkage between empathy and prosocial development in infancy and toddlerhood. I propose that the

structure of the sympathetic reaction accommodates factors related to emotional experience and social competence serving together as triggering elements of pro-social responses. In order to test these hypotheses, I aim to investigate the role of the behavioral skills to act in the benefit of another and of the own experience with feeling distress in certain situations as factors underlying the sympathetic behavior in infants and toddlers. I suggest cross-sectional investigations into the role of emotional and behavioral experience in empathy and prosocial development. This study will also investigate the developmental changes in prosocial responses from infancy to toddlerhood. Recently the design has been worked out, and the study has been piloted. Now I am in process of collecting data in the first section of 30-36 months' subjects. This is two-factor between-subject experiment with four groups of subjects each including individual variation of factors. The design includes interaction involving the independent factors and the part of interaction that measures the dependent variable-child's prosocial acts of comforting. I have no final statistical evidence now since there are only 24 participants. Despite this, initial data show the strong trend that endorses my model. Most of children display comforting in cases of both of factors presence. I plan to have the full empirical confirmation to August in order to present it in the full volume and to have a discussion.

16. Iain Jackson, Anna Theakston, Eugenio Parise and Vincent Reid
Agents, patients, and actions: What is encoded in 12-month-olds' perceptions of dynamic events?

Perception of causal events requires infants to identify individual objects and participants, to encode relations between them, and to use these relations to form inferences about causality. By the end of their first year infants are able to process simple events using these steps, and have also been found to process more sophisticated event components, such as goals and intentions, path and manner of movement, and the animacy of the event participants (Gergely, Nadasdy, Csibra, & Biro, 1995; Pulverman, Song, Hirsh-Pasek, Pruden, & Golinkoff, 2013; Rakison, 2005). For many of these more advanced event components, however, infants' processing seems initially restricted to specific elements of particular events, so that, for example, a particular act is only associated with a specific agent (Cohen & Oakes, 1993).

For infants to establish mappings between non-linguistic event components and linguistic categories they must learn to generalise from specific features of particular events to meaningful, abstract, conceptual categories independent of those events. Two such categories, semantic roles (e.g. agent and patient) and types of action, are to be investigated in the current series of eye tracking experiments. Twelve-month-old infants will be habituated to animations of two-participant causal events. At test, novel animations presented to infants will be systematically varied to assess infants'

sensitivity to 1) changes of action in the events, 2) changes to the semantic roles of event participants, and 3) changes in the animacy of the participants. We will present results of looking behaviour at test which will reveal if and how previously learned event information is generalised to novel events, and thus provide insight as to whether abstract categories of agents, patients, and/or action type are part of infants' event processing at the end of the first year. Implications for event perception and language learning will be discussed.

17. Ayumi Sato, Tomomi Sato, Cahrlie Lewis, Yumiko Ishikawa, Yu Saito, Shoji Itakura and Etsuo Horikawa
The message is in the medium: Electronic vs. paper picture-books influence joint attention in mother-infant interaction

Background: Some studies indicate that joint attention episodes occur more often during shared book reading than in other play situations (Sato & Uchiyama, 2012; Sugai et al., 2010; Yont et al., 2003). Recently tablet devices, like iPads, have been in widespread use and many children use electronic picture-books from early childhood. However, it is simply assumed that shared e-book reading promotes the same kinds of interaction and joint attention as printed picture-book reading. The goal of this study is to clarify these effects by examining the frequency of joint attention episodes in printed and electronic picture-book reading contexts. Methods: Participants were 10 pairs of 12-month-old infants and their mothers. We conducted printed picture-book reading, electronic picture-book reading with narration sounds, and electronic one with no sound context (respectively 3 minutes), using the same story in each medium – a book entitled 'Mari'. The videotaped mother-infant interactions were coded according to the coding system concerning the infants' responding to joint attention requests form the mother (RJA) and initiating joint attention (IJA), developed by Osorio et al. (2011). Results: A series of ANOVAs suggest that [1] the duration of mother's looking at the child was lower in the electronic picture-book with narration/sound than in printed book context; [2] the proportion of maternal looking at the child and alternate gazing preceded RJA more than did parallel attention; [3] a clear trend in our analyses to date show that infant-mother RJA (reciprocal gazing) occurred less in the electronic book with sound than when mother and infant were sharing a paper book. Conclusions: These results show that electronic picture-books with narration/sound may reduce the frequency of the child's RJA. We discuss the implications of the increase in technology for infants and the possible effects on e-books with sounds on joint attention development in infancy.

18. Alison Rees, Sylvain Sirois and Alison Wearden
Maternal prenatal DHA intake and infant performance on a free-play attention task at

22 months

We present the results of a study examining maternal prenatal docosahexaenoic acid (DHA) intake, during the second and third trimesters, and an infant free-play attention task at 22 months. DHA is a long-chain polyunsaturated fatty acid member of the Omega-3 family and higher prenatal maternal intake has been previously linked to improved infant cognitive development. No study as yet has determined whether this is specifically related to intake in a particular trimester period. Fifty-seven infants completed the free-play attention task (a portion of a larger sample of 125 women and children who participated in this ongoing longitudinal study). Maternal DHA intake estimates were gained using a comprehensive Food Frequency Questionnaire (FFQ) and were divided into high or low groups for analysis. One-way ANOVA's revealed a number of significant differences in task performance, between the high and low groups, in relation to third trimester DHA intake. There were no significant findings for second trimester intake. The results initially appear to indicate better performance for the low DHA group with this group showing longer task duration ($p = 0.01$); greater number of attention events ($p = 0.01$); and greater attention duration ($p = 0.04$) throughout the task. As we would have expected better performance in the high DHA group we discuss the appropriateness of the outcome measures in this task and the interpretation of which attentional patterns are taken to indicate 'better performance'. It may be that children with lower interest are, in fact, better information processors. Or that perhaps the task becomes quickly boring, and those children with a heightened sense of exploring the environment score lower than more placid children. While an open question at this stage, we nevertheless observe a significant link between DHA intake in the third trimester of pregnancy and cognitive outcome late in the second year.

19. Wiebke Pätzold, Sriranjani Karthik and Ulf Liszkowski
Neurophysiological measures of object representations following occlusion and communication

Previous research has established the role of gamma synchronization as a measure of object representation after occlusion, also specifically to occluded objects instead of faces and to the agent's beliefs about occluded objects. However, less is known about infants' direct online processing of object representations following referential communication. The aims of the present study are twofold: to replicate the established signature of object representation in our sample of 12-month-old infants and to test whether similar results would also be evident when processing a communicative pointing gesture towards an occluded object. If this was the case, it would strongly support the notion that babies expect an object when they follow a

point.

A life-action video sequence depicting object occlusion and disappearance are presented to 12-month-old- infants. After the event, the actor points at the occluder. At present, we have completed the EEG recording from about 50 infants and after attrition, expect that at least half the number of data sets comprise our final sample. Due to the procedural difficulties with the analysis of infant EEG data, it has been challenging at this point to state the precise location of gamma activation for the experimental conditions of interest. However, our expectation is that the referential communication towards the occluder also elicits gamma synchronization in the right temporal areas as reported in the earlier studies. We also expect these event-related activations to be significantly greater than the baseline.

Data reduction and analyses of the pointing phase of the study are ongoing. If we are able to replicate the Kaufman 2005 effect in this novel paradigm, it would provide converging evidence for neurophysiological markers of object representations. In addition, if the current data elicit comparable results from the referential communication, it would add a new dimension to infant object representation.

20. Emma Ward, Jan Buitelaar, Ricarda Braukmann and Sabine Hunnius
Perception and expectations in young children at-risk for Autism Spectrum Disorder (ASD)

This PhD project is part of a longitudinal study to identify early markers of ASD, which so far cannot be reliably diagnosed before 3 years of age. Participants are infants who have an older sibling with ASD. Around 20% of these infants will develop ASD themselves, compared to around 1% of the general population.

The Predictive Processing account of ASD posits that people with ASD rely less on expectations and previous experience than people without ASD when it comes to interpreting new sensory information. The current project will test how children adjust these expectations.

Study 1: EEG and eye-tracking task Two-year-olds view faces looking in different directions, and then faces looking in one extreme direction. This should help them build an expectation of where people tend to look. They then see people looking in different directions again. At-risk infants are expected to habituate to the faces more slowly (more gradual attenuation of N290 and P400) and to differentiate less between the direction they are used to seeing and the direction they have had less exposure to (smaller ERP-amplitude differences between conditions) than typical infants.

Study 2: Touch screen task Three-year-olds will play a categorisation game. Stimuli belong to different categories which are manipulated regarding their similarity to each other and their standard deviations, as well as their frequency of presentation. These are parameters for optimal categorisation as defined in Signal Detection Theory. At-risk children's responses are expected to be less affected by the frequency of presentation of the different categories than typical children's. That is, they should be less influenced by previous experience.

If fundamental expectation-building and -adjusting are impaired, as Predictive Processing claims, we should see this difference at an early age, which would lead to better understanding of the causes of ASD, and possibly earlier diagnosis.

21. Zoe Flack and Jessica Horst
Two Sides to Every Story: Children Learn Words Better From Single Page Displays

Picturebooks provide richer sources of vocabulary than conversations alone (Montag et al., 2015), thus facilitating young children's word learning (Senechal, 1997). Although young children learn better from realistic images than line drawings (Ganea et al., 2008), research on word learning from storybooks has neglected to examine the influence of number of illustrations. In the current study we tested whether displaying two storybook pages simultaneously or just a single storybook page affects word learning. We read the same stories to three groups of 3-year-old children (N=36). In the one illustration condition children saw a single illustration (i.e., other page was blank) and in the two illustrations condition children saw two pages simultaneously (i.e., one left, one right). Children in the control group were read stories printed in A3 format so they saw a single illustration but had the same surface area to scan as in the two illustrations condition. All children heard three different stories, providing a total of 12 exposures to two different novel objects and their names. Word learning was assessed using a 4-alternative forced-choice test (cf. PPVT). All children learned words from the stories. The ANOVA yielded a main effect of condition $F_{(2, 33)} = 4.10$, $p = .03$, $\eta^2 = 0.20$ (see Figure 1), specifically, children in both the one illustration and control group learned words to the same degree ($p = ns$) and more than in the two illustrations condition ($p < .01$). We argue that pre-reading children likely struggle to determine when the text has moved on to the next illustration. Previous research demonstrates that learning words from three different stories is difficult for young children (e.g., Williams & Horst, 2014), however, the current data indicate that simply reducing the number of illustrations enables learning in this already challenging situation. An additional intervention is suggested.

22. Youn Mi Cathy Lee and Hyun-Joo Song

Influence of Foreign Language Experience on Early Language Development

Recent study shows that experience in bilingual environments influences infants' expectations about the nature of word meanings; monolingual infants expect word meanings to be shared across different speakers who use the same language, but bilingual infants do not have such expectation (Henderson & Scott, 2015; Scott & Henderson, 2013). The current study examined whether regular exposure to a foreign language has the same effect as bilingual experiences on infants'understanding of conventional properties of language. Korean-speaking infants (mean age = 13.26 months) were tested in the violation-of-expectation paradigm. Some of the infants had very little or no exposure to English (monolingual) but the others were regularly exposed to English mainly via audio or video (exposed group). To start, the infants watched two experimenters alternately singing nursery rhymes in Korean, observing that the experimenters spoke the same language. Then the infants were familiarized to a scene in which the first experimenter provided a novel label for one of the two novel objects. During test trials, the second experimenter used the same label to refer to the same (same-object event) or different object (different-object event). Monolingual Korean infants looked significantly longer at the different-object event than at the same-object event, suggesting that they expected the same language speakers to share object labels. On the other hand, the infants with regular exposure to English looked about equally as long at the two test events, showing that the exposed group did not assume the object labels to be shared across different individuals who used the same language. Note that the results from the exposed group resemble the previous findings from bilingual infants (Henderson & Scott, 2015). The results suggest that experiences with foreign languages can influence early language development and such experiences do not necessarily have to be of immersive and bilingual.

23. Diana Su Yun Tham, Gavin Bremner, Dennis Hay and Pei Jun Woo
Females come first in the development of the other-race effect in infants.

Recent studies have showed that the other-race effect (ORE) in infancy emerges first for female own-race faces (e.g., Hayden et al., 2007; Sangrigoli & de Schonen, 2004) and later for both female and male own-race faces (Tham et al., 2015). This may be related to infants' predominant experience with gender and race of their primary caregiver (Quinn et al., 2002; 2008).

To understand the effects of exposure and how faces may be represented in infants' memory, it is important to include studies on individuals with multi-racial experiences. The current research aims to extend Tham et al's (2015) study by testing 4-month-old

(4m) and 9-month-old (9m) infants from a multi-racial population - the Malaysian population. The key group selected is the Chinese ethnic group. Specifically, we targeted these individuals that were born and raised in the capital of Malaysia, Kuala Lumpur (population breakdown: 45.2% Malays, 42.3% Chinese, and 11% Indians). Using a visual paired comparison paradigm (VPC), we assessed Malaysian-Chinese (n = 50) infants' ability to discriminate faces from three racial groups (Chinese, White, and Malay) of both face gender (female and male). According to the primary caregiver hypothesis, we expect 4m infants to show an ORE discriminating Chinese female faces and 9m infants to discriminate Chinese and Malay faces regardless of face gender.

As predicted, 4m infants demonstrated recognition only for female own-race faces, t (8) = 2.93, p = .019. In contrast, 9m infants demonstrated a recognition advantage for female Chinese and female Malay faces, t (8) ≥ 2.78, p ≤ .024. The pattern of performance in this study suggests that the perceptual system can be modified according to increased familiarity and that it is vital to take into account the role of face gender when investigating on face perception within the first year of life.

24. Miriam Beisert and Moritz Daum
Learning different kinds of tool use actions in early childhood

Already at the end of their first year of life, children start to use tools. Tools are objects which transform a user's operating movement into the desired outcome (effect) at the tool's effective end. The development of tool use seems to arise gradually from existing manual behaviour, for instance hammering from hand banging. Consequently, tool use in young children is mainly investigated with tools like a hammer or a crook for which the transformation is rather simple: The effect at the tool's tip obviously mirrors the operating movement at the tool's handle. However, in everyday tool use, humans are confronted with various and more or less complex kinds of transformations. For instance, these can be compatible (effect same as operating movement) or incompatible (effect inverse to operating movement), transparent, causally opaque and finally even virtual. Research has revealed that at least in adults, the kind of transformation substantially influences the speed and accuracy of movement selection and furthermore activates different strategies. So far, not much is known about how young children deal with different kinds of transformations. The presented project aims to fill this gap by investigating how young children learn to use tools which entail compatible or incompatible transparent, opaque and virtual transformations between operating movements and resulting effects. We developed a lever paradigm allowing to implement the different transformations, remaining equal in all other aspects (e.g., complexity of the operating movement). Results illustrate that 28-months-olds deal with all these kinds of

transformations, but that there are remarkable differences in the process of learning and in the facility of transfer. Results are discussed with respect to the ascending complexity of transformation from simple manual behaviour to technically sophisticated tool use.

25. Tomoko Tatsumi, Julian Pine and Ben Ambridge
The effect of input frequency on children's production of morphologically complex verb forms in Japanese

Differences in children's proficiency with different inflectional forms are often explained in terms of differences in their relative input frequency (see Ellis, 2002 and Ambridge, Rowland, Theakston & Kidd, 2015, for reviews). However, input frequency is often confounded with other factors, such as morphological complexity (high-frequency forms tend also to be simple forms). The aim of this study was to disentangle the effects of input frequency and morphological complexity by focusing on Japanese: a language with both simple and complex past-tense verb forms. 30 children aged 3;5-5;3 participated in a production experiment designed to elicit simple (e.g. tabe-ta 'ate') and complex completive past-tense forms (e.g. tabe-chat-ta 'ended up eating') using a combined priming/sentence-completion paradigm. Half of the verbs were more frequent in simple than completive form in a representative corpus of child-directed speech (MiiPro corpus, Nishisawa & Miyata 2009; 2010), and half displayed the opposite pattern. A mixed effects model revealed a significant positive relationship between the relative frequency of completive versus simple forms in the input and children's production of completive versus simple past tense forms (Beta=2.92,χ2= 5.21, p<0.03). That is, children produced more complex than simple forms for verbs that were more frequent in complex (completive) than simple form in the input, This finding constitutes evidence against accounts under which complex forms are always generated from simple or root forms by the application of a morphological rule or process, and in favour of accounts under which children learn and reproduce forms directly from the input, in a way that is highly sensitive to input frequency.

Session 2: Friday, August 26, 2016

1. Maurits Adam and Birgit Elsner
Cross-domain influences of early word and action learning
For infants, a good strategy to learn about their surrounding world is to communicate with experienced speakers. Successful communication includes the comprehension of spoken language as well as observed actions. When a caregiver shows a new action to

an infant, he or she will not only demonstrate the action for the infant to imitate, but will also use language to describe the action to the child. The infant, in turn, can use this information to learn about the action presented. There is evidence that verbal information presented during action demonstration indeed has an impact on infants' action processing and reproduction of that action. Therefore, information from the different domains might interact in social learning situations. The present research seeks to further enrich our knowledge about this interaction and investigates how different verbal information during action presentation influences subsequent action reproduction. In a video phase we will present 18- and 24-month-old infants with videos of two novel actions, each performed with an unfamiliar object, accompanied by verbal information. This information, depending on the experimental condition, will emphasize either the movement, the object acted upon, both, or none of it. Here, we will track the infants' eye movements to examine how the verbal information influences infants' distribution of attention to the demonstrated actions. In a subsequent imitation phase, infants will act on real-life versions of the objects. We expect that the infants will integrate the verbal information into their cognitive action-representation, and therefore we expect differences in action reproduction between our experimental conditions. Furthermore, we will be able to investigate possible relations between eye movements/attention distribution and imitation behavior. The planned research will therefore shed light on mutual influences in the early development of language and action.

2. Ebru Ger, Nazlı Altinok, Ulf Liszkowski and Aylin Kuntay
What predicts infants' pointing frequency at 12 months?

Pointing is a robust predictor of infants' later language capacities (Colonnesi et al., 2010). Yet the predictors of the development of pointing frequency in the first year of infants' lives are not as well-known. Pointing development might be dependent on infant-driven competencies (Liszkowski & Tomasello, 2011) as well as the shaping of adults (Matthews et al., 2012). In the current study, we examine the fine motor and point following abilities of infants along with caregiver responsiveness in relation to later pointing frequency. 23 mother-infant dyads (12 girls) were examined at infants' 10 and 12 months of age. Infants' points and mothers' responses to these points were assessed via the decorated room paradigm (Liszkowski et al., 2012). The verbal and/or non-verbal responses mothers provided to their infants' points within 2 seconds were used to construe a maternal responsiveness measure. Responses were categorized as "relevant" if they were semantically relevant to the item infant pointed at, "non-relevant" if they were irrelevant, and "none" if the mother did not provide any behavior. Percentages of response categories were calculated by dividing the total number of responses in each category by the total number of infant points. Also,

infants' fine motor development and ability to follow points were assessed via the Mullen Scales of Early Learning (Mullen, 1995) and a point following procedure adapted from Mundy (2003), respectively. Results showed that the frequency of infants' points at 12 months was significantly predicted by the percentage of relevant maternal responsiveness at 10 months, even when controlling for the frequency of infants' points, Mullen scores, and point following scores at 10 months ($F(5,17)$= 3.908, $p <.05$, $R2$= .54). This study demonstrates the prevailing effect of caregiver responsiveness over infants' own fine motor and social-cognitive abilities on the development of pointing within the first year.

3. Christiane Patzwald, Maike Schiller and Birgit Elsner
The influence of speech-action relatedness on 24-month-olds' selective imitation

Meltzoff (1995) showed, using his reenactment procedure, that by 18months, infants can look past an adult's surface behavior by detecting and reproducing in their behavior the adult's underlying intention, even if the corresponding action was never observed by them before. Furthermore, we know that infants selectively imitate intentional over accidental actions (e.g. Carpenter et al., 1998). Based on this, we investigated if infants can process and, in their imitative behavior, rely on an adult's speech, even if that verbally announced action intention does not match the adult's following observable action. Fourty-six 24-month olds observed an adult performing one of two possible actions (e.g., up and down) on an object. Prior to each action demonstration, the adult verbally announced that she wanted to perform an action, using a telic preposition (e.g., 'up'). In a between-subjects design, she then performed either the matching action (e.g., up; congruent condition) or the non-matching action (e.g., down; incongruent condition). In a 30-second response period, infants could then act on the object themselves. This procedure was repeated across 2 more trials with different objects, actions, and prepositions. Our results confirmed our expectations, in that they showed that infants in the congruent condition performed the demonstrated action (DA) more often than infants in the incongruent condition ($p<.01$), while infants in the incongruent condition performed the alternative action (AA; matching the spoken intentions) more often than infants in the congruent condition ($p<.01$). The two conditions only differed in the relatedness between speech and action, so we conclude that infants were able to perceive the discrepancy between the actor's verbal announcement and the performed action. This provides indication for the impact of verbal communication on infants' cognitive action representation.

4. Silvia Rigato, Milla Grigorova, Manuela Stets and Helge Gillmeister
The emergence of face- and body-selective brain signatures in infants

Face processing is a rapidly emerging ability already present at 3 months of age (Halit et al., 2003). This, together with other behavioural evidences (e.g., Johnson et al., 1991), has led researchers to suggest that our ability to recognise faces is the result of an innate 'social brain' with pathways genetically pre-specified for processing social information (e.g., Baron-Cohen et al., 1999). Since bodies are social and communicative tools, they should also be 'special' in their function of informing us of others' intentions and emotions. We presented 3-, 9-, and 14-month-old infants with images of upright and inverted faces and bodies while recording their brain activity. While faces elicited the well-known face-related ERP components (N290 and P400) in each age-group, these were not present for bodies at 3 months of age. However, at this age, the latency of the N290 showed some degree of sensitivity to the face stimuli's orientation, peaking earlier for upright than inverted faces. At 9 and 14 months, the N290 was significantly affected by stimulus orientation, showing larger amplitude for upright than inverted faces and bodies. Stimulus orientation also affected the amplitude of the P400 component; however, this effect was modulated by stimulus and hemisphere at 9 months, showing a right hemisphere specialisation for faces, and a left hemisphere specialisation for bodies. Finally, at 14 months the P400 showed specialisation to face stimuli, peaking earlier for upright than inverted stimuli over the right hemisphere. These findings show that infants' occipital-temporal cortex is sensitive to faces earlier in life than to the rest of the body. These sensitivities appear to emerge in concert with exposure to other people, which is weighted towards faces earlier in infancy, while the rest of the human body is more frequently visible when the infant begins to sit upright more.

5. Maria Crespo Llado and Elena Geangu
Individual differences in the neural correlates of infants' responses towards other baby's cry and laughter

A growing body of evidence has shown that infants by 10-12 weeks already show emotional resonance to adult facial and vocal displays of happiness, sadness and anger (e.g. Haviland et al., 1987). Less is known about infants' responses to their peers' emotions and whether such emotional responses are modulated by temperamental traits. To date, few studies have shown that during their first hours of life, newborns express reactions of self-distress in response to another newborn cry (e.g. Simner, 1971). Our study aims to address this gap by investigating whether the neural correlates of infants' responses to their peers' cry and laughter are related to their temperamental characteristics. Thirty 8-month old infants were presented with audio recordings of other infants' laughter, cry and coughing. ERPs time-locked to the onset of the sounds were analysed with respect to the effect of emotion (positive/negative/neutral) and hemisphere (right/left). These were further analysed

in relation to the IBQ-R scores. At frontal locations, we found a significant main effect of emotion for the mean amplitude of N1 (50-150 ms; $F_{(2, 58)} = 5.847$; $p = 0.005$), P2 (150-250 ms; $F_{(2, 58)} = 4.481$; $p = 0.016$) and LPC (550-750 ms; $F_{(2, 58)} = 5.179$; $p = 0.009$), such that crying evoked a more negative N1 amplitude than laughter ($p = 0.020$) and a larger LPC amplitude than coughing ($p = 0.045$). On the other hand, laughter evoked larger P2 amplitudes than crying ($p = 0.036$). Infants who scored higher on IBQ-R Emotion Regulation showed lower LPC amplitudes when listening a peer's laughter ($p = 0.004$). Furthermore, infants who scored higher on IBQ-R Fear showed larger P2 amplitudes for crying ($p = 0.003$). Taken together, our results provide evidence for an early negative bias in social-emotional development such that 8 months old infants allocate more attention towards a peer's cry compared to a peer's laughter.

6. Alexandra Marquis and Margaret Moulson

Put on a happy face! Infant's ability to discriminate happy, angry, and sad from fearful facial expressions using a Fast Periodic Visual Stimulation (FPVS) paradigm

The ability to "read" other people's facial expressions plays an important role in social interactions. This ability begins to develop early in life, however it is unclear whether infants are better at discriminating facial expressions that cross a category boundary (positive/negative – e.g., happy/fearful) than expressions from the same category (negative/negative – e.g., angry/fearful).

The current study uses a novel approach called Fast Periodic Visual Stimulation (FPVS) to evaluate this question in 7-month-old infants. FPVS is an electrophysiological technique that relies on rapid presentation of stimuli at a specific frequency. This creates a periodic response in the brain at that particular frequency that can be measured at the scalp surface.

In the current study, infants saw three emotion comparisons: a) Happy vs. Fearful, b) Angry vs. Fearful, and c) Sad vs. Fearful. In each pair, the first emotion was presented frequently and the second emotion was presented infrequently. We presented faces at a frequency rate of 6Hz (6 faces/second), while the infrequent fearful expression was presented every fifth face, creating a second "discrimination" frequency of 1.2Hz (6Hz/5 = 1.2 fearful faces/second). If infants are able to discriminate the fearful expression from the frequent expression, they will show a large response at the discrimination frequency. We predict that infants would show a larger discrimination response in the Happy vs. Fearful condition than in the other conditions.

Based on preliminary analyses (n=8), it is clear that infants show a large response at

the base frequency rate (6Hz), regardless of condition (Figure 1). It seems that infants in the Happy vs. Fearful condition show a discrimination response at 1.2Hz, whereas infants in the other conditions do not, however further analyses are required to assess their statistical and practical significance. It appears infants may be better at emotion discrimination that crosses a category boundary.

7. Shirley Cheung and Gert Westermann
Developmental differences in phonemic perception between monolingual and bilingual infants

Infants' ability to perceive native speech sounds improves with age and language exposure. Of growing interest are the differences in native perceptual abilities between monolingual and bilingual infants. Bilingual infants exhibit the remarkable ability to categorically perceive and organize two different sets of phonemes to its corresponding languages by performing successfully in phoneme discrimination tasks. There is robust research on phonemic discrimination in monolingual and bilinguals only of contrasts both native to bilinguals and one native to monolinguals. Findings show that at younger age groups (i.e. 4-6 months), monolinguals and bilinguals are able to distinguish all speech contrasts presented. However, at an older age (i.e. 10-12 months), only bilinguals succeed in the task. The research suggests that bilinguals are less committed to their languages during infancy (e.g. broader perceptual abilities) and their development of responses to speech sounds differ from monolinguals.
My PhD seeks to introduce a non-invasive neuroimaging technique to the field by using functional near-infrared spectroscopy (fNIRS) during phoneme discrimination tasks. Much work has been done using this technology to understand hemispheric lateralization of speech. I plan to test English monolingual and English-Mandarin bilingual infants on three speech contrasts: English, Mandarin, and Hindi. Testing a third contrast non-native to both groups would advance our understanding of the development of phonemic perception between monolinguals and bilinguals and potentially reveal a prolonged neural commitment or neuroplasticity in bilingual infants. In addition, using fNIRS would allow me to examine how each language contrast will be processed in the brain. For example, the left hemisphere processes linguistic stimuli whereas the right hemisphere processes slower, spectral changes such as pitch and prosody. My hypothesis is that English monolinguals will process Mandarin tone contrasts on the right hemisphere, and English-Mandarin bilinguals will process the identical Mandarin contrasts on the left hemisphere.

8. Kirsty Dunn, Vincent Reid, Young Robert, Johnson Amu and Nadja Reissland
The Prenatal Concept of number: Further Evidence of Visual Processing of Information before Birth.

Like many other cognitive capacities, the study of the development of numerical understanding stops at neonatal research, due to the practicalities of delivering visual stimuli and measuring response in a prenatal population. For the first time, Reid et al. (May, 2016) presented shapes of light to the late-term fetus finding a prenatal preference to shapes that were of a top-heavy than a bottom-heavy configuration. This illustrated the validity of delivering visual stimuli via light to the late term human fetus. The present study aimed to investigate the processing of visual representations of number earlier in development than previously reported, before birth. Behavioural responses to stimuli were assessed in 63 participants, utilising 4d ultrasound. Participants were excluded due to technical or experimenter error (2), poor image resolution (12), or if fetuses appeared to be in a behavioural state 1F (15) represented by a lack of eye or body movements through the scanning period (Nijhuis et al., 1982). This gave a final sample of 34. Light presenting 2 or 3 dots (order counterbalanced) was positioned on the maternal abdomen for 45 seconds to the side of the fetus. Fetuses spent more time looking towards than away from the 2-dot set only, $z = 2.293$, $p = 0.022$. No significant difference was found in looking to versus away from 3 dots. This indicates a possible difference in processing of the two number sets. To our knowledge, this if the first study to investigate visual discrimination of number in a prenatal sample and provides the basis for a more thorough examination. This provides further evidence for prenatal behavioural response to visually-presented information. Additionally, this provides further evidence of the potential to address questions of prenatal visual discrimination by utilising techniques more closely resembling postnatal methodology than is currently the case in the prenatal field.

9. Hanna Schleihauf, Sabina Pauen and Stefanie Hoehl
Does group membership affect overimitation in preschoolers?

The current studies investigated whether children's affiliation with a social group enhances overimitation of actions modeled by in-group members. Experimental conditions differ in how social group membership was emphasized. The child and two experimenters drew t-shirts out of a box before the overimitation-task started. In the shirts-condition the experimenters explained that there are blue and red shirts that couldn't be exchanged once drawn. In this condition experimenters accepted the result neutrally and made no further comments regarding group formations. In the teams-condition both experimenters expressed joy about the drawn color and the experimenter forming a group with the child engaged the child into celebration. Following, in both experimental conditions (each n=28) children observed both experimenters retrieve a reward from a transparent puzzle-box: First, the in-group-experimenter using non-functional, second, the out-group-experimenter using only functional actions. After each demonstration, children removed a reward. The number

of non-functional actions provided a measure of overimitation. In a baseline-condition (n=16) children operated the puzzle-box without prior demonstration. In the shirt-condition we found the same pattern as in Hoehl et al. (2014) without manipulation of group membership. After the inefficient demonstration (in-group-experimenter) children performed significantly more non-functional actions as children in the baseline-condition (t(42)=-5.01, p=.000) and reduced their overimitation after the efficient demonstration (out-group-experimenter) to baseline-level (t(41.86)=-1.6, p=.118).

In teams-condition children overimitated after the inefficient demonstration (t(42)=-6.14, p=.000) and continued doing so after having observed the efficient strategy demonstrated (t(41.99)=-3.79, p=.000).

Results show that the perseverance of overimitation (despite clear evidence of the irrelevance of certain actions) depends on whether child and model belong to the same group. Importantly, t-shirt color alone was not sufficient to elicit this effect. Only when the in-group model affectively emphasized team-membership did children pertain irrelevant actions above baseline level even after having seen the effective strategy by an out-group model.

10. Louah Sirri, Vincent Reid and Eugenio Parise
The evocative power of words for 9-month-old infants

There is increased evidence that infants exhibit a preference for words over other linguistic stimuli, suggesting that words have a privileged status from early stages of language acquisition. Yet, it remains unclear whether verbal (words) and non-verbal cues (associated sounds) activate conceptual representations in a similar manner. 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 pre-verbal infants. Nine-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. Preliminary 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 the associated sound condition, infants looked longer at the target object when it was preceded by a word. These findings suggest that conceptual representations are activated more quickly and efficiently by verbal labels as opposed to non-verbal cues, emphasizing the special status of words as referential cues during the early stages of language

acquisition.

11. Alice Skelton, Jenny Bosten and Anna Franklin
Comparison between infant and adult colour discrimination using an automated eye-tracking method.

From birth, infants are able to discriminate between chromatic and achromatic stimuli (Adams & Courage, 1998). Colour vision develops greatly over the initial post-natal months (Brown and Lindsey, 2013), resulting in the presence of adult-like chromatic mechanisms by 4 months of age. Initially, infants require larger colour differences than adults for discrimination, and the ability to discriminate colours continues to develop through childhood and adolescence (Knoblauch, Vital-Durand, & Barbur, 2001). There is evidence that adults' colour discrimination is not equal for different hues, but that some hues (blue and yellow) are discriminated poorly compared to others (e.g. red, green)(e.g Pearce, Crichton, Mackiewicz, Finlayson, & Hurlbert, 2014). It has been suggested that this variable discrimination performance may be the result of calibration to our chromatic environment (Bosten, Beer, & MacLeod 2015). In order to verify this we need to better understand how young infants discriminate colour. Traditionally, adult colour discrimination tasks use methods such as 4 alternative forced-choice, that we are not able to use with infants. In the current study, we used an automated eye-tracking measurement of colour discrimination, a method which is appropriate for both adults and infants (adapted from Jones, Kalwarowsky, Atkinson, Braddick, & Nardini, 2014). This allows us to compare the discrimination abilities of adults and infants across hues, in order to determine the extent that experience of our chromatic environment impacts our perception of colour.

12. Miriam Langeloh, David Buttelmann, Susanne Grassmann, Sabina Pauen and Stefanie Hoehl
Did you expect that? Neural correlates underlying selective imitation in infants

Imitation is an important social learning mechanism for infants exploring the world. Interestingly, infants do not imitate every action. Fourteen-month-olds predominantly imitated an unusual and inefficient action (turning on a lamp with one's forehead) when the model's hands were free compared to when the model's hands were occupied (Gergely et al., 2002). Rational imitation accounts suggest that infants evaluate actions by the rationality principle stating that people achieve goals with the most efficient means. Thus, infants form expectations on others' actions presumably influencing their imitative behavior. We conducted an event-related potential (ERP) study to investigate whether infants experience violation of expectation (VOE) while observing the head touch in a hands-free condition and whether this VOE changes

depending on situational constraints in a hands-restrained condition. In a between-subjects design, 12- to 14-month-olds watched videos of models either demonstrating that their hands were free (N=22, 11 girls) or restrained (N=15, data collection is ongoing). Subsequent test frames showed hand or head touch outcomes. We assume that infants hold expectations on how a person normally touches an object leading to VOE in response to the unusual head touch in the hands-free condition. The opposite result pattern is expected in the hands-restrained condition. Preliminary analyses revealed an increased Negative central (Nc) amplitude (400-600ms) in the hands-free condition on central channels (C3,Cz,C4) in response to the head touch (M=-20.57μV, SD=10.86) compared to the hand touch (M=-16.23μV, SD=10.68), t(21) =-2.470, p =.022, d=0.40. Results indicate that infants discriminated head and hand outcomes with differences in the allocation of attention. The increased Nc for the unexpected action may illustrate an orienting response reflecting mismatch detection. Therefore, our study was a first attempt to examine whether infants' selective imitation in previous studies might have been indeed rational. So far, results are in line with the rational accounts.

13. Stefania V. Vacaru, Johanna E. van Schaik and Sabine Hunnius
Facial mimicry in three-year-old children and its modulation by attachment security

Mimicry is defined as a nonconcious tendency to mirror another's behaviors, postures, facial expressions or speech (Duffy & Chartrand, 2015). While adult research widely acknowledges the social function of mimicry (i.e. as a "social glue"; Lakin, Jefferis, Cheng, & Chartrand, 2003), very little is known about how and when mimicry becomes socially sensitive. Pioneering work by van Schaik and colleagues (2013; in press) investigating a behavioral form of mimicry, shows that 3-year-olds display behavioral mimicry, however are not yet sensitive to social manipulations prompting affiliation. In contrast, 4- to 6-year-olds display socially sensitive behavioral mimicry (van Schaik & Hunnius, in press). Whether mimicry becomes increasingly social during development or whether the social manipulation used was ineffective for 3-year-olds thus remains unclear. To address this issue, the current study aims to investigate the relation between inter-individual differences in the intrinsic drive to seek affiliation and facial mimicry in 3-year-olds. In adults, attachment security moderates both affiliation motivation (Schwartz, Lindley, & Buboltz, 2007) and the expression of mimicry (both behavioral mimicry: Hall, Millings, & Bouças, 2012; and facial mimicry: Sonnby-Borgström & Jönsson, 2004). Accordingly, we will examine whether facial mimicry in 3-year-old children is modulated by attachment security. Subtle facial muscle activation in response to observed happy and sad facial expressions will be measured using electromyography (EMG). Attachment security will be assessed during 3-hour home observations, using the Attachment Q-Sort (Waters & Deane, 1985). This study will

test whether facial mimicry changes as a function of attachment security and will examine whether attachment security modulates automatic or controlled mimicry responses. Our findings will help unravel the development of social mimicry in early childhood as well as shed light on pivotal motivational processes underlying the intrinsic drive for affiliation in young children.

14. Damaris Bartz and Dagmar Bittner
L1-acquisition of finiteness in German ABER-clauses

Recent studies on German L1- and L2-acquisition have shown, that the emergence of finite clause structure is affected by certain particles: Penner et al. (2000), Winkler (2006, 2009) and Dimroth (2009) describe that the particle NICHT 'not' accelerates while the particle AUCH 'too' hampers the realization of finiteness in clauses containing them compared to clauses not containing any particle. We will show that the adversative connective and particle ABER 'but' also effects the emergence of finite clause structure providing further evidence for a stepwise acquistion of finiteness which interacts with other acquisition processes.

Our data come from longitudinal corpora of four children at the age of 2;0-3;5. We analyzed the main-clauses produced in the 12 months after the first documented ABER-production. The criteria for identifying the emergence of finiteness as a functional projection in the children´s grammar were taken from Jordens (2012). We observed that the acquisition of functional finiteness in main-clauses not containing a particle or connective leads to progress in the syntax of ABER-clauses on the one hand while on the other hand clear evidence for functional finiteness in ABER-clauses emerges about 2-6 months later than in clauses not containing any particle or connective. We even observed a delay of 1-2 months in the emergence of finiteness in ABER-clauses compared to AUCH-clauses.

We hypothesize that the delayed application of functional finiteness in ABER-clauses results from the semantic properties of adversative ABER and the information structural requirements in relating the alternative expressed in the ABER-clause to the (linguistic) context. Due to the complexity of this acquisition task which is similar but even higher than for AUCH-clauses, the 2-year-olds avoid the mere structural linguistic requirements for target production of ABER-clauses they have no full command on yet, and rely on syntactic structures acquired earlier on.

15. Alshaimaa Abdel Wahab, Allegra Cattani and Caroline Floccia
Measuring Exposure to English in Bilingual Children between 12- 24 months: a comparison of existing questionnaires

Bilingual children usually know and produce fewer words in each language than monolinguals (Gathercole, 2007; Bialystock, 2009). It is important to estimate the amount of exposure to each language to evaluate the development in these languages (Cattani et al., 2014; Gathercole & Thomas, 2009; Hoff et al., 2012; Pearson et al., 1997; Thordardottir, 2011). Our aim is to compare the various tools developed to quantify the amount of exposure to language and to estimate their relative reliability and user-friendliness. 30 Bilingual families living in England with children aged 12 to 24 months are randomly assigned to three groups. All are first sent the Oxford CDI (Hamilton et al., 2000) to complete. Then, within each group, parents complete the Plymouth Language Exposure Questionnaire 'LEQ' (Cattani et al., 2014), and one of the following three exposure questionnaires:[Alberta Language Exposure Questionnaire (Paradis, 2011); Child Multilingualism Questionnaire (Yang et al., 2006) and Bosch& Galles Language Exposure Questionnaire (Bosch& Sebastian Galles, 1997)]. The order of the presentation of the questionnaires is randomised. Preliminary analyses with 23 children show that the amount of exposure to English as measured by the LEQ (M = 53.5%) correlates significantly with that by other questionnaires (M = 54.5, r = .50, p = .016). A regression analysis with age and the amount of exposure (measured by the LEQ or other questionnaires) as predictors of CDI scores shows that overall all models are significant, with age always contributing significantly, but with the contribution of the amount of exposure building up to significance. In sum, questionnaires seem to measure similar information overall. Data at this point suggest that they all contribute equally to the prediction of vocabulary scores. User-friendliness is consistently rated as higher for the LEQ than the others, which may drive the decision to use one questionnaire or the other.

16. Eleanor Smith, Vincent Reid, Trevor Crawford and Megan Thomas
Understanding Sensory Processing in Early Development.

Schizotypy is a construct used to describe clusters of personality dimensions within the general population that display a predisposition to schizophrenia spectrum disorders (SSD) (Claridge, 1997). Atypical performance in specific event-related components has been shown by individuals with SSD, and also in their first-degree relatives, or those at high-risk of development (offspring of diagnosed individuals) (Carlson and Fish, 2005). Performance in an auditory paired-tone paradigm and facial emotion expression tasks will be examined in 6-month-old infants and their caregiver, who display a significant schizotypy score. The auditory paired-tone paradigm will measure the participant's sensory gating abilities, which display atypical P50 components in those with SSD and their first-degree relatives. It is thought that those with higher schizotypy scores will display similar abnormalities, but to a lesser degree. Individuals with SSD also show atypical abilities in facial emotion expression perception (Li et al., 2010). It is expected

that increased negative-central components will be observed in the infants of caregivers with schizotypy scores. Additionally, we predict that the looking behaviour in the latter half of this visual paradigm for infants of schizotypal caregivers will feature increased looking towards happy faces due to this being more novel, whereas low-risk infants will look longer towards fearful faces as they have little interaction with this expression in everyday life. A 5-minute period of free-play between the caregiver and infant will be observed, and baseline frequencies will be examined. During free-play, interactions take place that focus on the caregivers' ability to read the child's behaviour with reference to the likely internal states governing that specific behaviour. This is known as mind-mindedness (Meins, 1997). The baseline frequencies will be analysed as a function of mind-related comments made by the caregiver, and attachment type of the infant and caregiver, which will be examined using a series of questionnaires.

17. Janet Parsons, Rachael Bedford and Teodora Gliga
Looking but not learning: differences in gaze cue reading, visual attention and learning in 14 month old infants at risk for autism

Research has suggested 13 and 36 month old infants who develop autistic symptoms follow gaze but then look less at cued objects (Bedford et al., 2012) and do not learn word-object associations (Gliga et al., 2012).

The current longitudinal study aimed to replicate and extend findings by investigating gaze cue use, visual attention and word learning in 14 month old infants at risk for autism (n=96), due to having an older sibling with autism, and in low risk controls (n=21).

Each infant viewed videos of a demonstrator turning, looking and labelling one of two different objects. Gaze behaviour was measured with an eye tracker. We measured the proportion of correct first looks, and proportional looking time to the correct and incorrect objects and to the face. Word learning was measured as preferential looking to the correct referent in "looking while listening" trials. Trial difficulty varied with either one or both objects being labelled then tested.

Findings supported the conclusion gaze reading, not simply following, is necessary for learning (Gliga et al., 2012). No group difference was found in the proportion of correct first looks but at-risk infants that developed autistic symptoms looked less at objects in general and more at faces. The whole group of at-risk infants showed no evidence of learning. This demonstrates that 14 month at-risk siblings may not use gaze cues as effectively as infants with no family history of autism. Furthermore,

greater attention found to the demonstrator's moving face suggests competition from (facial) movement may interfere with processing and using gaze to learn information.

18. F Cansu Pala and Charlie Lewis
The difference between the felt and displayed emotions: When do young children understand the necessity of regulating emotions?

The problem with emotion-regulation (ER) as a construct is that it measures very broad functions. Studies tend to pick one or the other of the followings to define and assess ER; comprehension of emotions (emotional understanding-EU), regulation of negative emotionality (e.g. responses to not receiving a prize) and, rarely, regulation of positive emotionality – keeping good news secret. The cognitive underpinnings these skills have been overlooked due to the unclear assessments of ER. In Study 1 (N=117), the relationships between all the emotionality measures mentioned above were observed within the context of other rapidly changing cognitive skills in early childhood, notably social understanding and inhibitory control. Regression analyses showed that children's comprehension of emotions was strongly related to their social understanding, assessed through the false belief paradigm, an ability to regulate positive emotionality and age. Given the centrality of EU in Study 1, the next study (N=62) explored its nature in more detail. It examined whether there is consistency in how the child reacts to scenarios which contrast ones inner feelings with the need to display other emotions: in a new Scale for Understanding the Regulation of Emotion (SURE). Study 2 found that between 3 and 5 years children come to understand the importance of displaying regulated emotion over expressions which match their feelings. EU, (i.e. a grasp of ER) may be a novel way to investigate the link between ER and the development of social understanding and self-regulation.

19. Jessica Massonnié, Pascal Bressoux, Maryse Bianco, Gwénaëlle Joët and Laurent Lima
Predictors of reading comprehension in first grade: results of a longitudinal study.

Reading comprehension is fundamental for professional and personal achievement. It involves: naming speed, phonological awareness, letter knowledge, pseudoword and word reading, syntactic knowledge, vocabulary and oral text comprehension (Bianco et al., 2012; Ouelette & Beers, 2010; Silva & Cain, 2015). However, their respective importance for reading comprehension isn't well understood because: a) many studies are correlational, limiting causal inferences, b) longitudinal or training studies focus on a subset of skills, c) some authors group variables into two pre-established factors, representing "decoding" and "oral language" skills (Hoover & Gough, 1990). This structure has been questioned in exploratory analysis (Kendeou, Savage et al., 2009).

Our longitudinal study, on 556 French pupils, aims at:

1. Identifying, using regression analysis, the main linguistic abilities, measured at the beginning of first grade, causally predicting reading comprehension eight months later

2. Determining, with exploratory factorial analysis, if they represent two, or more types of competencies

We showed that phonological awareness, letter knowledge, alphanumeric naming speed, syntax and oral text comprehension were the main predictors of reading comprehension. Nonalphanumeric naming speed, pseudoword and word reading, vocabulary breadth and depth didn't have an independent effect. Four factors have been extracted: 1° naming speed (alphanumeric and nonalphanumeric), 2° written code skills (pseudoword and word reading), 3° oral code skills (phonological awareness, vocabulary breadth, syntax but also letter knowledge), 4° oral comprehension skills (vocabulary breadth and depth, syntax, oral text comprehension).

Our results show the importance, at the beginning of first grade, of word reading precursors (phonological awareness, letter knowledge and alphanumeric naming speed) in the development of reading comprehension. Syntax, but not vocabulary, had an effect independent from oral text comprehension (confirming Silva & Cain, 2015). The ambiguous status of syntax and vocabulary breadth, related to oral code and comprehension skills, is made explicit (Tunmer & Chapman, 2011).

20. Marina Loucaides, Katherine E Twomey and Gert Westermann
The effect of labelling on infants' object exploration.

Young children learn their first object names by associating the words they hear with items they see. Understanding the processes that help children link words with objects will offer important insight into cognitive development. One significant component of learning word-object associations is the way in which children interact with objects; however this has yet to be studied in detail. For a full understanding of infants' object exploration it is important to investigate where exactly they look during labelling tasks; that is, whether and for how long they look at specific objects' parts during physical interaction or passive observation, and whether their language level affects the learning of names during labelling events.

The current study will use head-mounted eyetrackers that record children's looking to explore how children at 16 and 24-months interact with novel objects. Participants will

be assigned to a physical interaction group, in which they will handle objects, and to a no physical interaction group, with no handling. Within these conditions half the children will be assigned to a labelling group, in which objects will be given novel labels (e.g., Look, a blicket!), and half to a no labelling group, in which objects will be unlabelled. Following this session and a five-minute break the experimenter will test children's retention of label-object mappings by presenting three objects and asking children for each in turn (e.g., Which one's the blicket?). Parents will complete a vocabulary inventory (UK-CDI; Alcock et al., in prep) to examine whether vocabulary interacts with object exploration in label learning.

We hypothesise that different ages will show different visual exploration styles. Vocabulary level and physical interaction with the objects are also anticipated to affect task's label learning. This research will enhance our understanding of early cognition by demonstrating how children's interaction with their environment affects their word learning.

21. Arthur Capelier-Mourguy
Where's my label?! Studying how a missing label and other missing features are perceived

Previous studies have tried to determine whether labels are treated as features or markers, when learning categories. There is some evidence that the label might be treated as a feature among other features in an early stage, the behaviour shifting to be more marker-like in adults. However the role of the label is still debated, its interaction with other features remaining unclear. We plan to run an experiment challenging these questions on pre-lexical infants, pre-schoolers and adults. We will use the set of stimuli introduced in Kovic et al. (2010), namely a 5-4 categorization task with simple drawings of animal-like creatures, the categories being formed with either the more salient (head and tail) or less salient (wings and legs) features being diagnostical (highly predictive of the category). Unlike the many studies using this kind of task, we will treat the label as any other feature, making it vary amongst exemplars of a category instead of being totally diagnostical. We will then study how a missing feature influences subject's behaviour; we are particularly interested in the effect of a missing label compared with other missing features. We will measure this effect in looking times during a test session. With respect to the Label-as-Feature theory, we expect the label to have the same role as other features, probably of high saliency. Thus, a missing label should be as surprising for the subject as a missing head or tail, depending on the exact level of saliency of the label. If however the label is treated as a marker, a missing label should have few or no effect at all on the subject's looking times during the test session. Running this experiment at different ages will allow us to

detect an eventual shift from a treatment of the label to the other during development.

22. Rebecca Frost and Padraic Monaghan
How do high frequency words assist infants' language acquisition ?

A key challenge facing language learners is identifying words and grammatical rules from continuous speech. Past research has suggested that these tasks are helped by infants' ability to extract transitional information from speech and use it to infer word boundaries and linguistic regularities. Critically, studies suggest that infants' statistical language learning may benefit from the presence of high-frequency marker words (Bortfeld et al., 2005) that may act as anchors around which speech segmentation can occur, while also assisting with grammatical categorisation (Monaghan & Christiansen, 2010).

To address these claims, we familiarised 10- and 20-month-old infants (each N = 24) with a continuous stream of speech comprising repetitions of 4 bisyllabic target words, and compared learning to the same language but with high-frequency monosyllabic marker words preceding target words, and distinguishing them into two distributionally-defined categories. We assessed infants' ability to segment the speech by using a head-turn preference task to monitor looking times to words versus part words. We also examined whether infants used the high frequency words to help them form grammatical categories. For this, we measured looking times to short streams of words containing items from the same versus different grammatical categories. For both tests, gaze direction and duration was measured using video-recording and eye-tracking. The results enable a test of whether infants can use high frequency words to segment speech and to learn about the grammatical structure of the language at an early stage of language development.

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23. Sophie Williams, Jane Oakhill and Jessica Horst
The end of the line: children learn more words from storybooks that do not rhyme

Rhymes are highly prevalent in children's language input. For example, over 40% of children's books for under-5s rhyme (The Book Trust, 2014). Recently, Read (2014) demonstrated that preschool children learn monster names better if they are placed at the end of a rhyming stanza than in the beginning or middle. However, because all children heard rhyming stories, it remains unknown whether rhyming storybooks facilitate word learning to a greater degree than non-rhyming storybooks.

In the current study we read preschool children purpose-written illustrated storybooks in either a rhyme or non-rhyme format. Critically, the only difference was the arrangement of the words (in the non-rhyme condition the same words were re-arranged so the lines no longer rhymed). Children were read the same storybook three times and received 12 total exposures to two novel objects and their names. Children were tested on their immediate recall of the name-object associations using a 4-alterantive forced-choice picture-pointing task.

Only children in the non-rhyme condition recalled more words than expected by chance, $t(11) = 5.65$, $p < .001$ d = 1.65. They also recalled more words than children in the rhyme condition, $t(22) = 2.53$, $p < .01$, d = 1.03. In a follow-up study, another group of children were presented with the same storybooks and tested on both immediate recall and retention 7 days later. Children in the non-rhyme condition retained more words than children in the rhyme condition, $t(34) = 2.54$, $p < .02$, d = .85 (see Figure 1). Taken together, these data demonstrate that preschool children learn more words from storybooks that do not rhyme. These findings have both theoretical implications for understanding children's word learning as a function of ease of encoding as well as practical implications for improving the vocabularies of young children via shared storybook reading.

24. Francesco Margoni, Renée Baillargeon and Luca Surian
Infants expect subordinates to comply with an authority's but not a bully's instructions

In the adult morality and evolutionary literatures, a simple form of dominance (a social asymmetry in which a dominant individual prevails over subordinates in competitive situations) is functionally distinguished from a more complex form of dominance often referred to as authority (a social asymmetry in which the power of an authority over subordinates is deemed rightful or legitimate by the parties involved). Here we investigated whether 21-month-olds already distinguish between these two forms of dominance: We asked whether infants would expect subordinates to comply with an instruction given by a leader (authority condition), but not an instruction given by a bully (bully condition). We presented infants with computer-animated events involving geometric characters. In the authority condition, we familiarized infants with three subordinates who bowed to the leader as soon as she arrived and gave her the ball

with which they were playing. During test events, the leader instructed the subordinates to go to bed. Subordinates either complied while the leader watched but disobeyed after she left (disobedience event) or continued to comply after she left (obedience event). In the bully condition, the leader was replaced by a bully who in the familiarization event hit the subordinates and stole their ball. Infants looked reliably longer at the disobedience than at the obedience event in the authority condition, but looked equally at the two events in the bully condition. These results suggest that by 21 months, infants expect subordinates to comply with instructions given by an authority, but not those given by a bully, and as such are already sensitive to the complex dynamics of power and authority.

25. Max Murakami, Jantina Bolhuis, Thorsten Kolling, Monika Knopf and Jochen Triesch
Look and Learn: A Model of Gaze Contingent Learning

How do infants learn to manipulate the world? How do they learn causality? We aim to shed light on these questions by combining infant experiments and computational modeling. We apply a gaze contingency paradigm that enables infants to control their visual environment (Wang et al., 2012). In this experiment, 8-month old infants are looking at a screen with two peripheral red discs. One of the discs has the function of triggering the appearance of an animal picture (presented centrally) if fixated, while the other one is non-functioning. Consecutive fixations on the functioning disc trigger the appearance of new pictures. Results indicate that the infants develop a gaze preference for the functioning over the non-functioning disc (functioning bias). In order to study the learning processes during the experiment, we adapt and extend a computational model of the basal ganglia, a brain region implicated in action selection and discovery. The original model was developed as an embodied model of action discovery and was able to reproduce contingency learning effects in an ethological experiment (Bolado-Gomez and Gurney, 2013). It captures learning as adaptations in cortico-striatal projections, which give rise to behavioral action preferences. This learning is modulated by a sensory prediction system comprising novelty salience and prediction errors as embodied by phasic dopamine. Our model reproduces the functioning bias effect that we find in the experimental data, which allows us to estimate learning progress of different individuals based on their gaze behavior. We conclude that our model captures the essence of learning during gaze-contingent experiments and may thereby help to bridge the gap between neuronal processes and human behavior.

26. Hannah Wilson, Gavin Bremner and Peter Walker
The Brightness-Weight Correspondence in Infants

Adults have been shown to appreciate the correspondence between brightness and weight, wherein brighter stimuli are associated with lighter weight and darker stimuli are associated with heavier weight (Walker, Francis & Walker, 2010). To date, no research has examined the presence of this correspondence in infants. Research has shown that pitch-sharpness and pitch-vertical placement correspondences are appreciated by infants as young as 3-4-months (Walker et al, 2010). Therefore we expect the brightness-weight correspondence may be observable in young infants. To test correspondences between sound and visual stimuli, looking-time measures have been successfully employed. Infants are shown displays which are cross-modally congruent and incongruent. It is assumed that if infants appreciate the correspondence they will look longer towards the incongruent display as it is surprising. To examine the brightness-weight correspondence however, this method would assume that infants understand complex weight principles. As a novel alternative, we have chosen to use motion-capture to examine infants' appreciation of the brightness-weight correspondence. Through a series of studies, infants will be presented with real objects, which vary with regards to brightness. We will examine whether infants approach these objects differently because of their anticipated weight. It has been shown that infants as young as 9-months use differentiated, manipulative force for objects they expect to differ in weight (Mash, 2007). Motion-capture equipment will be used to take various measures as the infants reach for, grasp, and transport objects. We anticipate that speed, acceleration, trajectory and distance travelled by the wrist may differ for darker and brighter objects. We also expect that the overall grip-force will vary depending on anticipated weight. Examining appreciation of the brightness-weight correspondence at various points throughout infancy helps us to reveal more about whether the correspondence is innate or learnt through experience with language and the environment.