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INTRODUCTION

This is the programme booklet of what would have been LCICD 2020, the 5th Lancaster International Conference on Infant and Early Child Development. Unfortunately due to the COVID-19 crisis, the organizing committee made the very difficult decision to cancel LCICD 2020.

LCICD has established itself during the past four years as one of the major international conferences on infant and early child (up to 4 years) development, and we have regularly had around 100 attendees from over 15 countries. We have always striven particularly to support early career researchers, organising the conference as single-track so that people can meet each other properly, with poster sessions that have no parallel talk sessions, a 'no results' poster category in which early career researchers can present their ideas in a friendly environment for discussion and feedback with more senior colleagues, and good food. The APA tells us that one can put contributions to cancelled conferences in one's CV, which is good and fair particularly for early career researchers such as PhD students who don't have the chance to attend many conferences. Therefore, we are publishing this booklet mainly as archival evidence of the accepted submissions to the conference. All abstracts were peer reviewed and we asked the authors of the accepted submissions to let us know if they did not want their abstracts to be published in this booklet.

Glancing through the booklet shows that once again LCICD 2020 would have been a very exciting meeting with presentations of cutting-edge work from international infancy researchers at all career stages. It was not meant to be, but let us all look forward to getting together again in Lancaster in 2021 to continue the now well-established tradition of discussing infant and early child development in the balmy late summer of northern England. See you at LCICD 2021!

Advice on how to include cancelled conference presentations on one's CV is provided by APA here: https://apastyle.apa.org/blog/canceled-conferences

The LCICD 2020 Organizing Committee.

KEYNOTE SPEAKERS

Attentive learning: Influences on and from what is learnt over development

Gaia Scerif
University of Oxford

Development occurs in the middle of things: Noise, distraction and attention in infant development

Natasha Kirkham
Birkbeck, University of London

Tuned in! The role of interpersonal rhythms for early social development

Stefanie Höhl
University of Vienna

TALK ABSTRACTS

How Interest Shapes Early Vocabularies

Lena Ackermann and Nivedita Mani
Georg August University of Göttingen

Young children are astonishingly fast word learners (Frank et al., 2016). Vocabulary growth rates are similar across languages, but between children, we find considerable differences in which words they know. Historically, input was assumed to explain these differences, while recent approaches also consider the child as a source of variability (Mani & Ackermann, 2018). Across three eye-tracking experiments, we explore whether children's interest in objects and natural categories influences the words they learn, building on findings that children retain information best when they have requested it (e.g. Begus et al., 2014). Interest and word recognition: Children (30 months) saw pictures of familiar objects from four categories, with pupil dilation change measured as an index of interest. We then exposed them to one new word-object-association from each category. Word recognition was tested using intermodal preferential looking. Children recognised objects from high-interest categories, but not from low-interest categories. Interest and word retention: We tested word recognition in children (24 and 38 months) immediately after exposure, five minutes later and 24 hours later, using the above paradigm. 24-months-olds showed recognition immediately after exposure, but no retention. However, target looking was boosted for words from broader categories after five minutes (cf. Borovsky et al., 2016). After 24 hours, category interest modulated recognition, suggesting a beneficial, but not sufficient, influence. 38-months-olds showed robust recognition at all time points. After five minutes, category interest and interest in specific objects positively affected target recognition. Interest and referential ambiguity: We presented children (30-36 months) with two novel objects from different categories, but only one label. Ongoing analyses ask whether children resolve ambiguity by preferentially assigning labels to referents from high-interest categories. These experiments show that children's interests play a major role in their vocabulary development and add to the growing evidence that children structure their own learning environment.

What Explains Changes in Cross-Situational Word Learning Behaviour over Development? A Process-Level Model

Ajaz Bhat, John Spencer and Larissa Samuelson
University of East Anglia

Twelve-month-old infants can learn word-object mappings in cross-situational word learning (CSWL) tasks (1). Learning improves when children temporarily suppress sensitivity to novelty (2), engage in long, stable looks (3) or are exposed to increasingly diverse learning contexts (4). Eye-movement data suggests attention and memory subsystems are critical in CSWL (2,3,5,6). Developmentally, we know that older children learn best when there is a delay between repeated presentations of a word-object pair in CSWL tasks (7), while younger children learn best with immediate presentations (5). While there are multiple accounts of CSWL, no current theory captures the full variety of findings within or across ages and none does so at a process level. We propose WOLVES (Word-Object Learning via Visual Exploration in Space), a neurally-grounded, non-linear model of CSWL that implements real-time interactions between attention, working and long-term memory to capture looking dynamics at moment-to-moment timescale and measure both looking behaviour and word learning. WOLVES takes a dynamical systems approach to allow fine-grained indexing of the changes in the looking-learning loop along its developmental trajectory. Manipulations of memory consolidation and forgetting processes allow WOLVES to capture empirical data from 7 developmental and 5 adult studies, thereby providing insights into changes over development. WOLVES demonstrates that (a) momentary selective attention in CSWL is both dependent on and indicative of learning; (b) bottom-up attention due to local novelty competes with top-down memory-driven attention to suppress learning; and (c) interactions between memory processes (working memory and long-term memory formation, recall, forgetting) operating over different timescales account for non-linear age-group differences in CSWL tasks. Furthermore, WOLVES shows how the structure of test paradigms impacts performance and how individual differences may emerge over the course of learning. Importantly, WOLVES connects CSWL to visual phenomena of novelty detection and habituation to offer the first developmental story of CSWL.

Investigating the 'Contagious Cry' in Utero: Interpretation of Physiological and Behavioural Data

Kirsty Dunn[1], Gavin Bremner[1], Tim Donovan[2] and Vincent Reid[1,3]
[1]Lancaster University, [2]University of Cumbria, [3]Waikato University

The newborn baby shows peer-specific sensitivity to the sound of other newborn cries by crying themselves (Simner, 1971; Martin & Clark, 1982). Many have interpreted the 'contagious cry' as evidence for the precursors to empathy (Hoffman, 1975) whilst an alternative explanation is that the infant cries due to a confusion of the auditory input with the infants' own cry (Piaget, 1962). We examined early response to the sound of externally-presented newborn cries, in utero. We aimed to A) investigate the mechanisms behind the 'contagious cry' by comparing responses to a newborn cry to a backwards (perceptual control condition) cry in utero, before participants have heard the sound of their own cry, and B) assess the 'peer-specific' nature of this behaviour by comparing responses to native and non-native cries. Investigating the effects of condition and time course of trials, on fetal heart rate (FHR) and movements (head, brow and mouth), linear mixed effects models were applied to the data using an incremental approach. For FHR, there was a significant interaction between condition, and time course of trials ($\chi^2(4) = 142.489$, $p = <.001$). For head movements, results showed significant main effects of condition and movement direction ($\chi^2(5) = 77.49$, $p = <.001$). For eyebrow movements, a significant main effect of trial time only was found ($\chi^2(1) = 4.371081$, $p = 0.04$). For mouth movements, significant main effects of conditions and movement type were found ($\chi^2(1) = 118.598$, $p = <.001$). Whilst overall, physiological data indicates a social, non-peer specific, response to cry sounds, behavioural data suggests differential response to cry sounds in utero.

Variability in sleep affects visual working memory in infants across cultures

Samuel H. Forbes, Jeevun Grewal, Jordan McCarthy and John P. Spencer
University of East Anglia

Sleep is the dominant state in infancy, taking up over half of the average infant's time. Sleep is thought to be a period of consolidating learning, with both sleep spindles and slow wave sleep implicated in learning and memory functions. In later childhood, even small deficits in sleep were found to have detrimental effects on school performance, memory and executive functioning. However, in the first year of life, sleep patterns are notoriously inconsistent, so the effects at this age are unclear. Visual working memory is a highly limited core cognitive function that develops early, and has been shown to be predictive of factors such as school performance in later life. We present data from infants in the first year of life in both the UK and India, tested with the same visual working memory task using both eye-tracking and fNIRS, and with questionnaires and actigraphy to measure their sleep. The preliminary results demonstrate that variability in sleep is associated with performance in the visual working memory task in both groups of infants. Additionally, since sleep quality is thought to be affected by related socio-economic factors such as noise pollution, the cross-cultural nature of this result suggests a crucial role for sleep in the development of visual working memory, possibly independent of other factors. Infant sleep may be inconsistent, but the importance of sleep is greatly consistent.

Validation of the Early Executive Functions Questionnaire: a parent-report measure of Executive Function development suitable for 9- to 30-month olds

Alexandra Hendry and Karla Holmboe
University of Oxford

The Early Executive Functions Questionnaire (EEFQ) is a 31-item, 4-scale parent-report measure. The EEFQ complements temperament measures by targeting cognitive and regulatory capabilities. Exploratory Factor Analysis with 2 independent samples of 9- to 30- month-olds (n=486; 304) indicates that Inhibitory Control, Flexibility and Working Memory scales load onto a common 'Cognitive Executive Function (CEF)' Factor, whereas the fourth scale, regulation, does not. CEF and Regulation scores show low floor and ceiling effects (<1%), good internal consistency (Cronbach's alpha >.75), short-term stability (bivariate correlations across 3-6 months >.38), and convergent and divergent validity with extant measures of attentional control. Cross- sectional (see Figures 1-2) and longitudinal data indicate that CEF scores increase with age; Regulation scores do not (see Figures 2-3). With the EEFQ it is now possible to use parent report to measure development of EF skills across infancy and toddlerhood.

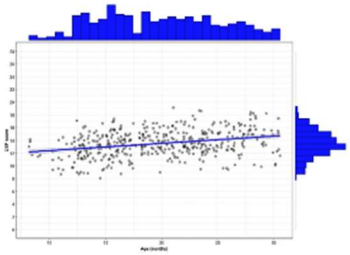


Fig 1. CEF scores by age, for Sample 1

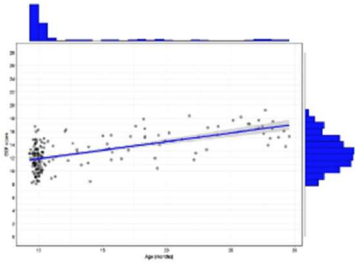


Fig 2. CEF scores by age, for Sample 2

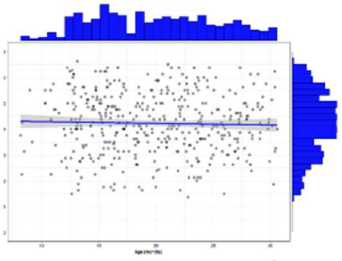


Fig 3. Regulation scores by age, for Sample 1

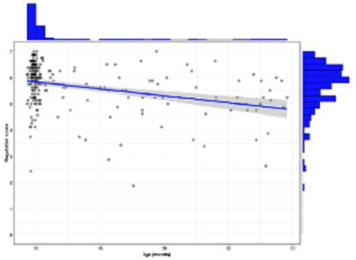


Fig 4. Regulation scores by age, for Sample 2

Toddlers raised in multi-dialectal families learn words better in accented speech than those raised in monodialectal families

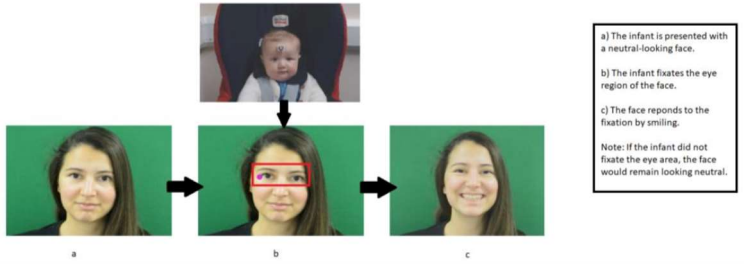
Natalia Kartushina, Audun R. Rosslund and Julien Mayor
University of Oslo

Many infants grow up in multi-accent environments, which offer rich but inconsistent language input, as words are produced differently across accents, providing no robust mapping between an acoustic signal and a word. For instance, in Oslo, 30% of population speak Norwegian as their second language, and among the remaining 70% of speakers, ~30% use a different dialect than the one spoken in Oslo area. Previous research has shown that brief exposure to multiple accents facilitates understanding of unfamiliar accents in infants with no prior multi-accent experience; yet, long-term exposure to accents (being raised in a bi-accent family) hinders word comprehension. The current study examined whether multi-accent variability affects infants' ability to learn words and whether toddlers' prior experience with accents modulates learning. To address these questions, we designed a child-friendly audiovisual tablet-based storybook "Krokko og Grynte på fisketur" and embedded four novel pseudowords into the story, each referring to a novel object. Two audio conditions were created: in the multi-accent condition, the audio narration was recorded in three distinct Norwegian accents, whereas in the single-accent condition, it was in one Norwegian accent. The ebook was presented, twice per day, to thirty 2.5-year-old Norwegian toddlers, in their kindergarten, for one week. Half of them were assigned to multi-accent and the other half to single-accent condition. Toddlers' age, gender and vocabulary size were matched between groups. Word learning was assessed in a four-alternative forced-choice identification. The results revealed no differences between conditions, suggesting that multi-accent variability did not hinder toddlers' word learning. Yet, in the multi-accent condition, toddlers exposed to dialects at home showed significantly larger improvements than toddlers growing up in uniformly-accented families, suggesting that accent exposure benefits learning in multi-accent environments, and thus revealing, for the first time, advantages of bi-accent home exposure on language development in an ecological setting.

Reduced social responsiveness in infant siblings during interactive gaze-contingent eye-tracking tasks

Jolie Keemink [1], Lauren Jenner[1], Nicky Wood[2], Jonathan Prunty[1] and David Kelly[1]
[1]University of Kent, [2]East Kent Hospitals University NHS Foundation Trust

Recent studies with infant siblings of children with Autism Spectrum Disorder (ASD) suggest that ASD symptoms emerge between 12 and 24 months (Bussu et al., 2018). Early detection of ASD symptoms is essential for early treatment and improves prognosis (Fernell et al., 2013). Current research suggests a gradual onset of impairments across multiple domains (Rogers, 2009); however, a reliable first-year marker remains elusive. In this talk, we propose that the fundamentally social nature of ASD requires us to develop methods that are sufficiently socially demanding and realistically interactive in order to reliably identify early manifestations. Consequently, we developed a novel and interactive gaze-contingent (GC) eye-tracking paradigm in which the participant's viewing experience is contingent upon their eye movements and enables the participant to 'interact' with stimuli to provide a more naturalistic experience (See Figure for example). We present two studies using interactive gaze-contingent face stimuli, in which infants could trigger socio-communicative responses from faces by fixating pre-specified regions of the face. We collected eye-tracking data and video-recorded behavioural response data from typically developing infants and infant siblings (6/9/12mo). In study 1 (N = 162), infants could elicit socially engaging and socially disengaging responses by fixating the eye or mouth area. In study 2 (N = 153), infants induced emotionally expressive responses by engaging in eye contact. Our findings demonstrate reduced social responsiveness from infant siblings at the group ($F(1, 147) = 4.10$, $p = .042$, $\eta p2 = .028$) and individual level (Fischer's Exact, $p = .032$). Whereas eye-movements provide no evidence of deviancies, behavioural response data show significant aberrancies in reciprocity. Infant siblings showed significantly fewer instances of imitative response rates ($p = .013$) and were less likely to respond with a smile ($p = .038$). We discuss the implications of our results in relation to subsequent infant sibling development.



Twelve-, ten-, and six-month-olds remember complex dynamic events across two weeks

Osman Kingo, Trine Sonne and Peter Krøjgaard
Aarhus University

The Visual Paired-Comparison (VPC) paradigm is widely acknowledged for assessing recognition memory in infancy (e.g., Hayne, 2004). Although the VPC task has been used extensively over the years to test infants' ability to remember simple, static material (e.g., pictures), we know surprisingly little about how infants perform when testing their memory for dynamic events (i.e., events unfolding in time) in the first year of life. While there is evidence to suggest that complex dynamic events (i.e., events involving agents, and a storyline) may be comprehended in the first year of life, 16- to 18-month-olds are hitherto the youngest infants documented to remembering such material (e.g. Sonne, Kingo, & Krøjgaard, 2018). In the current study, using the VPC paradigm, we examined 12-, 10-, and 6-month-olds' (N = 108) ability to encode and remember cartoons involving complex dynamic events across two weeks. Infants encoded one of two short (30 seconds) cartoons (se Figure 1). Two weeks later, infants were eye-tracked while watching both movies simultaneously. Results showed that all age groups were capable of remembering these cartoons - evidenced by a visual preference for the encoded movie above chance (ps < .05, rs range .33 - .67, see Figure 2). To our knowledge, this is the first experiment to document memory for such complex material in young infants using the VPC paradigm. These results will be followed up by control experiments investigating if it is the storyline per se rather than lower level perceptual information that drive the memory response in these age groups. Such privileged status of the storyline has previously been found in 18-month-olds using the same stimulus material (Sonne, Kingo, & Krøjgaard, 2018).

Figure 1

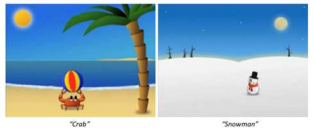
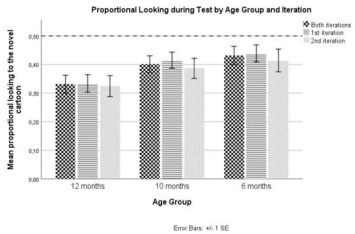


Figure 2



Exploring Systematicity in the Developing Lexicon with Phonological Networks

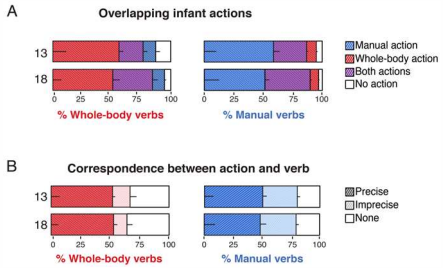
Catherine Laing
Cardiff University

Early in development, infants' words are structurally very simple. Studies have shown that early productions are phonologically systematic (Laing, 2019; Vihman, 2016), reliant on structures that are simple to produce, such as consonant harmony (/beibi/ to represent baby) and open CV syllables (/da/ to represent dog). Furthermore, infants' earliest words are often phonologically similar: in data of a bilingual (English-Spanish) child's early word acquisition, Deuchar and Quay (2000) show that 13/20 first words are produced with a CV structure, and many are phonologically identical: car, clock, casa 'house' and cat are produced as /ka/, and papa 'daddy', pájaro 'bird' and panda as /pa/. This points to continuity and systematicity in the transition from babble to words (Oller, Wieman, Doyle, & Ross, 1976; Vihman, Macken, Miller, Simmons, & Miller, 1985): infants' early words resemble the simple canonical syllables produced in babble, and contain the well-rehearsed sounds that they can most easily produce (McCune & Vihman, 2001). In this paper, I observe the phonological distance between American infants' early words (segmental and prosodic features, cf. Monaghan, Christiansen, Farmer, & Fitneva, 2010) in an attempt to document emergent systematicity in phonological development. Drawing from the Providence corpus (Demuth, Culbertson, & Alter, 2006), I analyse over 20,000 words from 5 infants (2 males) between ages 0;11 to 2;0, accounting for phonological distance between each infant form and i) the target 'adult' form, and ii) all other words produced by the child in the same session. Cluster analysis, combined with analysis of phonological similarity, will index the systematicity of the developing lexicon over time. Preliminary analyses using mixed-effects regression models suggest that phonological distance between child and adult form does not change with age (t=-.046, p>.5). Additional analyses will observe clustering within each child's own word forms to account for phonological systematicity over time.

Mothers talk about infants' actions: How verbs correspond to infants' real-time behavior

Kelsey West, Katelyn Fletcher, Karen Adolph and Catherine Tamis-LeMonda
New York University

Verbs are notoriously difficult to learn. Infants must attend to unfolding events, extract common features, and connect meaning to words. Yet, infants learn hundreds of verbs by age two. How do they accomplish the verb-mapping challenge? We propose infants' motor actions predictably frame verb inputs, and moment-to-moment connections between word and action help infants learn words. That is, when an infant stacks blocks as caregiver says, "Can you build?" the connection between the word build and stacking is reinforced. We video-recorded 32 infant-mother dyads (16 13-month-olds, 16 18-month-olds) for two hours at home. We identified manual verbs (e.g., press, shake) and whole-body verbs (e.g., bring, go) mothers directed to infants. We coded whether infants displayed manual and/or whole-body actions during a 6-second window anchored by the verb. We specified whether infants' actions corresponded precisely (mother says "stack", infant stacks), imprecisely (mother says "stack the blocks", infant bangs blocks or stacks different object), or no correspondence. Mothers averaged 94.59 manual verbs (SD = 54.70) and 66.53 whole-body verbs (SD = 35.24). Manual and whole-body verbs aligned with the two types of infant actions at both ages (Figure 1a). When mothers used manual verbs, infants performed more manual actions than whole-body actions; when mothers used whole-body verbs, infants performed more whole-body actions than manual actions, $F(2,60) = 186.78$, $p < 0.001$. Mothers' verbs frequently corresponded with infants' behaviors (Figure 1b). Half of manual and whole-body verbs corresponded precisely to infants' actions, which was more frequent than imprecise or no correspondence, $F(1,30) = 14.58$, $p = 0.001$. Infants' behaviors and their language experiences are reciprocally interrelated. Infants continually interact with objects and spaces in their environment; As they do, mothers offer words for infants' ongoing actions. Simultaneously, mothers' verb input may spur new actions in infants, thus shaping infants' interactions with their worlds.



Mothers' gaze-monitoring influences infants' later vocabulary development

Eugenia Wildt and Katharina J. Rohlfing
Paderborn University

Gaze-following serves as an early predictor for later language development (Morales et al., 2000; Mundy et al., 2007). While intrapersonal approaches focus on individual attention within the child, it is little known about how gaze-following is fostered in early interactions. Thus, we investigated the relation between mothers' interactive behavior to infants' later language outcome. For this purpose, we videotaped 15 mother-child dyads when infants were six months old. Mothers were instructed to change their gaze from looking at the infant to one side for approximately 10 seconds without looking or instructing their child face-to-face to initiate infants' gaze following. In addition to this interactive behavior, a Polish version of the MCDI (Fenson et al., 1994) was used to provide parent report of infants' productive vocabulary at 24 months (N = 13). Results of a linear regression analysis revealed that mothers' number of gaze-following offers could not explain infants' vocabulary score, $R2 = .19$, $F(1,11) = 2.57$, $p = .14$. However, we found that some mothers (N = 8) controlled infants' reaction from the corner of their eyes (gaze-monitoring) during the waiting phase, and this behavior significantly explained 36.1% of variance in infants' vocabulary size at 24 months, $F(1,11) = 6.23$, $p = .03$. As gaze-following also significantly predicted infants' vocabulary score, $F(1,11) = 5.79$, $p = .035$, we combined both variables in a multiple regression model: Although, gaze-following, $t(10) = 2.49$, $p < .05$, and gaze-monitoring, $t(10) = 2.4$, $p < .05$, remained significant predictors, gaze-monitoring turned out as a stronger predictor for infants' language development. In sum, it is not sufficient explaining differences in language development only by individual attentional processes. Our results provide evidence that responsive maternal behavior in early interactions is also a crucial predictor for infants' language development.

POSTER ABSTRACTS

Assessing neural sensitivity for mother's face in 5-month old preterm and term infants with fast periodic visual stimulation

Steffie Amelynck[1], Lyssa de Vries[1], Sofie Vettori[1], Bruno Rossion[2], Bieke Bollen[3], Els Ortibus[3], Gunnar Naulaers[3] and Bart Boets[1]

[1]Katholieke Universiteit Leuven, [2]Université de Lorraine, [3]Universitair Ziekenhuis Leuven

Infants communicate with others by 'reading' faces. They discriminate familiar from unfamiliar faces, and derive information about their feelings and intentions. Preterm infants are at risk for socio-emotional difficulties and an increased prevalence of ASD. Therefore, detailed monitoring of early socio-emotional development in this high-risk population is a valuable avenue for early detection and prevention of future psychopathology. Methods used in previous studies are generally complex, inconclusive and time-consuming. Here, we apply frequency-tagging EEG to assess the neural sensitivity for detecting a familiar face among unfamiliar faces. This approach is reliable, robust, and allows obtaining data without complex analyses. The basic principle of this approach is that the brain responds at exactly the same periodicity as the frequency of visual stimulation. Based on this principle, an oddball familiar face discrimination paradigm was administered to a group of adults, a group of 5-month old preterm infants, and a group of 5-month old term infants. We present a stream of different unknown faces, all within their natural background, at a base frequency of 3 Hz. In between these faces, every third face, thus at 1 Hz oddball rate, is an image of a familiar person (for the infants the face of their mother). All these images of the mother differed largely in terms of viewpoint, background, etc. The EEG-amplitude at the oddball frequency reflects the sensitivity for recognizing the familiar face at a single glance. A selective oddball response is observed in almost every individual participant, situated along occipitotemporal regions. We expect adults and term infants to be able to detect the familiar face better than preterm infants. In the future, we will use retrospective analysis to compare typically developing infants to infants who develop autism and socio-emotional difficulties. We expect differences in attachment styles may also modulate their performance and sensitivity. Participants who learned the association between AG and location demonstrated at 50% probability of producing anticipatory looks. Attentional disengagement elicited activity in both the pre-frontal and parietal regions. Anticipatory look probability and disengagement efficiency at 30-months was found to be predictive of effortful control at 42-months.

Interpersonal behavioural synchrony affects toddler's novel word retention

Marina Bazhydai[1], Han Ke[2], Hannah Thomas[1], Malcolm Wong[1] and Gert Westermann[1]
[1]Lancaster University, [2]NanYang Technological University

The present study investigated the behavioural and physiological effects of interpersonal behavioural movement-based synchrony on word learning in 2.5-year-olds. In the laboratory experiment, children (N = 40) engaged in either a synchronous or an asynchronous movement-based interaction with the experimenter while listening to an upbeat song. After the (a)synchronous movement episode, the same experimenter engaged children in a fast-mapping word learning task. Following a caregiver-child free play break, children were tested on their novel word retention. During the (a)synchrony and learning phases, children's physiological arousal was continuously recorded, resulting in heart rate and skin conductance response measures (acquired by a wearable wristband device, Empatica E4). While children fast-mapped novel labels equally well during the learning phase in both conditions, the results revealed the above-chance retention of novel labels only following the synchronous, but not the asynchronous episode, though the comparison test between conditions did not reach significance. Regardless of the condition, children's heart rate and tonic skin conductance level were heightened at the learning as compared to the (a)synchrony phase. Furthermore, skin conductance was significantly higher during the learning phase in the asynchronous as compared to the synchronous condition. However, neither measure of the physiological arousal predicted children's word retention. We provide preliminary evidence of greater label retention following a synchronous interpersonal movement episode as compared to an asynchronous episode. While the effect of synchrony on prosocial outcomes is well documented, it appears to extend to the knowledge acquisition domain. Independently from these social processes, our results demonstrate that children's physiological arousal increases during learning and more so following an asynchronous rather than synchronous social interaction. To shed light on the underlying mechanisms of interpersonal synchrony experience and its effects on learning, future research should further evaluate the role of both social learning and physiological mechanisms on attention and cognition.

Eleven-month-olds selectively refer to their social partner following epistemic violations of expectation

Marina Bazhydai, Gert Westermann and Eugenio Parise
Lancaster University

Pre-verbal and pre-pointing infants' active behavioural responses to epistemic uncertainty is an understudied area in social cognitive development. Infants look longer at the sources of the violations of expectation and at their social partners if they enabled such uncertainty (such as providing unreliable information). Distinct from passive looking time measures, discrete social looks have been proposed to serve an epistemic, information seeking function. The present study aimed at investigating pre-verbal infants' social referencing in response to epistemic violations of expectation. In experiment 1, 11-month-olds (N = 48) saw ten screen-presented familiar objects, with caregivers enabling three between-subject conditions: Congruent (caregiver providing a matching label to the object), Incongruent (mismatching label, e.g., calling a cat a dog), and No Label (caregiver not providing any label but instead saying: "Look at this!"). Following epistemic violations of expectation events – caregivers providing inaccurate labels referring to familiar objects - infants generated more social looks at their caregivers as compared to when labels were accurate, or no labels were provided. There were no differences in duration or onset of their social looks. In experiment 2 using the within-subject design, when infants' (N = 32) caregivers provided a mix of inaccurate and accurate labels, social referencing was enhanced indiscriminately following both types of labelling testimony (congruent and incongruent trials) as compared to when no labels were provided, with no differences in looks' duration or onset. These results suggest that pre-verbal infants selectively respond to epistemic uncertainty from receiving unreliable labelling testimony from the trusted social partner. This study supports the proposition that discrete social looks (but not looking duration) index infants' response to epistemic violations of expectation events, indicating an epistemic function of these communicative behaviours.

Should I stay or should I go? Three-year-olds' sensitivity to appropriate motives to break a commitment

Francesca Bonalumi[1], Barbora Siposova[2], Wayne Christensen[2] and John Michael[1]
[1]Central European University, [2]University of Warwick

Commitments create obligations, but the precise scope of commitments can never fully be made explicit. For instance, we often expect someone to be released from a commitment when it conflicts with a weightier moral consideration (Shpall, 2014). Previous research shows that three-year-olds understand the obligations entailed by joint commitments (Gräfenhain et al., 2009), and that they distinguish between instances in which a partner fails to make a contribution intentionally and instances in which she fails to do so for other reasons (Kachel et al., 2017). But can they assess the legitimacy of motives leading agents to intentionally break commitments? To probe this, we manipulated the motives leading a partner to break a commitment. Three-year-olds played a two-trials game together with a puppet who suddenly interrupted this joint activity because either (a) she was lured away to play another tempting game; or (b) she assisted another agent in distress. We measure whether children released the partner from the commitment by scoring their verbal reactions on a Release Scale of -1, 1; where -1 means denying release (e.g. protesting), and 1 means granting release. Our descriptive data (N = 60) suggest that children granted release more often when the partner was faced with a conflicting moral duty (43%) than when the partner was lured away by another temping game (23%). Moreover, children manifested signs of protest (i.e. denying release) more often when the partner was lured away by another tempting game (63%; 14% showed no reaction) than when the partner was faced with a conflicting moral duty (47%; 10% showed no reaction). Statistical analyses are in progress. If significant, these results would suggest that three-year-old children make appropriate normative evaluations of the scope of commitments.

Why do children (not) learn words in multimodal settings?

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Georg-August-University Göttingen

Much research has shown that children comprehend word-object mappings by six months (e.g., Bergelson & Swingley, 2012), however, when presented with multimodal input (i.e., words, actions and objects), early word-object learning shows different results (e.g., Eiteljoerge et al., 2019). Here, we aim to carefully examine how word learning occurs as children are presented with multimodal information, and what factors influence word learning in multimodal environments. Stimulus synchronicity is the temporal alignment of multiple stimuli, boosting word-object learning in infancy (e.g., Gogate, 2010). We test the potential impact of stimulus synchronicity on word action-object mappings in early development, including the presentation of aligned and misaligned stimuli in a multimodal setting. We further investigate individual differences and how cognitive and language abilities might explain word learning success at 12- and 24-months of age in multimodal settings. Children will be trained on word- and action-object associations as they are presented with two novel objects, each associated with a novel name (e.g., "Oh, a Tanu!") and an arbitrary action (e.g., a hand rotates the object around its axis). At test, children's looking patterns to the target object (upon seeing the associated action being performed on a control object or hearing its associated label) and pupil dilation changes during match and mismatch trials will serve as an index of learning of previously trained associations. Growth curve models will estimate changes in children's looking behaviour within trials, while learning of the associations is expected to be stronger in older children relative to younger children, and more so when cognitive and language scores are high and stimulus presentation is temporally aligned. Systematic patterns of word-object learning in a multimodal setting will allow us to identify factors underlying word learning in early development.

Dynamic modulation of frontal theta power predicts cognitive ability in infancy

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Cognitive ability is a key factor that contributes to individual differences in life trajectories. Identifying early neural indicators of later cognitive ability may enable us to better elucidate the mechanisms that shape individual differences, eventually aiding identification of infants with an elevated likelihood of less optimal outcomes. A previous study associated a measure of neural activity (theta EEG) recorded at 12-months with nonverbal cognitive ability at ages two, three and seven in individuals with older siblings with autism (Jones et al., under review). In a pre-registered study (https://osf.io/v5xrw/), we replicate and extend this finding in a younger, low-risk infant sample. EEG was recorded during presentation of a non-social video to a cohort of 6-month-old infants and behavioural data was collected at 6- and 9-months-old. Initial analyses replicated the finding that frontal theta power increases over the course of video viewing, extending this to 6-month-olds. Further, individual differences in the magnitude of this change significantly predicted non-verbal cognitive ability measured at 9-months, but not early executive function. EEG theta change at 6-months-old may therefore be an early indicator of later cognitive ability. This could have important implications for identification of, and interventions for, children at risk of poor cognitive outcomes.

TEACH-BRITE: Transforming EArly ChildHood- Bringing Research to Individuals through online Technology

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Since smartphone use is now relatively ubiquitous, it is timely to explore how we can use these technologies in the field, particularly to increase the participation of families who are typically missed from developmental research. We are leveraging technological developments, using new AI-based technology that enables us to individualise the items presented to each parent via an app. Individualisation is particularly critical because it allows us to be sensitive to developmental differences. This could improve on current methods which typically involve long and laboursome measures to establish children's ability levels. We have developed an app for collecting information about child behaviour in low resource (i.e. non-laboratory, 'real life') settings. The app consists of activities that the parent tries with their child; based on their report of the child's behaviour, the app will use artificial intelligence algorithms to select each new activity. Data on their child's responses will be used by the app to build a developmental profile of the child. The first stage of this research involves large scale data collection with the app to get norms and to develop artificial intelligence algorithms which individualise app content. This can all be achieved remotely, meaning there is no need for in-person assessments and a broader group of families may be reached. Once a large amount of data have been gathered, we will use these to map out a task space that will allow the use of state-of-the-art artificial-intelligence-based algorithms to individualise the activities provided to parents. This data collection is currently ongoing, and we hope to present some preliminary data at the conference. The app will also provide tailored neuroscience-based information based on the feedback parents provide on their child's responses to previous activities. The final app will facilitate data collection in large-scale longitudinal studies of infants from hard-to-reach populations.

Do infants store multi-word sequences as unanalysed linguistic units? A computational study

Francesco Cabiddu, Lewis Bott, Chiara Gambi and Bill Macken
Cardiff University

A fundamental question in language acquisition research is whether infants discover words within the speech they hear by (i) merging sublexical components (e.g., syllables) (small-to-big hypothesis) or (ii) breaking down initially unanalysed multi-word phrases into word-like representations (big-to-small hypothesis). We examined the developmental plausibility of these two hypotheses using a computational approach. Recently, Grimm et al. (2017) found a positive relation between multi-word frequency (i.e., the number of multi-word phrases containing a target word) and target word Age of First Production (AoFP), apparently supporting the big-to-small hypothesis. However, this finding was based on a model (Chunk-Based Learner; McCauley & Christiansen, 2014) that merges pre-discovered words into multi-word phrases, and does not in fact discover words within multi- word phrases. Thus, it is unclear whether earlier acquired words have higher multi-word frequency because they are more likely to appear in different contexts throughout development, or rather their occurrence in different contexts makes them more likely to be discovered. To answer this question, we compared three word segmentation models which initially only know phonemes. Two of these models (Forward and Backward Transitional Probability, e.g., Hay et al., 2011) implement the small-to-big hypothesis, while the third (PUDDLE, Monaghan & Christiansen, 2010) implements big-to-small; we also included a random segmentation model (baseline). Importantly, we only count multi-word phrases discovered before a target word is discovered to compute multi-word frequency. The input was ~200,000 child-directed utterances from CHILDES (MacWhinney, 2000; 8 corpora, ages 1-4 years). Supporting the big-to-small hypothesis, only PUDDLE was able to capture the effect of multi-word frequency on AoFP when controlling for word frequency, phonemic length and neighbourhood density (see Figure 1). A follow-up analysis will examine the part-word units discovered by each model, to assess whether models that commit segmentation errors can capture the emergence of morphosyntactic structures (e.g., "[Verb]+ING_TO+[Verb]").

Pupil dilation as a window into word-object association: a comparison between in 12-month-olds and adults

Giulia Calignano[1], Simone Sulpizio[2], Francesco Vespignani[1], Sofia Russo[1] and Eloisa Valenza[1]
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The way attention is deployed toward an object with or without a concomitant spoken word abruptly changes across development. We investigated the effect of spoken word on attention deployment to visual objects, in 12-month-olds and adults. The two groups were familiarised with a visual object systematically presented with a word or silently, in two separate trainings. Through eye-tracking, we measure looking times and pupil dilation as complementary indexes of resource allocation. Variations in pupil diameter provided a useful indirect measure of the processing demand (Blaser, Eglington, Carter, & Kaldy, 2014; Brisson et al., 2013; Sirois & Jackson, 2012) that accurately reflected the time course of information processing during the trainings (Hepach & Westermann, 2016). We found differences in resource allocation between the two groups, during the word-object and the object-only training. Infants showed higher pupil dilation during the object-only training, whereas the opposite pattern of findings emerged in the group of adults. We discuss the different role may be played by spoken words on attention deployment towards visual objects, in the developing vs the developed cognitive system.

How in-home environmental noise positively and negatively affects infant cognitive development

Brittney Chere, Giulia Serino, Allison Haack and Natasha Kirkham
Birkbeck, University of London

It is well known that environmental stimulation during infancy directly impacts on their brain and cognitive development. Therefore, how might noise, and specific characteristics of noise, be benefiting or hindering infant development? To address this, we directly measured the sound levels from infants' homes to determine how exposure to noise might be impacting their ability to sleep and process sensory information. Families recorded 4.5 hours of sound levels from the room that their infant sleeps in, and 4.5 hours from another room that their infant often occupies. Parents completed a 7-day sleep diary, the Brief Infant Sleep Questionnaire (BISQ), and the Sensory Profile 2 questionnaire. Preliminary results reveal that when looking at how sound levels in the infants' room might be influencing their quality of sleep using the BISQ, the higher the consistently present background noise (L(A)90), the less the infant sleeps at night. Furthermore, a clear trend demonstrates that the higher the average sound level (L(A)eq), the more time they spend awake at night. Interestingly, no correlations were found between noise levels and the sleep diary, suggesting that these two methodologies capture different aspects of infant sleep. When looking at average in-home sound levels and sensory processing, results reveal that the higher the average sound levels in the home, the better the baby is at efficiently processing auditory sensory information. Intriguingly, both the BISQ and the sleep diary reveal a clear indication that more night wakings correlate with lower general sensory processing, and that higher total sleep (night and day) on the BISQ additionally correlates with better general sensory processing. Together, these results reveal: (a) a clear negative relationship between environmental noise levels and infants' quality of sleep, (b) that exposure to noise improves their ability to process auditory sensory information, and (c) that sleep influences general sensory processing.

The effect of environmental noise on infants' visual attention

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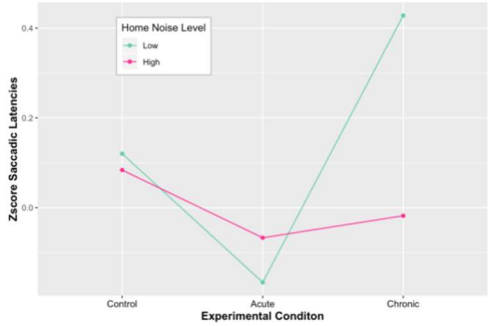
Over the course of development, learning occurs in dynamic and multimodal environments. Within these environments, the developing infant must learn what information is relevant and what is to be ignored. Is this ability affected by highly distracting environments? Does the environmental noise that infants are exposed to every day modulate this process? We investigated these questions by presenting 10-to12-month-old infants with a visual statistical learning eye-tracking paradigm, while manipulating the background acoustic noise. Specifically, infants were exposed to either no noise, acute noise (i.e., phone buzzing), or chronic noise (i.e., traffic, muffled TV, etc.), and saccadic latencies towards the most likely visual stimuli positions were taken as an index of learning. Furthermore, to capture the environmental noise infants are usually surrounded by, parents were asked to record 9 hours of sound levels from their home. Preliminary results reveal that infants from noisier homes demonstrate significantly faster saccadic latencies in the chronic noise condition compared to infants from quieter homes, suggesting that experience with noise improves their ability to pay attention in distracting environments. Similarly, when analyzing infants' performance based on their in-home noise levels, saccadic latencies of infants from noisier homes are similar across experimental conditions. On the contrary, infants from quieter homes show significantly slower saccadic latencies in the chronic noise condition compared to the no-noise condition. Additionally, they show faster saccadic latencies in the acute condition. Although unexpected, in line with the literature (i.e., Wetzel et al., 2012; Pozuelos et al., 2014), this result might indicate that low levels of noise can boost attentional arousal, improving task performance. In conclusion, to our knowledge, these findings reveal for the first time that infants' learning skills and attentional response to task noise are modulated by the stimulating and complex learning environments that infants inevitably find themselves in.



Does face familiarity impact audio-visual association? Matching phonetic information with own- and other-race faces in 3- and 9-month-old infants

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[1]Grenoble Alpes University, [2]Institute of Cognitive Sciences – Marc Jeannerod

Face and language processing show intriguing commonalities during development (Pascalis et al., 2014). Newborns initially show universal perception abilities and become gradually attuned to the languages and the faces they are the most exposed to (Eimas et al., 1971; Nelson, 2001; Kelly et al., 2007). Infants even lose the ability to recognize other-race faces at nine months (Kelly et al., 2007). Uttley et al. (2013) investigated whether six-month-old have already developed a multisensory representation of race and language. Results showed that six-month-olds looked longer at face-voice pairings when native language was paired with own-race face or when non-native language was paired with other-race faces than otherwise. Hence, the development of the sensitivity to own- vs. other-race faces could affect language learning processes. One essential skill for language learning is to be able to exploit the speech multimodally. Past research (Kuhl & Meltzoff, 1982, 1984; Patterson & Werker, 1999, 2003) shows that speech is represented inter-modally as early as two months of age. The goal of the study was to test matching skill is sensitive to the race of faces that produces the speech signal. We tested three- and nine-month-old infants in a similar audio-visual matching task, using either own and other-race faces. Infants were presented with two simultaneously displayed talking faces of the same female speaker (one side producing [i], the other [u]) with a synchronous vowel sound (audio /i/ or /u/). The speaker's face was either from the own-race of the infant (Caucasian) or from another race (Indian). So far, we only collected data in the in the own-race study. Data collection is still in progress, but preliminary results show that three-month-olds look longer at the matching face ($p = 0.01$; $N = 26$). However, nine-month-olds did not ($p = 0.357$; $N = 13$) (Figure 1).

Table 1 - Mean of the proportional looking time towards the matching face of 3- and 9-month-old infants during the test trials.

Age group (months)	M(SD)	t	p	Cohen's d
3	64.70 (27.13)	2.76	0.010	0.767
9	41.46 (26.00)	-1.18	0.259	-0.464

Pupillometry in 5-months-old infants at elevated likelihood for developing autism spectrum disorder

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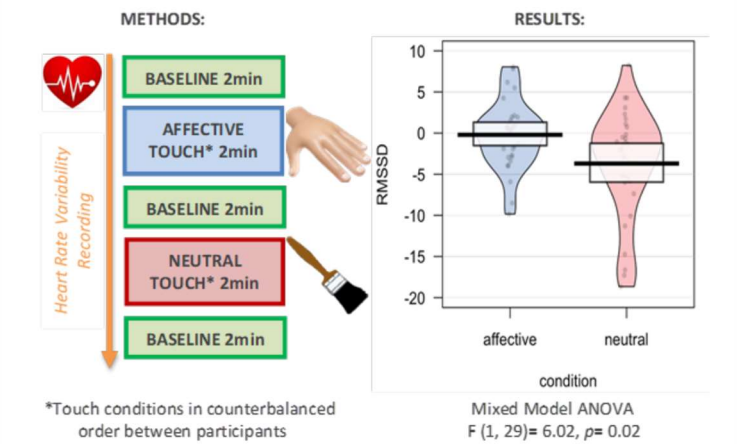
[1]Katholieke Universiteit Leuven, [2]Uppsala University, [3]Ghent University, [4]University Hospital Leuven

Autism spectrum disorder (ASD) is a neurodevelopmental condition, which is diagnosed by trained clinicians based on observed behaviours and parental interviews. At an early age, this diagnosis is often difficult to establish. Underlying mechanisms that explain the behavioural symptoms are not yet fully understood. The pupil is a window into the autonomous nervous system, and therefore is interesting and moreover easy to measure. In reaction to light, a pupil constricts. Pupillometry can measure the baseline pupil size, amplitude of the change in diameter and the latency to the maximum constriction, among other parameters. We performed a meta-analysis, in which we showed that this latency robustly differs between individuals with ASD and their typically developing peers at group level, with a Hedges' g of 1.13 in the overall comparison. While the latency is prolonged in children, adolescents and adults with ASD, an opposite effect with significantly shorter latencies was observed in infants at elevated likelihood (EL) of developing ASD at the age of 10 months (Nystrom et al, 2015). In our longitudinal study, our aim is to investigate the maturation of the autonomous nervous system by tracking the evolution of this parameter during infancy. We measure the pupillary light reflex at the ages of 5, 10 and 14 months in EL infants: siblings of older children with an ASD diagnosis and very and extremely preterm children born before 30 weeks of gestational age. We also collect data from infants without elevated likelihood of developing ASD. The pupillary response is recorded with a Tobii eyetracker, while infants sit on their parents lap' and watch a black screen shortly flashing white, interspersed with other tasks. Currently, data collection and data analysis are still ongoing, but group comparisons of the first timepoint (age of 5 months) will be presented at the conference.

Tactile stimulation modulates heart rate variability in newborns

Letizia Della Longa and Teresa Farroni
University of Padova

Affective touch (gentle caress-like stroking linked to C-tactile afferents) is an integral part of early caregiver-infant relationship and provide a sensory foundation for the development of affiliative bonds and social communication skills (Feldman et al., 2010; Hertenstein et al., 2006). Interventions based on skin-to-skin contact (kangaroo care) have been shown to reduce the autonomic stress responses and promoting self-regulation in preterm infants (Feldman & Eidelman, 2003; Chiu & Anderson, 2009). The beneficial effect of affective touch on infants' health and grown is hypothesized to be directly mediated by parasympathetic activity. In the present study, we aim to investigate whether newborns discriminate between different types of touch as reflected by modulation of heart rate variability (HRV - changes in the time interval between successive heartbeats), which represent an index of parasympathetic impact on the heart. We measured heart rate of newborns (N= 30) when they were in a sleeping state and we compare changes in HRV during two minutes of affective touch (caresses by hand) and two minutes of neutral tactile stimulation (tapping with a brush) in respect to two minutes of resting pre-stimulus HRV. Our results indicate that newborns show physiological sensibility to different types of tactile stimulation. More specifically, we found a decrease in hear rate variability during neutral touch compared to affective touch ($F= 6.02$, $p= .02$). This indicates that when newborns are sleeping, affective touch is effective in maintaining a calm physiological state whereas a neutral tactile stimulation elicit a vagal retrial. These findings suggest that tactile stimulation may have a crucial role in modulating autonomic self-regulation from the earliest stages of development.



*Touch conditions in counterbalanced order between participants

Mixed Model ANOVA
$F (1, 29)= 6.02$, $p= 0.02$

Two languages, one brain: Exploring dual language word segmentation in bilingual infants

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Oxford Brookes University

There is evidence suggesting that bilingual infants may be better able to deal with the processing demands of segmenting two languages than monolinguals (Antovich & Graf Estes, 2018; Bosch, Figueras, Teixido, & Ramon-Casas 2013). This may be related to statistical learning capabilities. It has been shown that bilingual 14-month-olds can segment two congruent artificial languages, whereas monolinguals cannot. However, bilingual infants have not been tested on segmenting incongruent languages. This is key because natural bilingual input usually contains incongruent languages. In the current study, 8-to-14-month-old monolingual and bilingual infants will be tested on their ability to segment words from two interleaved artificial languages, using only syllabic transitional probabilities. This interleaved stimuli better mimics bilingual input (Orena & Polka, 2019). Each language contains four trisyllabic words e.g., **katonu**-sugivo**nosaki**vikuta). MBROLA, a speech synthesiser, was used to create a continuous speech stream. Syllabic transitional probabilities within words were 1.0 between words and .33 between words. Infants will play quietly with their caregiver in a sound-attenuated booth whilst the languages are presented interleaved in 1-minute segments. Each language will play for a total of 4 mins, for an 8-minute familiarisation period. Infants will then be tested on one of the languages, using a preferential listening procedure. Test items will be two words, and two part-words comprised of the offset syllable of one word, added to the two onset syllables of another (e.g., vonosa, nuviku). In the congruent condition, the two languages will not share any syllables. In the incongruent condition, they will share 4 of 12 syllables. If the statistical information in both languages is aggregated, syllabic transitional probabilities will change, thus it will only be possible to segment the languages in the congruent condition. The results of this study will shed light into the segmentation abilities of bilingual infants.

Neural Differential Processing of Gaze Cueing from a Congruent and Incongruent Informant

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Infants are capable of processing social information very early in life. However, less is known about abilities related to actively choosing the information source on which to rely, over passively processing all available information. A recent study showed that eight-month-olds' gaze following was influenced by the informant reliability (Tummeltshammer, Wu, Sobel, & Kirkham, 2014), suggesting young infants could evaluate other people's trustworthiness as an informant. To better understand this discriminative ability, the current study utilises event-related potentials (ERPs) to investigate whether infants' neural activity indicates the differentiation of a reliable (congruent) informant from an unreliable (incongruent) informant. Nine-month-old infants (N = 22) were presented with 32 static images which showed two female experimenters, one of whom looked at the object appearing on one of the corners 100% of the time (i.e. congruent informant) and the other only looked at the object 25 % of the time and looked away from the object 75% of the time (i.e. incongruent informant). A paired-sample t-test showed that the amplitude of the negative deflection peaking at approximately 275ms post-stimuli over fronto-central regions was enhanced while infants attended to a congruent informant compared to an incongruent informant (t= -2.49, p= .002), which indicates the differential neural processing of congruent and incongruent informants. Furthermore, an enhanced positive slow wave (PSW) over fronto-temporal regions was observed for an incongruent informant compared to a congruent informant (t= -2.309, p=.003). As PSW is thought to reflect memory updating (Reid, Striano, Kaufman, & Johnson, 2004; Snyder, Webb, & Nelson, 2002), this may suggest how infants alter their perception about the congruency of gaze cue. This study extends our understanding forward on how infants collect and process social information by offering evidence that infants as young as nine months of age selectively process sources of information differentially in the social domain.

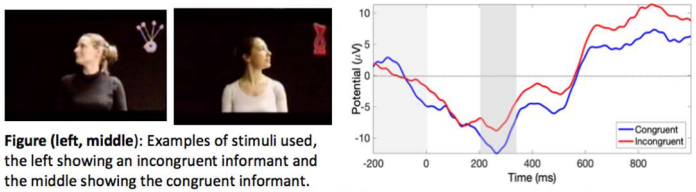

Figure (left, middle): Examples of stimuli used, the left showing an incongruent informant and the middle showing the congruent informant.

Figure (right): Example illustration of ERP results. The figure shows grand-average waveforms on the Congruent (blue) and Incongruent (red) trials over frontocentral electrode sides. The x = 0 marks the stimuli onset, and the grey shading indicates the time window of baseline (-200ms to 0) and the negative deflection (200-350ms post-stimulus).

Selective Preference for Dominance Traits from Female Faces in 2-year-olds

Cristina-Ioana Galusca, Martial Mermillod and Olivier Pascalis

Grenoble Alpes University

Human adults judge character from faces rapidly and automaticly (e.g. if someone looks dominant or submissive; Willis & Todorov, 2006). These judgements impact not only low-level processes (e.g. how faces are processed), but also higher-level decision-making (e.g. election results; Todorov, Mandisodza, Goren, & Hall, 2005). So far it is unclear whether character judgement of faces is learnt through experience or whether it is an inherent step of face evaluation, present from early on in infancy. In a set of three experiments, we employed a visual preference paradigm to study 2-year-olds sensitivity to dominance traits for different categories of faces ranging in familiarity. All the face we used were previously judged for dominance by adults and matched in attractiveness. Experiment 1 (N=16) tested the visual preference for natural own race female faces (highly familiar category). When faces were presented upright, toddlers showed a preference for the dominant face, but no preference was found when the same faces were inverted. Experiment 2 (N=16) presented natural male faces (moderately familiar category), where no preference was found for either the upright or inverted conditions. Experiment 3 (N=16) introduced artificially morphed faces (no familiarity; Oosterhof & Todorov, 2008) and toddlers showed no sensitivity to dominance traits for the upright or inverted artificial faces. Taken together, these results show that early in development infants prefer to look longer at faces judged as dominant by adults, but only when the faces are from a highly familiar social category (here, own race female faces). One possible interpretation of these results is that sensitivity to dominance traits from faces is primarily the product of extensive experience that begins to unfold in the second year of life. Yet further studies are needed to confirm that infants are indeed capable of extracting dominance traits from faces.

Visual Evoked Potentials during implicit naming in bilingual toddlers

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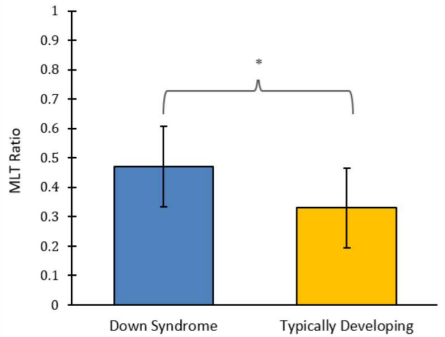
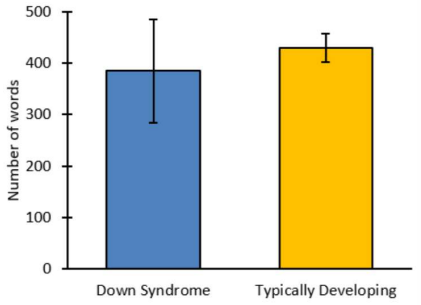
When infants are presented with pictures of known items in silence, this leads them to activate a representation for the item's name (i.e. implicit naming; Mani & Plunkett, 2010). Differences observed in Visual Evoked Potentials (VEPs) show greater negativity in the early time window (126-225 ms) following the presentation of items that infants know the names of compared to items with unknown labels (Styles et al., 2015). In this study we aim to observe how word recognition may vary amongst a sample of bilingual participants where we expect that VEPs may also be affected by the stimulus cognateness (i.e. words with phonological overlap across languages which also share similar meaning). Previous research shows that bilingual adults identify pictures corresponding to cognates quicker than pictures corresponding to non-cognates (Costa et al., 2000); however, there is little information on how cognates affect word processing in young bilinguals. While recording EEG, we will present bilingual toddlers (21-30-month-olds) with pictures of known and unknown objects in silence for one second: half of the pictures will be cognates and half will be non-cognates. A group of monolingual toddlers and adults will be included as a control sample (for adults, the unknown objects will be objects which are generally unfamiliar for most adults). For stimuli known in the bilingual's dominant language, we predict that phonological activation will be strong, while activation for stimuli known in the non-dominant language will be weak. We also expect that phonological activation will be largest for cognates known in both languages and for this to correlate with the amplitude of VEPs in the early window. The results of this study will help us evaluate the impact of language similarity of the non-dominant language on the EEG signatures of implicit word recognition in the dominant language in young bilinguals.

In the Balance: Fewer Words but Greater Conversational Balance in Parent Speech to Toddlers with Down Syndrome

Désirée Grafton-Clarke, Elizabeth Nixon and Jean Quigley
Trinity College Dublin

Toddlers engage in conversations with others long before the emergence of their first words. Even very young infants may be observed actively engaging in back-and-forth communicative exchanges with their caregivers. Caregiver speech is critical for the development of language skills in typically developing children. However, little research has examined caregiver speech in the context of Down Syndrome (DS). The aim of this study was to analyse the quality and quantity of maternal speech towards toddlers with DS compared to age-matched typically developing (TD) children. The total number of words, the diversity of words used (Vocd) and length of utterances (Mean Length of Utterance, MLU) for mother and child were calculated by transcribing and analysing recordings obtained during a 5-minute structured-play interaction. Conversational balance was also examined, by calculating a ratio of child mean length of turn (MLT) to mother mean length of turn. Participants comprised fourteen children (8 females) aged 18-35 months with Down Syndrome (M = 23.5, SD = 9.18) and twenty typically developing children (11 females) between 21-27 months (M = 24.06 months, SD = 1.39), matched on chronological age, and their mothers. Independent samples t-tests revealed mothers of children with DS used significantly shorter utterances (MLU) compared to TD dyads but displayed greater conversational balance (MLT ratio). No significant differences were observed for vocabulary diversity or for number of words, although on average mothers of children with DS used 45 fewer words. These findings contrast with previous literature suggesting parents interact with their children with DS more directively to compensate for increased passivity in DS children, resulting in less mutually interdependent interactions. Our preliminary findings suggest parents of children with DS adapt to their children's language abilities by using shorter utterances, whilst responding to the conversational cues provided by their toddlers.





Role of Technology in Preschoolers' Reading Comprehension Development – A Literature Review and New Model Proposal

Zejian Guo
University of Cambridge

With the advent of the Web 2.0 era, more and more young language learners are being exposed to this new technology-based era where a variety of media devices and equipment are designed for educational use, including the early development of word knowledge, reading comprehension, phonological awareness, numerical knowledge as well as scientific knowledge. The application of technological devices (e.g. e-books, computers, Artificial Intelligence, and Visual Reality) and portable devices (e.g. smartphones and tablets) to develop young language learners' early literacy skills, particularly reading comprehension development is the area that is worth exploring. Whether such technology-based design could support young learner's reading comprehension or not is the question that needs education professionals, researchers, and policymakers to answer. To better explore this question, this article reviews the previous technology-education-related programs and theories, and proposes a new model to elucidate the role of technology in early reading development. This model suggests that technology contributes to three parts of the emergent reading process, namely expanded information input, development of decoding skills through strengthening learners' orthographical processor and phonological processor, as well as improving their contextual processor. Schools and teachers can design more formed pedagogies and curriculum to aid students' early literacy development as a whole.

Distinct environmental cues trigger spontaneous memories of past events in three- and four years old children even after long delays

Toril Jensen, Peter Krøjgaard, Osman Kingo and Dorthe Berntsen
Aarhus University

Spontaneous memories are memories that come to our mind, almost 'out of the blue', without any deliberate attempt to recall the events (Krøjgaard, Kingo, Dahl, & Berntsen, 2014). Recently, a novel paradigm has made it possible to induce and examine spontaneous memories in preschool children in an experimental setting (Krøjgaard, Kingo, Jensen, & Berntsen, 2017, Sonne, Kingo, Berntsen, & Krøjgaard, 2019, 2020) across a one week retention interval. The aim of this study was to examine spontaneous recall across longer retention intervals, which has never been done before. 227 children, aged 35 months old (n = 114) or 46 months old (n = 113), visited the lab twice. At the first visit, the children were exposed to one of two unique events (see Fig. 1). After either a 1-, 4.5, or 13-week retention interval, the children returned to the lab for a second visit, where they were exposed to distinct environmental cues and children's spontaneous recall of the unique event was recorded. Subsequently, the children were asked questions requiring strategic recall (e.g., "Do you know what is inside the red box?"). In all of the three retention groups – regardless of age – children spontaneously recalled the events. This did not interact with age or delay. In contrast, older children reliably outperformed their younger peers on the questions requiring strategic recall (see Fig. 2). These results show that 3- and 4-years-old children are equally capable of spontaneously remembering a unique and distinctive event even after 3 months, whereas strategic retrieval was more difficult for the younger children. The results challenge a prevailing understanding of event memory development (e.g. Tulving, 2005) and suggest that: (1) Spontaneous retrieval has been overlooked in developmental research, (2) It is present early in development and (3) is less affected by age than strategic retrieval.

Fig. 1: A schematic representation of the design employed

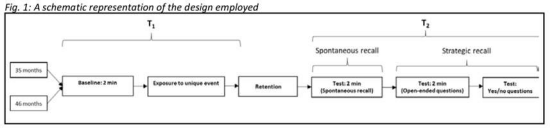
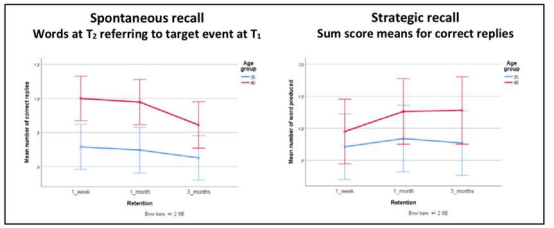


Fig. 2: Mean number of words produced at T_2 referring to the target event at T_1 indicating spontaneous recall and sum score means for correct replies referring to strategic recall across the different retention intervals for both age groups (35- and 46-months-old).



Children as active teachers: Do toddlers transmit generalisable or specific information?

Didar Karadağ, Marina Bazhydai and Gert Westermann
Lancaster University

Children as young as 2 years old actively and selectively transmit information to others based on the type of information and the pedagogical context during learning (Bazhydai et al., 2020; Vredenburgh et al., 2015). Research shows that children might preferentially transmit information when the information is generalisable compared to when it is specific, with findings suggesting that children expect generalisable information to be transmitted in teaching contexts (for a review, see Ronfard & Harris, 2017). However, to our knowledge, no study directly tested whether children indeed transmit generalisable as opposed to specific information preferentially. We designed a behavioural study to address this question. In this study, 2-year-old children will be presented with three novel boxes, identical except their colour. In each box, one of two equally salient actions will lead to a generalisable outcome (e.g., playing a (different) tune in each box), whereas the other will lead to a specific outcome (e.g., turning on a light, vibrating the box, or making a noise). In the discovery phase, children will have a chance to discover the functions of each box presented one-by-one. Later, in the exploration phase, they will be given an opportunity to independently explore all three boxes presented together. Finally, in the transmission phase, an ignorant recipient will enter the room and ask the child to show them how these toys work. We will measure whether children will preferentially transmit either generalisable or specific information when they are asked about the function of the toys, and whether children's engagement with the toys will differ between the exploration and transmission phases. The findings of this study will not only inform us about children's selectivity when transmitting information but also about the role of information transmission in their development.

Language acquisition in time of Covid-19 – a multi-site, multi-country, multilanguage study

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[1]University of Oslo, [2]Oxford Brooks University

In an attempt to contain the coronavirus (Covid-19) pandemic, schools and kindergartens are closed nation-widely in over 165 countries (COVID-19 Educational Disruption and Response. UNESCO. Retrieved 2020-03-27). In the current, preregistered, longitudinal study, we evaluate the consequences of home-"schooling" on language acquisition in 8-36-month-old children. In particular, we aim to assess home activities and interactions that parents engage in with their children during the confinement period, and to examine their role in early vocabulary development in families with varying socioeconomic status (SES). We hypothesized, that vocabulary acquisition when not attending a kindergarten would largely be modulated by (a) differences in SES, as low-SES families might provide their children with a learning environment less conducive to rapid increases in vocabulary size (Kelly et al., 2011, Melhuish et al., 2008), and (b) everyday activities that parents would engage in with their children during the confinement period. In particular, we expect positive effects of shared book reading and structured parent-infant interactions, and negative effects of screen exposure (O'Farrelly et al., 2018; Sénéchal & Young, 2008). To test these hypotheses, we contacted parents of young children via social media and participants databases and asked them to fill in Communicative Development Inventories (CDI) early into confinement times (T1). We will recontact participants towards the end of the confinement period (T2) and ask them to fill in another CDI, supplemented with questions about daily routines during confinement (e.g., amount of book reading, parent-infant interactions, exposure to TV, screens, etc). As of March 27th, T1 data collection has started in Norway and the United Kingdom, with over 800 participants having filled in T1 questionnaires. A further 40 researchers in another 10 countries have expressed interest in launching the study locally (i.e., Australia, Bulgaria, Canada, France, Germany, Israel, Poland, Switzerland, Turkey and USA).

The Role of Shape Bias in 'Online' and 'Offline' Categorisation in Autism

Leigh Keating[1], Calum Hartley[1] and Katherine Twomey[2]
[1]Lancaster University, [2]The University of Manchester

From around 24-months-old, children develop a tendency to categorise objects by shape over other perceptual features during word learning, known as the shape bias. This bias appears to be a powerful tool that allows children to learn new words faster and make generalisations from a single example. Recent evidence suggests some children with Autism Spectrum Disorders (ASD) may not use shape as a preferred cue to category membership, which may affect the efficiency of word learning, however the relationship between this attentional bias and the ability to generalise labels to novel exemplars is not yet well understood. For much experimental research into shape bias, both the new category exemplar and the test objects are visible at all times, allowing direct ('online') comparisons to be made. Whereas children's real-life category judgements are often made from internal representations ('offline'), without a known example present. To date there has been no research into how these different task types may affect word learning for children with ASD. This talk presents a series of studies investigating the effect of visible referents during a shape bias task in a variety of cases. Study 1 uses a 'forced choice' scenario, in which a shape-match to the exemplar is pitted against two distractors. Study 2 employs a 'yes/no' task where participants accept or reject each example sequentially. Finally, study 3 investigates whether the addition of a salient local feature affects attention to global shape, and if attentional differences in ASD could contribute to an underlying explanation for some word learning and categorisation difficulties.

Investigating the transition from orienting attention to executive attention

Jordan P D. McCarthy[1], Lourdes M. Delgado Reyes[2], Samuel F. Forbes[1] and John P. Spencer[1]
[1]University of East Anglia, [2]University of Pennsylvania

Research suggests there are at least three attentional networks in the brain: An alerting system modulated by norepinephrine within the locus coeruleus, an orienting network comprising of a dorsal attention system situated within the parietal lobe and frontal eye fields, and a ventral system active in the temporoparietal junction and ventral frontal cortex. Attention in early childhood and infancy appears to be primarily controlled by the orienting network interacting with sensory systems to prioritise information. By four years of age, attention is largely controlled by the executive system, allowing resolution of task conflict via enhancing activity in goal-focussed networks and inhibiting conflicting information. We propose that children at 30-months are developmentally situated within a transitional period whereby both orienting and executive networks are active. To study this, 30-month-old children took part in a fNIRS study that involved a unified executive attention task in which anticipatory looking and disengagement was measured. Participants wore a custom EEG cap fitted with grommets securing an array of fibre-optic cables to the scalp with 16 sources and 32 detectors. The task presented one of two visually and auditorily distinct attention getters (AG) with fixation. AG presentation was followed by simple visual stimuli, with stimuli location predicted by the AG. Participants completed Training, Test, and Disengage trials. In training, stimuli would appear to the left or right of the AG, contingent with AG displayed. Test trials presented stimuli on both sides of the AG, disengage trials repeated this, but maintained the AG on screen. Participants who learned the association between AG and location demonstrated at 50% probability of producing anticipatory looks. Attentional disengagement elicited activity in both the pre-frontal and parietal regions. Anticipatory look probability and disengagement efficiency at 30-months was found to be predictive of effortful control at 42-months.

Parental perinatal depression and children's outcomes at 2 years postpartum

Laura Nix, Veronica O'Keane, Elizabeth Nixon and Jean Quigley
Trinity College Dublin

Depression is the most common perinatal psychiatric disorder, and has been associated with a range of adverse outcomes for mothers, their children, and overall family functioning. This poster is based on data collected at the fifth timepoint – 2 years postpartum – of a prospective longitudinal study examining perinatal depression, parenting behaviours and children's neurodevelopmental outcomes, from pregnancy through to 3 years postpartum. At the first timepoint, 98 pregnant women were recruited to the study, and formed three groups: 1. Depressed (those with a clinical diagnosis of Major Depressive Disorder [MDD]); 2. History (currently euthymic with previous MDD episode); 3. Control (no history of psychiatric disorder). The current study sought to examine associations between perinatal depression and children's neurodevelopmental outcomes at 2 years postpartum. 61 women, their children (M=26 months, SD=1.83; 35 boys and 26 girls), and 41 fathers, participated in follow-up appointments in the Infant and Child Research Laboratory, Trinity College Dublin. Parents' depression levels were assessed using the Hamilton Depression Rating Scale (HAM-D), children's social-emotional, cognitive, language, and adaptive behavioural development were measured using the Bayley Scales of Infant and Toddler Development, 3rd Edition (BSID-III), and parent-child play interactions were video recorded. Preliminary results indicated no direct associations between parental perinatal depression and children's social-emotional, cognitive or language development. However, an unexpected positive association between maternal perinatal depression and children's social adaptive behaviour was observed, which conferred an advantage to children whose mothers had suffered from depression. This finding is discussed in the context of differential-susceptibility theory. The analysis of observational data will enable examination of the indirect influence that perinatal depression may have on children's development. An important aspect of this analysis involves the examination of language used during play interactions. Transcription of observational data is underway, the results of which will also be presented on the poster.

Rotated object recognition and word comprehension in 12 month-olds

Ixchel Peyrot and Elda Alva
National Autonomous University of Mexico

There is evidence that object recognition is related to vocabulary size and word learning at 18 to 24 months-old. The current pilot study explores the possibility that word comprehension could be also a variable related to mental rotation task where infants have to recognize a familiar rotated stimulus changing their gaze to novel mirror object. The present study was carried under the Intermodal Preferential Looking Paradigm and only 12 months-old typically development infants participated, knowing that at this age they start to produce their first words corresponding to more experience related to language. During the visit to the lab, parents were asked to answer the Version I of the MacArthur-Bates Communicative Development Inventory (CDI) and infants watched, at a familiarization phase, 10 trials of 10,000 ms each one, with a 2D visual stimulus representation of a 3D object (as used in Moore & Johnson). Following this phase, 8 test trials of 5000 ms each one with two test stimuli were presented: the familiar test stimulus and the novel mirror object. The measures obtained were the Differential of Looking Time which is the difference from the total time to the novel stimulus minus the total time to the familiar stimulus, and CDI natural punctuations. A Pearson correlation analysis showed that there is a significant statistical correlation between the number of comprehended words of the infant and the novel looking time preference ($r = .64$, $p < .04$). This means that that those infants who were better recognizing a geometrical object had more experience with learning words and labeling objects knowing that words are used to name different objects or identify that an object could be seen from different perspectives but labeled with one name.

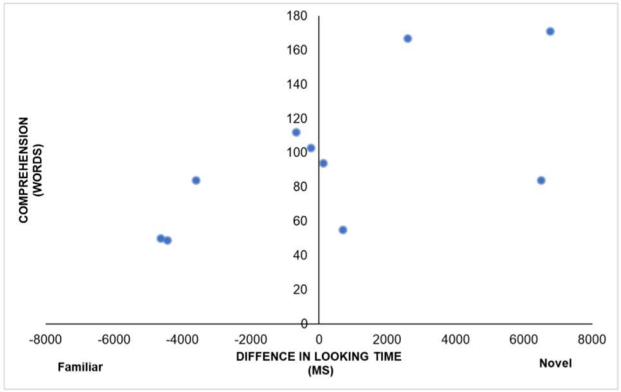


Figure 1. Correlation of rotated object recognition and CDI natural punctuations of word comprehension.

The role of child's inhibitory control in the course of mother-infant interaction

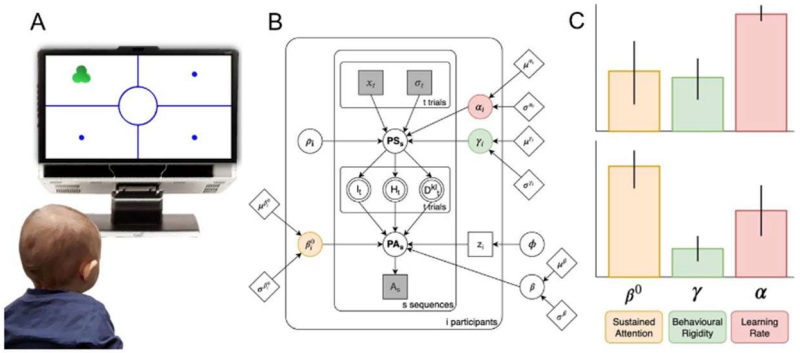
Magdalena Pietrzak and Agata Piasecka
Adam Mickiewicz University

Executive functions are responsible for organising and taking intentional actions. They play an important role not only in cognitive, social and emotional development but also in holding relations. One of the core executive function - inhibitory control – appears in the first year of life. Inhibitory control is understood as an ability to control one's behaviour and override a strong predisposition to act. Studies confirm connection between the level of child's inhibitory control and the quality of early interactions with parents. The main problem of presented pilot research concerns the interplay between the level of child's inhibitory control at 10-12 months of age and a) the amount of child's contribution in interaction, b) the length of interaction. Five mother-infant dyads took part in this research. They participated in one session which consist of the A-not-B task as an inhibitory control measure and an observation of the interaction. The observation was focused on social directed behaviours that allowed to track the mother's and child's contribution in interaction and the length of interaction as well. Results will be presented at the conference. On the base of previously and currently published studies I predict that children with lower level of inhibitory control will show less contribution in interaction. They will probably focus their attention on distracting stimuli that will result in diverting this attention from interaction with mother (i.e. increased number of interruptions and shortened duration of interaction). The summary of results will provide the preliminary knowledge about the role of child's inhibitory control in the course of interaction. This knowledge could help to find the risk factors of mother-infant interaction. It would be a good starting point for creating the method of support early interaction in risk groups (e.g. preterm infants).

Individual differences in infants' learning and attention: Early markers of later cognitive performance?

Francesco Poli[1], Mark Rietvelt[1], Rogier Mars[1,2] and Sabine Hunnius[1]
[1]Radboud University, [2]Oxford University

In the first year of life, infants learn an astonishing amount of information from their social and physical environment. Early individual differences in their attentional and learning skills might thus have a strong impact on their later cognitive development. In this study, we aim to identify reliable individual differences in infants' learning and attention which can then be related to their later cognitive performance. As a first step, we tested ninety 8-month-old infants on a visual learning task and on a classical visual habituation task. Results on the latter have been associated with IQ scores later in life (Bornstein & Colombo, 2012), but the cognitive mechanisms that support its predictive power are still debated. In the visual learning task, infants were exposed to statistical regularities while their eye-movement behaviour was measured via eye-tracking. This allowed us to examine infants' allocation of attention during learning. Using a Bayesian hierarchical mixture model, we estimated cognitively meaningful model parameters, such as sustained attention, learning rate, memory span, and behavioural rigidity. These parameters are tailored to every infant's looking behaviour, thus allowing us to capture individual differences in early cognitive skills. We then link these parameter estimates to the results of the habituation task, such as habituation time and novelty preference. In so doing, we can explore the specific cognitive mechanisms that might predict later intelligence. Furthermore, this work holds great potential in a longitudinal perspective, as the individual differences we find might be early markers of later cognitive outcomes and psychological wellbeing.



(A) By collecting eye-tracking data and (B) analysing them with bayesian modelling, we can (C) extract individual differences in infants' cognitive abilities. Note: data reported in the figure are simulation data.

Rhythm in early language acquisition: evidence from normal-hearing and deaf infants

Sofia Russo, Eloisa Valenza, Barbara Arfé and Antonio Rodà
University of Padova

The *Auditory Scaffolding Hypothesis* (Conway et al., 2009) posits that the lack of an early experience with sound may affect the general sequential-learning ability of deaf infants, leading to successive language impairments. In particular, Conway and colleagues investigated the implicit learning of sequences by means of artificial grammars, which test the ability to make use of statistical cues (i.e., statistical learning; Saffran, 2003). However, another class of cues is available for infants to infer linguistic structures: prosody, and the rhythmic aspects of language in particular (Nazzi et al., 1998; Ramus et al., 2000). Rhythm is indeed a widespread and powerful tool for temporal encoding and may therefore bootstrap language acquisition processes as in the normal-hearing, so in the deaf infants' development (Lewkowicz et al., 2006; Cason et al., 2015). To date, the effect of an early auditory deprivation on the ability to benefit from this second class of cues is underestimated in the field. Therefore, this study aims to (a) test and compare the rhythmic discrimination ability of normal-hearing and deaf, 6- to 8-month-old infants, and to (b) investigate whether it is related to better language outcomes, one year later. To address this issue, we will implement the use of vibrotactile devices for music perception in a familiarization-testing paradigm for the rhythmic task (Hannon & Johnson, 2005; Karam et al., 2009); while we will measure the linguistic outcome through standardized parent-report questionnaires (i.e., MacArthur Communicative Development Inventory) and online behavioural tasks (i.e., looking-while-listening task, Fernald et al., 2008). This work may overcome the limits of the *Auditory Scaffolding Hypothesis* by means of a new (i.e., vibrotactile) sensorial modality and through the investigation of a relatively unexplored time-sequencing mechanism (i.e., rhythm), unlocking the door for future training programs involving music and cross-modal perception.

The development of joint attention and communication from 6 to 10 months of age

Gideon Salter and Malinda Carpenter
University of St Andrews

Joint attention is widely agreed to be a key skill in infants' social development. However, there is still a lack of consensus over what exactly joint attention is, and when and how it emerges in development (Reddy, 2008; Tomasello, 1999). For example, while some have suggested that joint attention is a requirement for communication (e.g. Peacocke, 2005), other have argued that joint attention itself is a communicative phenomenon (Carpenter & Liebal, 2011). Our aim was to address these questions. Twenty-six infants participated in a longitudinal study from 6 to 10 months of age. This involved five monthly lab visits. In the lab sessions, mother-infant dyads took part in a free-play period and naturalistic communication task. In addition, an experimenter ran a battery of short behavioural tasks that tested a variety of social and non-social skills. Social tasks focussed primarily on skills related to joint attention (e.g. elicitation of sharing looks, gaze following, social referencing) and communication (e.g. request, show and give elicitation). Non-social tasks focused on skills such as means-end understanding and object permanence. Interview and questionnaire data on social and communicative development were also collected at multiple time points. Ordering analyses and analysis of individual developmental trajectories are still in progress, but preliminary results from the joint attention elicitation tasks indicate that over a third of infants (38%) initiated joint attention from as young as 6 months. Initiations of joint attention became more consistent from around 8 months, along with the emergence of communicative skills (showing, giving) occurring at around 8 to 10 months. These findings will enable us to contribute to both philosophical and developmental debates about what joint attention is, how it develops, and its relation to communication.

Race Discrimination and Preference in Bilingual Infants

Leher Singh[1], Thilanga D. Wewalaarachchi[1], Kang Lee[2] and Paul Quinn[3]
[1]National University of Singapore, [2]University of Toronto, [3]University of Delaware

Over the first year, monolingual infants undergo fundamental changes in race sensitivity. They progress from discriminating own- and other-race faces at 3-months to selective discrimination of own-race faces at 9-months. Over the same interval, infants transition from an own-race preference to an other-race preference (Liu et al., 2015). The present studies investigate whether infant race sensitivity, both discrimination and preference, is modified by bilingual experience. Sixty-eight English-Mandarin bilingual Chinese-race infants, with near-exclusive own-race exposure, were tested cross-sectionally at 3-months (N = 20), 6-months (N = 24) and 9-months (N = 24). In a between-category discrimination task, infants were habituated either to an own- or other-race face and then tested on an own- and other-race face. In a race preference task, visual preferences of the participants were measured for own- and other-race faces. Discrimination. A 3 x 2 x 2 (age x habituation race x test trial race) ANOVA with fixation time as the dependent variable revealed a significant interaction of habituation and test trial race, $F(1,62) = 9.37$, $p = .003$, but no interaction with age. Infants habituated to own-race faces demonstrated a novelty preference for other-race faces, $F(1,31) = 9.31$, $p = .005$, but infants habituated to other-race faces demonstrated no preference for own-race faces ($p = .21$) (Figure 1a). Preference. A 3 x 2 (age x test trial race) ANOVA revealed a significant preference for other race faces, $F(1,65) = 23.09$, $p < .001$, but no interaction with age ($p = .29$) (Figure 1b). The findings indicate that bilingualism may increase perceptual openness to and preference for other-race faces. Just as racial diversity may drive an other-race orientation in discrimination (Gaither et al., 2012) and preference (Bar-Haim et al., 2006), the data suggest that linguistic diversity may re-orient infants towards novelty in their environment.

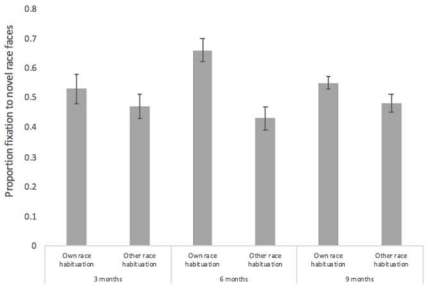


Figure 1a. Race discrimination by age and habituation race. Error bars reflect *SEM*.

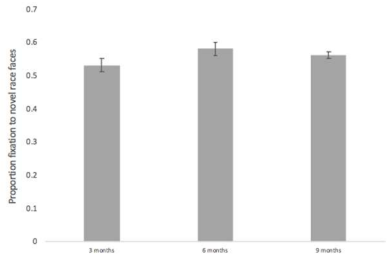


Figure 1b. Race preference by age. Error bars reflect *SEM*.

Phoneme-weighted Levenshtein Distance: A Measure of Cross-linguistic Phonological Similarity

Serene Siow[1], Gonzalo García-Castro[2], Kim Plunkett[1] and Núria Sebastián-Gallés[2]
[1]University of Oxford, [2]Pompeu Fabra University

Many studies in bilingualism have explored how form similarity between translation equivalents (i.e. cognateness) impacts language processing. Cognates range from being identical to sharing only a few key features. Although there exists some objective measures of orthographic similarity between word-forms, there is still no representative equivalent for phonological similarity. In infant bilingual research, a measure that reflects perceptual similarity of spoken words as presented in infant-directed speech would be of great value. A widely used metric for word similarity is Levenshtein distance (Levenshtein, 1966). This measure calculates word-form similarity by computing the smallest total number of substitutions, insertions and deletions needed to change one word to the other. However, a challenge when defining phonological similarity is that some phonemes (e.g. [k] and [g]) are perceptually more similar than others (e.g. [k] and [o]). The standard Levenshtein distance calculation treats each change equally. Thus it often overestimates phonological distance between words. We are developing an adaptation of Levenshtein distance for phonological representations, where edit operations are weighted according to the degree of phonemic feature changes involved, type of change (e.g. vowel or consonant insertion) and position in the word. To estimate the weights, we are collecting behavioural data in an auditory translation elicitation task. Monolingual adult participants with no exposure to the target language will be asked to guess and produce the translations of auditorily-presented words. The only way for participants to guess the correct translation is by mapping the presented unknown phonological form onto the phonology of its known translational equivalent. Cross-linguistic phonological similarity will be operationalised as the probability that participants correctly guess the corresponding translation. The higher the probability, the higher the perceptual similarity. Our weighted similarity metric will provide a useful tool for identifying phonological similarity between words in infant-directed speech.

Studying time perception in the first year with pupillometry and ERPs

Sylvain Sirois[1] and Julie Brisson[2]
[1] University of Quebec at Trois-Rivieres, [2] University of Rouen

This study examines the neural basis of the development of time perception in the first year of life. Method: Infants aged 4 months (n = 34) and 9 months (n = 34) took part in an auditory oddball task. They watched a ball on a computer monitor as it repeatedly bounced on a surface. At the time of contact, a 500Hz tone could be heard. For 80% of the trials, the tone lasted for 600ms (standard duration). For 10% of the trials, the tone lasted 300ms (short oddball); for the remaining 10% of trials, the tone was 900ms (long oddball). Infants were given 40 randomised trials in total (32 standard, 4 short, and 4 long tone durations). A Tobii X120 system (sampling @ 60Hz) was used for eye-tracking, whereas an EGI Geodesic system (128 electrodes, sampling @ 500Hz) allowed for EEG recording. Results: Eye tracking. Pupil diameter was averaged from both eyes, low-pass filtered, with missing samples linearly interpolated. Analyses do not suggest significant differences between conditions for 4-month-olds, but differences in onset and amplitude of responses by condition for 9-month-olds. ERPs. In 4-month-olds, the responses of both auditory cortices discriminate between standard, short, and long durations. We do not report such a discrimination for the left frontal cortex (LF), but it can be observed in the right frontal cortex (RF). In 9-month olds, we do not observe discriminating activity in either auditory cortex. However, the long oddball duration generates a different response to either the standard or short oddball (which are mostly indistinguishable) in both frontal cortices, which is more pronounced and sustained in LF. Discussion: The implications of striking processing differences between 4- and 9-month-olds are discussed in the context of a developmental shift from subcortical to cortical control of behaviour (cf. Colombo & Richman, 2002).

Qualitative exploration of home environment and caregiving practices for early childhood care and development for young children 0-36 rural central India

Sarinkumar Sivan, Abhishek Raut and Subodh Gupta
Mahatma Gandhi Institute of Medical Sciences

A better care and stimulating home environment during early years of life has a defining effect on a child's cognitive, social, emotional and physical development. This study presents descriptive qualitative data on home environment, roles of each caregiver and caregiving practices for early childhood care and development for young children of 0 to 36 months of age in a rural Indian context. Methodology: Qualitative cross-sectional study using in-depth interview, direct observations and a participatory learning action tool (Daily activity charts). In-depth interviews were done with 26 primary caregivers of different socio-economic strata's along with a one hour each of semi structured direct observation of their home environment and caregiving practices. The role of each caregiver in caregiving activities was assessed by plotting daily activity charts of 20 families. Analysis: Content analysis of in-depth interviews, semi quantitative expression of participatory learning action tool. Results: Caregivers from the lower socio economic strata are less conscious about the stimulating home environment or nurturing care practices for child development compared to caregivers from upper socio economic strata. However, this does not mean that the home environment and caregiving practices in the lower socioeconomic strata is inferior. Caregivers give more importance to nutrition, attention for safety, language learning, disciplining, hygiene. Opportunities for play, learning and various exposures varies depending on the caregivers. Even though the nature of physical environment is different in each households, making it a stimulating home environment depends on the caregivers. The overall emotional environment and interpersonal relations in the household varies from house to house. Mothers and old individuals who stay at home for most part of the day are found to be more involved in caregiving activities compared to fathers.

Neural responses to live social and non-social displays in infants with older siblings with ASD and/or ADHD

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While neurodevelopmental disorders like ASD are not diagnosed until childhood, differences in neural responses to social and non-social stimuli presented on screen at 6 months predicted later ASD (Lloyd-Fox et al., 2018; Jones et al., 2016). Because neural differences between infant social and nonsocial attention appear stronger for live versus screen action (e.g. Jones et al., 2015), we investigated how ASD likelihood affects neural activity during live social and non-social experiences. Eighty-six five-months old infants with a first-degree relative with ASD, ADHD or typical development watched an experimenter singing nursery rhymes (social) or operating toys (non-social) while EEG was recorded. Log theta power (3-5Hz) over frontal cortex (following Jones et al., 2015) was extracted from 1-second segments of social and non-social attention. Repeated-measures ANOVAs analysed a) the proportion of segments looking at the stimulus and b) frontal theta power by stimulus type (social, nonsocial), laterality (left, right, centre) and ASD and/or ADHD likelihood. Looking at social versus non-social features did not differ by ASD and ADHD likelihood (Fs<1, p >.3). Frontal theta power was greater during social vs. non-social attention ($F(1, 77) = 9.82$, $p = 0.002$). This difference was significantly smaller in infants with elevated ASD likelihood ($F(1,77) = 3.93$, $p = 0.05$), but not with elevated ADHD likelihood ($F(1,77) = 0.037$, $p = 0.85$). Preliminary results indicate that five-months-old infants at elevated ASD (but not ADHD) likelihood lack the typical elevation of frontal theta power during live social versus non-social attention. Because frontal theta power during social vs non-social attention typically strengthens over the first year (Jones et al., 2015), the present finding advocates delayed development in infants with elevated ASD likelihood. We will further analyse data from the same infants at 10 and 14 months and relate them to ASD outcome.

Habituation detection: Understanding infant attentional processing

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Despite the ubiquity of habituation to study infant cognition, some basic characteristics of the habituation process remain elusive. A better understanding of habituation will both advance the methods we use to assess infant cognition and provide deeper understanding of habituation itself. We ask two questions: First, what is the functional form of the habituation curve? Second, how can we optimally decide whether an individual infant has habituated? The first question is surprisingly understudied. The literature offers many solutions to the second question, resulting in different habituation criteria used in different studies. One alternative to answer these questions is a model-based approach (e.g., Gilmore & Thomas, 2002). Our model proposes to divide the habituation curve into three sections: 1) the initial level of attention, 2) habituation, where the attention level decreases with repeated exposure, and 3) the asymptotic/residual attention level, the amount of attention that remains after habituation. The model represents each phase with a separate parameter and can describe habituation curves. We can therefore explore different habituation criteria, eg., identifying when evidence is found for decreasing attention, or identifying that habituation is complete when attention level asymptotes. Common criteria used to detect habituation (eg., 50% decrement in looking from the initial looking level, Oakes, 2010) have proven to be useful and have been verified in a simulation study. However, although simulations confirm that such criteria have a high detection rate (>90%), they can also have a high false positive rate (>90%), especially in cases of high variability. The proposed model-based approach enables researchers to quantify the variability in the data. In addition, this approach provides more information than an all-or-none decision about whether infants habituated, but rather quantifies uncertainty about the eventual decision (habituated vs. not-habituated) as well as the extent to which an infant has habituated.

Emergence of word comprehension in bilingual infants

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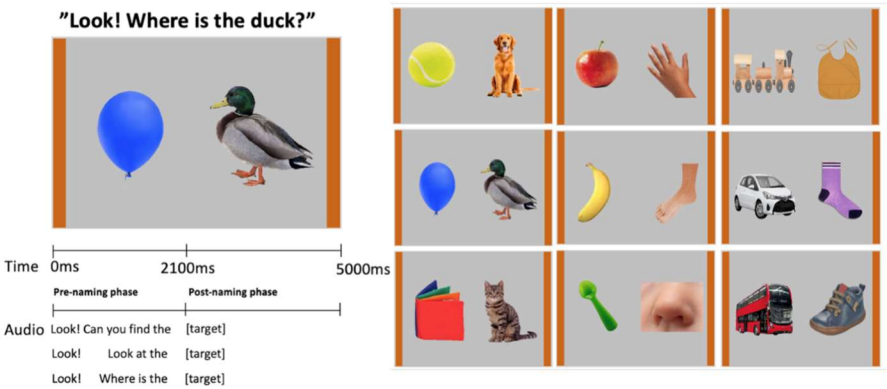
The past few years have seen growing evidence that infants as young as 6 months of age can understand the meaning of some words such as “mummy”, “feet”, or “banana” (Tincoff & Jusczyk, 1999; 2012; Bergelson & Swingley, 2012). However, all studies investigating the emergence of infants’ word comprehension have been conducted with monolingual infants. With the estimate that around half of the world’s population is bilingual (Grosjean, 2010), it is important to understand how early word comprehension develops in this population. Given that bilingual infants have been found to develop the pre-requisites of word comprehension at the same age as monolinguals (e.g., language discrimination, sound perception and word form segmentation), this suggests that they may also develop word understanding around the same age too. Yet, bilinguals’ language environment is far more complex than monolinguals’. Split input between their two languages (Braginsky, Yurovsky, Marchman, & Frank, 2019), increased exposure to non-native speakers (Place & Hoff, 2010) and increased phonological complexity of at least one of their languages (Kartushina & Mayor, 2019) may delay their word comprehension. Accordingly, the present research explores this issue. 6-to-12-month-old bilingual infants will be tested using a preferential looking task. A Tobii TX-300 eye-tracker will record infants’ eye movements while they are presented with 9 pairs of commonly understood words by this age group (according to more than 1300 CDI reports). Objects were paired together with semantically unrelated objects (i.e., toys-animals; food-body parts; vehicles-clothes). Infants will be tested twice, once in each of their languages. Analyses on the proportion of target looking between the pre- and the post-naming phase will be conducted to assess infants’ word comprehension.



The acquisition of relative clauses in the spontaneous speech of monolingual Mandarin and bilingual Mandarin-English children

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Subject relative clauses (RCs) (e.g., the dog [that bites the cat]) and object RCs (e.g., the cat [that the dog bites]) can be used to describe the same event, but children appear to acquire and process them differently. In English, RCs (in brackets in the above examples) follow the head noun. Subject RCs have the same subject-verb-object (SVO) word order as simple transitive sentences (e.g., the dog bites the cat), making them easier to acquire and to process than object RCs (e.g., Diessel & Tomasello, 2000). Unlike English, Mandarin RCs precede the head noun (e.g., [xiaogou yao de] xiaomao, ‘the cat that the dog bites’) and object RCs resemble simple SVO sentences (e.g., xiaogou yao xiaomao, ‘the dog bites the cat’). Nevertheless, there is no consistent object RCs advantage in Mandarin (cf. Tsoi, Yang, Chan, & Kidd, 2019). In usage-based theory, children learn complex constructions by building up from simpler ones and their language acquisition is influenced by what they hear (e.g., Diessel & Tomasello, 2000, 2005). We extracted all Mandarin subject and object RCs of two Mandarin-speaking monolinguals (0;08-4;05), three heritage Mandarin-English bilinguals (1;07-4;11) and their caregivers. Based on the theory, we examine whether Mandarin-speaking monolinguals produce more object RCs than subject RCs and whether bilinguals’ production of Mandarin RCs is affected by their representation of English RCs. We found that object RCs are far more frequent than subject RCs in both monolinguals (77.4% > 22.6%) and bilinguals (69.4% > 30.6%). This pattern is consistent with that found in their caregivers, supporting that the word order similarity between constructions and input frequency play an important role in children’s complex syntax development. Bilinguals didn’t perform significantly differently ($p>0.05$) from monolinguals, which might be because of their various language experience (e.g., quantity and quality of language input).

Can Late Talkers be taught a shape bias for noun extensions?

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Late talkers (LTs) show a significant delay in their language development compared to other children their age, in the absence of any conditions or disorders that could explain their delay. This delay might be related to a lack of typical word learning strategies. Contrary to typically developing children, LTs do not show a shape bias for extending object labels. Instead, they show a preference for extending labels based on texture similarities or have no preference at all (Jones, 2003). Smith et al. (2002) showed that one can teach typically developing infants a shape bias before they would normally learn it. In the current study we taught LTs a shape bias and assessed if such training promotes LTs' noun learning outside the laboratory. Fifteen LTs between 2 and 4 years of age were randomly divided into a training and a control group. Children in the training group were taught with the means of four sets of novel objects, that objects similar in shape have the same name. Children in the control group were presented with sets of real toys and their names. Both groups were taught the names and objects during 7 weekly sessions. In two further sessions, children's generalization strategies were assessed with trained (familiar) objects and unfamiliar objects. Preliminary results from 11 participants showed that children in the control group showed no preference in the generalization tasks, confirming earlier findings. Children in the training group extended labels by shape for trained and thus familiar objects, but showed no particular preference when extending unfamiliar objects. Vocabulary assessments via parental reports showed no group differences in receptive or expressive vocabulary growth over the course of training. Thus, even explicit shape bias training seems not to help LTs to pick up on a helpful word learning strategy.