WILD 2024

6th Workshop on Infant Language Development

June 19th – June 21st, 2024

University of Lisbon

Lisbon, Portugal

PROGRAM SUMMARY

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* For Conference Dinner Registrees ONLY

WELCOME

Welcome to the 6th edition of the Workshop on Infant Language Development (WILD)!

WILD was an initiative by the Basque Center on Cognition, Brain and Language (BCBL). The first WILD was hosted by the BCBL in San Sebastian in 2013. It was followed by three outstanding meetings in Stockholm in 2015, Bilbao in 2017, and Potsdam in 2019. After a one-year delay due to the pandemic, WILD returned to San Sebastian in 2022. We are delighted to welcome you to Lisbon!

WILD was created to provide a forum where developmental researchers could gather to discuss the most recent advances in the fields of early language and cognitive development, joining scientists with different perspectives and methodological approaches. To fulfill this goal, we have prepared a program with four outstanding keynote presentations and a selection of oral and poster presentations. Our program features research on many different languages, in monolingual, bilingual and multilingual settings, and typical and atypical language development. It reflects our linguistic and cultural diversity, and highlights the continuous efforts in our field towards inclusiveness and dialogue across disciplines.

We hope that you will enjoy our inspiring program and discussions. We also suggest that you take this opportunity to explore the charming and lively city of Lisbon, and its beautiful surroundings.

WILD 2024 is organized by the Lisbon Baby Lab of the Center of Linguistics of the University of Lisbon, with the support of from the Portuguese Association of Linguistics (APL), the Portuguese Science Foundation (FCT), the Mind-Brain College of ULisboa, and the Association for the Development of the School of Arts and Humanities (ADFLUL). We are grateful to all the lab members and students who were involved in the conference organization.

We hope that you will enjoy WILD 2024!

Sónia Frota and Marina Vigário

(on behalf of the WILD 2024 Organizing Committee)

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[K-1]

Not all rhythms are equal: late emergence of mora-timed rhythm in Japanese

Reiko Mazuka

RIKEN Center for Brain Science, Japan & University of Tokyo, Waseda University, Duke University

Spoken languages are rhythmic, and some have argued that rhythmic properties of speech play a role in the early stages of language development. Researchers have commonly identified three basic rhythmic types of language: English and German are considered stress-timed; French and Spanish are syllable-timed; and Japanese is mora-timed. To date, however, research on this topic has focused mostly on the stress- and syllable-timed rhythms most often found in Western languages. In this talk, we will review results of our studies that examined the emergence of mora-timed rhythms among Japanese infants and young children. Across all our studies, we found no indication that Japanese learners are initially sensitive to the rhythmic units of mora-timed language (i.e., moras). At around 10 months, however, infants seem to become sensitive to the difference between heavy (two-mora) and light (one-mora) syllables, which we construe as a sensitivity to moras per se (noting that production does not become predominantly mora-based until 11 years of age). This is significant because, as we have reported elsewhere, Japanese mothers use infant-directed vocabulary (IDV) that is predominantly trochaic (heavy-light). We propose that Japanese infants learn word segmentation according to a three-step process, by first learning to differentiate heavy and light syllables, then using that sensitivity to learn IDV, then using those words to process speech that includes non-trochaic vocabulary. This contrasts with both French and English, for which the predominant rhythmic patterns are already accessible to infants, without resort to an intermediating IDV.

[K-2]

A neuroconstructivist, transdiagnostic view of Developmental Language Disorder

Gert Westermann & Samuel Jones

Lancaster University, Bangor University

Developmental Language Disorder (DLD), which is characterized by delayed language acquisition profiles, lower spoken word recognition accuracy, word finding difficulties and attention deficits, affects approximately 7% of all children. Nevertheless, the origins of this developmental disorder are elusive. Here we present a mechanistic view of how DLD could arise, taking a neuroconstructivist perspective and using computational modelling to describe the path from early small deviations in auditory processing to higher level language problems. We show that low level deficits in auditory representations can lead to noisy lexical representations, and these sub-optimal representations overload working memory capacity and impair sentence processing. We extend these findings to a transdiagnostic view of how rational learners might disengage from the information sources that they find difficult to process, further exacerbating the deficits that characterise a specific disorder. Together, this approach highlights the strength of taking a neuroconstructivist approach to developmental disorders.

[K-3]

Babies Babbling in the Wild: Long-Form Recordings to Study Infants' Vocal Development and Speech Environments

Alex Cristia

Laboratoire de Sciences Cognitives et Psycholinguistique, Département d'études cognitives, ENS, EHESS, CNRS, PSL University

Traditional laboratory experiments have significantly advanced our understanding of speech and language use, but a reliance on controlled environments limits our ability to ensure observations generalize to real-world communication. In this talk, I offer a complementary approach that extends beyond the confines of the lab setting, aiming to enable us to test extant theories' generalization to everyday interactions with greater statistical power through larger samples. Our approach is anchored on employing machine learning to analyze speech behavior as it unfolds in real-world interactions captured through long-form recordings. These data can be interrogated in very different ways. For instance, in a 13-author collaborative study, we analyzed over 40,000 hours of audio from 1,001 children across 12 countries. Correlation analyses suggested that maturation and speech exposure were more important predictors of infants' speech development than gender and socioeconomic status. Another way in which such data can be used is to assess the extent to which causal models predict general milestones in the infant population. For example, in one study, we use state-of-the-art self-supervised learning models to argue that tailored biases are needed to face the rich variability of naturalistic audio, meaning that uninformed statistical learning cannot suffice. I couch these examples within a larger discussion of the promises and pitfalls of wearable technology to study language and communication.

[K-4]

The Sound-of-words model: a developmental perspective of phonolexical acquisition

Thierry Nazzi

INCC, CNRS – Université Paris Cité

The sound inventory of all languages contains consonants and vowels. Nespor et al. (2003) proposed a division of labor according to which consonants are given more weight in lexical processes, and vowels in prosodic/syntactic processes. The proposal of a consonant bias (C-bias) in lexical processes led to many studies. While a C-bias was mostly found in adulthood (see Nazzi & Cutler, 2019, for a review), the crosslinguistic picture from developmental studies suggests a more nuanced picture. The present talk will present an overview of the studies conducted in infancy and toddlerhood. First, it will summarize two decades of studies conducted in French, that assessed when the C-bias is first observed in development, and then started testing whether the C-bias is an innate bias, or an acquired bias, and if so whether it is learned in link with phonological or lexical acquisition. Second, it will give an overview of the studies conducted in other languages, in order to assess whether or not the trajectory found in French generalizes to other languages, and if not, the linguistic properties likely to affect this trajectory. From this, we will propose a new model of the acquisition of the phonolexicon, the Sound-of--words model, taking into account the current state of the art on this issue, and linking this acquisition to linguistic properties of the native language(s), input properties of parental/environmental speech, and later vocabulary development.

[OS-1.1]

Word segmentation in bilingual infants acquiring rhythmically different languages

Annika Unger[1], Barbara Höhle[1] & Claudia Männel[2,3]

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Speech segmentation is a major challenge in first language acquisition due to the continuous nature of spoken language. Prosody has been shown to facilitate word segmentation in infants (Jusczyk et al., 1999), though the use of prosodic cues is language-specific (Polka & Sundara, 2012). Infants growing up bilingually thus face a distinct challenge, as word-level prosody differs across languages. Using electrophysiology, we here ask, how bilingual infants segment words from rhythmically different native languages that may require language-specific adjustments of segmentation procedures (Polka et al., 2017). In an event-related brain potential (ERP) study with 9-month-old German-French bilinguals (n=36), we evaluated infants' segmentation of bi-syllabic words in both native languages. German and French are particularly interesting due to their different rhythmic characteristics, with German having lexical stress and French lacking lexical stress. For each language (with counterbalanced order), infants were familiarized with text passages and then tested with a list of familiarized and non-familiarized words. Differences in ERP responses to test words would indicate infants' recognition of familiarized words and their segmentation from sentences during familiarization. Infants showed more negative-going ERP responses to familiarized versus unfamiliarized words for both languages ($p < .001$), indicating bilinguals' abilities of word segmentation across rhythmically different languages. In addition, preliminary ERP results suggest cross-linguistic differences in infants' word segmentation based on language dominance. In conclusion, the current study provides evidence that bilingual infants are similarly able to segment words from continuous speech across rhythmically different languages and that these abilities develop in a comparable way to monolingual language learners (see Jusczyk et al., 1999; Houston et al., 2000; Höhle, 2002; Männel & Friederici, 2013).

[OS-1.2]

The role of language-specific cues in predictive behaviours in monolingual and bilingual infants

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Prediction, which involves encoding patterns in the environment and updating expectations in light of new information, is an important component of language processing. Recent evidence suggests that early bilingual experience may shape the development of early prediction abilities. Specifically, bilinguals' experience of monitoring two linguistic systems is proposed to shape their information encoding patterns. That is, bilinguals may establish stronger predictions compared to monolinguals when these predictions are relevant to encoding language-specific information. We designed a novel version of an anticipatory looking task to test infants' ability to establish and update predictions when provided with language-specific information. We collected gaze data from 9-month-old Spanish or Basque monolinguals (n=24; M L2 exposure=4.6%) and Spanish-Basque bilinguals (n=18; M L2 exposure=39.5%). Following an auditory cue and a 1- second anticipatory period, infants predicted the location of a target appearing on one side of a screen for 9 trials (pre-switch), and then on the opposite side for 9 trials (post-switch). The auditory cues comprised 4-syllable strings matching Spanish and Basque word orders (VO/OV) and prosodic properties (duration/pitch). Each phase presented infants with cues from only one language (e.g., Spanish pre-switch and Basque post-switch). Gaze proportions to the expected target location during the anticipatory period were analysed. Overall, infants accurately predicted the target location, performing significantly better in the pre- compared to the post-switch phase, with target anticipation increasing throughout each phase. This indicates that infants persisted at first in their previously-learned behaviour before updating their predictions. Interestingly, the same patterns emerged between monolinguals and bilinguals, irrespective of degree of L2 exposure. We will discuss these findings in light of theories on the effects of bilingualism on attention, and present vocabulary data for these infants at 18-months to explore the link between early prediction abilities and later individual language outcomes.

[OS-1.3]

Infants' phonotactic sensitivities to regularities involving low-salient fricatives: a cross-linguistic study

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Infants' sensitivity to language-specific phonotactic regularities emerges between 6- and 9-months of age (Friederici & Wessels, 1993; Jusczyk et al., 1994). However, the acquisition of phonotactic regularities involving perceptually low-salient phonemes (i.e., phoneme contrasts that are difficult to discriminate), has rarely been studied and prior results show mixed findings (Gonzalez-Gomez & Nazzi, 2015; Henrickson, Seidl & Soderstrom, 2020). Here, we aimed to assess infants' acquisition of such regularities involving the low-salient contrast of /s/- and /ʃ/. Using the headturn preference procedure, we assessed, in two experiments, whether French- and German-learning 9-month-old infants are sensitive to language-specific regularities varying in frequency within and between the two languages. Experiment 1 (N = 48) targeted infants' sensitivities to word-initial consonant clusters (i.e., /st/ and /sp/ frequent in French, but infrequent in German, /ʃt/ and /ʃp/ frequent in German, but infrequent in French). In Experiment 2 (N = 48), we investigated infants' sensitivities to word-initial singletons followed by a vowel (i.e., /sV/ frequent in French, but infrequent in German, /ʃV/ frequent in German, but infrequent in French). We analyzed the data using mixed-effects models. French-learning infants showed significant sensitivities to language-specific phonotactic regularities, with a familiarity preference in Experiment 1 and a novelty preference in Experiment 2 (Exp 1: $p < .05$; Exp 2: $p < .001$), while we did not find statistical evidence for phonotactic sensitivity in the German-learning infants group (Exp 1: $p = .36$; Exp 2: $p = .55$), suggesting crosslinguistic acquisition patterns. Although not significant in Experiment 1, the interaction between language and phonotactic was significant in Experiment 2 ($p < .05$), confirming that French and German groups' sensitivities to phonotactic regularities differed between each other. Our findings suggest that infants' early phonotactic sensitivities extend to regularities involving perceptually low-salient phoneme contrasts at 9 months, and highlight the importance of conducting cross-linguistic research on such language-specific processes.

[OS-2.1]

Unweaving WEIRD Patterns in CHILDES: Biases in Naturalistic Recordings

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Recent investigations into mainstream journals highlighted a significant bias in developmental studies, with a predominant focus on WEIRD (Western, Educated, Industrialized, Rich, and Democratic) populations, raising concerns about the reliability and generalizability of research findings. To further explore this issue, we focus on the CHILDES (Child Language Data Exchange System) database, which serves as the primary repository for naturalistic language recordings and transcripts used in language acquisition research. We systematically review the database to uncover potential biases of naturalistic language input samples. We assess corpora across four critical dimensions known to influence early language input: Socioeconomic Status (SES), Urbanization, Family Structure, and Languages. SES encompasses aspects such as education, wealth, and occupation, while Urbanization distinguishes between urban and rural settings. Family Structure delves into variables like the average number of children per household and the family's composition (extended or nuclear). Languages consider the number of languages in each corpus and the children's lingual status (monolingual, bilingual, or multilingual). We describe results at both country and corpus-level. While our examination of 180 corpora within CHILDES reveals a rich representation of languages and countries, it also uncovers biases across all dimensions and levels of analyses. Specifically, we find that CHILDES corpora predominantly sample from middle to higher SES backgrounds. In nearly half of the corpora, children had parents with research-related professions. Furthermore, the data is skewed towards urban settings and nuclear family structures. While naturalistic samples in CHILDES include more than 43 different languages, two-thirds of corpora feature monolingual children. In summary, the naturalistic recordings found in CHILDES predominantly feature wealthier, highly educated, urban, and monolingual nuclear families. Although these biases may impact specific research questions differently, it is crucial to acknowledge their existence. Our findings underscore the need for greater inclusivity and diversity in sampling methods within child language studies.

[OS-2.2]

Language Mixing Patterns in Multilingual Homes: Evidence from Daylong Recordings

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Research exploring language input in multilingual environments show that infants experience language switching not only during short free-play sessions (Bail et al., 2015) but also in naturalistic settings captured through daylong audio recordings (Kremin et al., 2022). While studies in monolingual settings reveal variability in language input throughout the day, often associated with daily activity patterns (Casillas et al., 2020; Soderstorm & Wittebolle, 2013), understanding such variation in multilingual homes, including features like language mixing, remains limited. This study explores time-of-day (morning, afternoon, evening) effects on language mixing in 23 multilingual families raising 6-20 month old infants in London. Families audio-recorded two days at home, and we annotated 60 minutes (12 x 5-minute segments) per family. Infants experienced an average of 17.47 minutes of speech per hour (Median = 16.36, Range = 9.72 - 37.38). Language mixing instances, defined as switches between languages within and across utterances and speakers, were quantified using a language switching proportion score calculated as the number of switches per 5-minute segment out of the number of language switching opportunities (total utterances - 1). We fitted a mixed-effects linear regression model to predict the language switching proportion, from time-of-day, number of speakers, and child age. The presence of two speakers (instead of 1) significantly increased language mixing ($\beta = 7.02$, SE = 2.67, $t = 2.62$, $p = .009$) along with infants' age ($\beta = 0.02$, SE = 0.01, $t = 2.140$, $p = .04$), but time-of-day did not ($p > .3$; though note individual differences between families, Figure 1). Future analyses will explore speaker specific code-switches (inter- and intra-sentential) and differentiate child-directed from other-directed language mixing. We will also examine if the time-of-day effect depends on the activity the child is engaged with. In summary, these findings imply a need to reassess language mixing estimation approaches in multilingual contexts.

[OS-2.3]

How to count words (or their parts): Measures of speech quantity and complexity in multilingual, translanguaging populations using word versus morpheme boundaries

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In child language research, counts of words/morphemes are commonly used as a measure of speech quantity, and in computations of metrics for speech complexity (e.g., MLU). As most prior research has been conducted in monolingual samples (Kidd & García, 2022), decisions about the unit of linguistic analysis tend to be straightforward, as word-building rules keep the relationship between word-count and morpheme-count stable within a language. However, in multilingual contexts, parents and children may speak in any of their languages, or translanguage, making use of their linguistic resources together. Such practices mean the relationship between word-count and morpheme-count can vary greatly within a conversation, or even a single sentence. As morphemes are meaning-bearing units of speech, we propose that the morpheme is an optimal unit of analysis in multilingual/translanguaging samples, and we demonstrate the use of morpheme counts in parent-child conversations featuring four typologically distinct languages: English, Mandarin Chinese, Malay and Tamil, ranging from analytic to agglutinative. Spontaneous child-directed speech was elicited using a wordless picture book ('Little Orangutan: What A Scary Storm', Styles, 2020) in a large sample of parent-child dyads in Singapore (N = 146, child age range: 8 to 40 months). The corpus was transcribed by research assistants using a protocol designed to capture translanguaging. Counts of speech quantity were conducted using a) word boundaries and b) morpheme boundaries using automated morphemisers, a decision protocol for manual checking, and manual morphemising protocols for each language. In this paper, we 1. present a principled justification for the use of morphemes as a unit speech quantity/complexity in multilingual contexts, 2. describe a cross-linguistic morphemising workflow, and 3. demonstrate how the choice of word versus morpheme boundaries influences metrics derived from the full corpus. Implications for child language science and automated 'word count' estimates derived from English are discussed.

[OS-3.1]

Decoding Early Vocabulary Acquisition: Naturalistic evidence from EEG encoding models across the First Five Years

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Infant language acquisition is marked by rapid learning, with comprehension of some basic words emerging within the first year of life. Measuring the earliest stages of lexical acquisition experimentally remains challenging due to infants' limited attention and overt response capacities. In this study, we assess the acquisition of lexical knowledge from electrophysiological (EEG) recordings of infants listening to naturalistic children's stories. Our quasi-longitudinal dataset comprised a final sample of 51 children (31 female) between 3 months to 5 years of age, assessed twice within a 3-month time window. Children heard translation-equivalent stories in their native language (German) and an unfamiliar language (French). We quantified word processing from continuous EEG through temporal response functions of EEG deconvolution models. Analyses revealed a significant word onset response between 100–300 ms in the native language, which increased with infant age (t=2.34, p=.021). This response was absent in the unfamiliar language. Together, this indicates that infants' brains registered the onsets of native words in fluent speech. To assess whether this effect indeed reflects the neural representation of word forms in infants' emerging mental lexica, we tested for a modulation of onset responses by age of acquisition. We calculated the probability of a child producing a word based on vocabulary trajectories from Wordbank. Strikingly, our mixed-effects models demonstrate a decrease in the word onset response for more familiar words (t=-2.17, p=.029). We interpret this as evidence that familiar words are processed more efficiently. More generally, it suggests that infants' emerging lexical representations are mirrored in their EEG responses to natural speech. In sum, we provide first evidence for the usefulness of EEG deconvolution to trace the emergence of the mental lexicon during naturalistic stimulation. Using language models and syntactic annotations, we currently aim for applying our EEG methodology for revealing the emergence of semantic and syntactic processing.

[OS-3.2]

Neural Tracking of Audiovisual Speech in 10-Month-Old Infants and Relationship With Vocabulary Development

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In face-to-face interactions, infants are exposed to both auditory speech and visual speech cues, including rhythmic movements of the lips and mouth. Infants' sensitivity to these cues has been well-established; however, there isn't much work on their effect on infants' neural processing of continuous speech. Neural tracking of speech, which refers to the synchronisation of neural oscillations with the speech envelope at multiple frequencies, plays a role in speech processing, and potentially in language development. Visual speech cues, particularly at the syllable rate, may enhance neural tracking through the temporal synchronisation of lip movements and the acoustic envelope. In this study, we investigated whether visual speech cues facilitate infants' neural speech tracking and its relationship with vocabulary development. Ten-month-old Dutch-learning infants watched videos of a speaker reciting passages in infant-directed speech, while EEG was recorded. Half of the videos displayed the speaker's full face (AV-condition), while the mouth region was masked with a static block in the other half (AV-Blocked-condition). Neural tracking was measured using speech-brain coherence (SBC) at stress and syllable rates (1–1.75 and 2.5–3.5 Hz in our stimuli). Using cluster-based permutation, we first compared real SBC to surrogate data, and then tested differences in SBC in the two conditions at the frequencies of interest. Additionally, infants' receptive and expressive vocabulary 10 and 18 months were assessed using the N-CDI. Our findings (N = 34) revealed robust neural speech tracking at both stress and syllable rates. However, no differences were identified between the two conditions, indicating comparable tracking with and without visual speech cues. Moreover, infants' neural speech tracking abilities predicted later vocabulary development at 18 months. This study demonstrates that infants' neural speech tracking is not hindered when visual speech cues are masked, and suggests that it may be a key mechanism in language acquisition.

[OS-3.3]

Cortical tracking of native and non-native speech in bilingual and monolingual Spanish/Basque infants at 4 and 7 months

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During their first year, infants' speech processing abilities become attuned to their native language(s), enabling the extraction of meaningful linguistic information from the speech signal. Recently, cortical tracking of speech (CTS), the synchronization between neural oscillations and the temporal structure of the speech envelope, has been proposed as the neural mechanism underpinning the ability to process speech information at different timescales. Here, we tested this proposal by assessing CTS development at slow frequency rates (<3Hz, Delta band, corresponding to the phrasal rate in speech, and 4-8Hz, Theta band, corresponding to the syllable rate). Additionally, we investigated the potential influence of bilingualism on CTS given bilingual infants' additional challenges of differentiating and acquiring two linguistic systems instead of one. We will present preliminary data (33 monolingual; 26 bilingual, L1 exposure M=60%) from a large-scale longitudinal study of language development in monolingually- and bilingually-raised children acquiring Spanish and/or Basque from 4 months to 7 years. We assessed CTS at 4 and 7 months to test the prediction that CTS efficiency to infants' native language(s) compared to a non-native language increases with age. We recorded continuous electroencephalography while infants listened to ~5-minute stories in Spanish, Basque (native/dominant languages), and English (non-native language). Preliminary analyses of speech-brain coherence unveil distinct CTS patterns for native/dominant and nonnative languages. Delta and Theta coherence was higher for the nonnative compared to the native/dominant language. Bilingualism and age effects were not significant, except for a trend for a decrease in Theta coherence from 4 to 7 months. These findings confirm that infants differentially process native and nonnative languages already at 4 months. We will discuss the speech-brain coherence patterns in relation to a potential developmental shift from speech processing based on large-scale (encoded by Delta and Theta frequency bands) to faster and smaller-scale information in speech.

[OS-3.4]

The Effect of Early Bilingualism on Executive Functions: A Training Study

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According to the bilingual cognitive advantage (BCA), bilinguals exhibit greater executive function (EF) abilities than their monolingual peers. Although this advantage has been reported in children as young as 6 months of age, many studies have failed to consistently replicate these results. Given that the current literature mainly uses correlational designs, the present study aims to determine whether teaching monolingual children a second language will lead to greater increases in EF than if taught new words in their native language. Two groups of 20 -to 27-month-old children are undergoing a 12-week online training program during which 9 translation equivalents (TEs; experimental condition) or 9 novel words in their native language (control condition) are taught weekly. Participants' EF is compared pre- and post-intervention using the Early Executive Functions Questionnaire, which assesses the four following scales; working memory (WM), flexibility (F), inhibitory control (IC), regulation, and the following factor: cognitive executive function (CEF, which loads onto WM, F, and IC). Word learning is assessed weekly with a forced choice task based on touch and at the final session for 25% of all words taught. Preliminary results (N=26) suggest that both groups were equivalent in age postintervention and EF abilities pre-intervention. In addition, results suggest that learning TEs and learning new words in one's native vocabulary are equally difficult. Results also suggest that CEF increased across time only in the experimental group and that F increased across time only in the control group. Thus, these preliminary results suggest that toddlers' acquisition of TEs benefit more EF abilities than acquiring new words in their native language.

[OS-4.1]

Sensorimotor influences on infant speech perception: phonemes, stress and intonation

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Recent advances on the perception-production link in early development revealed sensorimotor influences on auditory speech perception in English-learning pre-babbling infants. Sensorimotor influences were shown to modulate phoneme discrimination, highlighting the integration of sensorimotor information and auditory speech prior to production. Although the perception of prosody is multimodal, sensorimotor influences on prosody perception have not been investigated. We examined the selectiveness, generalizability and potential cross-domain impact of sensorimotor influences, by testing a novel (native) phoneme contrast (/da/-/za/), a stress contrast (trochaic/iambic stress) and an intonation contrast (statement/question intonation). In three experiments, Portuguese-learning 6-month-old infants listened to the speech contrasts without and with oral-motor impairments induced by two teething toys: a gummy teether and a flat teether. A modified version of the visual habituation paradigm was used to test discrimination of the phoneme contrast (P), and of the intonation contrast (I). The anticipatory eye movement paradigm, implemented with eye-tracking, was used to test perception of the stress contrast (S). Three groups of infants (no object in the mouth, with gummy teether, and with flat teether) performed P, I and S, with experiment order counterbalanced across participants. 71 infants were included in the study. Infants discriminated the phoneme contrast only in the absence of a teething toy. Similarly, the stress contrast was discriminated without a teether, while both teethers disrupted discrimination. Discrimination of the intonation contrast was found both in the absence of the teething toys and in the gummy teether condition, but not in the flat teether condition. Our results are the first to suggest that sensorimotor influences modulate speech perception beyond phoneme discrimination. Their effects on infants' prosody perception were different for stress and intonation, pointing to specificity in the sensorimotor influence. These findings offer new insights into the significance of the perception-production link in language acquisition.

[OS-4.2]

A vibrotactile rhythmic priming for processing language

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Rhythmic priming tasks have been largely applied to investigate the possibility to transfer benefits from short-term exposures to musical rhythms across domains, including language (Cason et al., 2015; Fiveash et al., 2020). Moreover, the rhythmic priming effect was found to occur across sensory modalities, such as auditory to visual (Fotidzis et al., 2018) and visual to auditory (Gould et al., 2018). However, very few studies investigated the cross-modal influence of vestibular, tactile, and sensorimotor (VTS; Provasi et al., 2014) inputs. Surprisingly, although the core involvement of sensorimotor processing is accounted for in nowadays models of rhythm perception (Fiveash et al., 2021; Nayak et al., 2022), the potentiality of VTS sensory modality is significantly underestimated in the field. Based on previous research on the role of VTS rhythmic abilities in language acquisition (Russo et al., 2024), this Study tests for the first time to our knowledge the benefit of processing language when primed by a matching, short-term VTS rhythmic exposure. Infants were presented with a rhythmic prime via a vibrotactile system for music perception (Russo et al., 2024); then, VTS rhythmic primes were followed by matching or mismatching linguistic sequences via auditory modality. Changes in pupil diameter were collected in a gaze-triggered paradigm as index of cognitive effort (Calignano et al., 2023). Data were modeled via generalized, linear mixed models and model comparison was performed to maximize statistical robustness while accounting for inter-individual variability (Nieuwenhuis et al., 2012). Preliminary results on 16 participants (M age: 340 days, SD:117) point toward potential cross-domain and cross-sensory effects of VTS rhythm on language. Findings are discussed within current frameworks on rhythm in language (i.e., Temporal Sampling Framework, Goswami, 2011; Processing Rhythm In Speech and Music framework, Fiveash et al.,2021) with promising impacts for screening, training, and educational practices.

[OS-4.3]

Covering the eyes or mouth of a speaker does not prevent toddlers' word learning

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Prior research shows that both infant gaze-following skills and attention to the mouth of a talking face are positively correlated with vocabulary growth during the second year of life. This correlational evidence has prompted researchers to suggest that these two attentional strategies are essential mechanisms that support infants' acquisition of new words. If that is the case, covering the eyes or the mouth region of a talking face that teaches infants novel word-object associations should disrupt or diminish their word learning performances. To explore this question, we recorded 17- to 42-month-old toddlers' eye gaze (N=165) while performing an audiovisual word learning task in one of three conditions: 1) Full-Face condition, with the face of the speaker teaching new words entirely visible, 2) Glasses condition, with the eyes region of the speaker covered by black opaque glasses, and 3) Mask condition, with the talking mouth and nose of the speaker covered by a black surgical mask. The results showed that infants from 24 months of age learned the new word-object associations, and crucially, that they did so regardless of condition. Interestingly, in the Full-Face condition, word learning performance correlated with infants' gaze following behavior (i.e., target-object looking and face-target shifts) but not with attention to the eyes or mouth. These results show that word learning capacity from a quick audiovisual interaction emerges around 24 months of age and suggest that infants' optimal attentional strategy at this stage involves social understanding (i.e., gaze following, social referencing) and object exploration, rather than attention to the eyes or mouth of the speaker. In this talk I will discuss the implications of these results, notably for naturalistic vocabulary learning situations.

[OS-4.4]

Exploring Multimodal Interactions: Haptic Cues Between Adults and Infants Aged 9 to 12 Months.

Eva Murillo[1], Irene Rujas[2], Teresa Sierra[1], Elvira Zamora[1] & Guzmán Azagra[1]

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The aim of this study was to analyse the use of touch in the communicative interaction of dyads comprising adults and infants at the end of their first year of life. We examined the extent to which touch was involved in communicative interactions and how the use of physical contact changed with age. We observed whether the physical contact was initiated by the adult or by the infant and how haptic information was coordinated with speech. Additionally, we analysed the function of haptic cues when the physical contact was adult-initiated vs. infant-initiated, as well as the use of objects in the communicative interchanges involving haptic cues. We longitudinally observed 22 parent-infant dyads in a spontaneous play situation with toys when the infants were 9 and 12 months old. Results showed some form of physical contact during 13% of the observation time. There was a tendency for physical contact to decrease with infant's age, but only when it was adult-initiated. When infants initiated the contact, it was primarily for affectionate purposes. In contrast, adult-initiated contact served a variety of functions, and was accompanied by infant-directed speech around 75% of the times. Our results revealed that adult-initiated contact frequently involved the use of objects, meaning that the adult touched the infant using a toy or placed the toy on the child's body. Adults tended to use of objects symbolically when interacting with infants, showcasing the object's characteristics, and coordinating these actions with speech. Our findings suggest that physical contact is highly coordinated with speech, especially when it involves an object. These results highlight the importance of considering haptic cues when studying joint-attention formats and analysing the role of haptic cues in promoting lexical development and language processing abilities.

[OS-5.1]

The development of turn-taking skills in autistic and typically developing children

Christopher Cox[1], Riccardo Fusaroli[1], Ethan Weed[1], Deborah Fein[2] & Letitia Naigles[2]

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Turn-taking and language go hand in hand for adults, but long before children start to produce and understand words, they engage in reciprocal vocal communication with their caregivers. To engage in vocal communication with caregivers, young children have to adapt and respond to caregivers' cues in real time. In this study, we empirically evaluate existing meta-analytic findings that suggest no reliable changes in turn-taking as children develop and longer pauses between turns in conversations with autistic children (Nguyen et al., 2022). By analyzing spontaneous speech in 64 parent-child dyads from a longitudinal corpus, we extend the state-of-the-art by assessing how individual differences in linguistic, socio-cognitive and motor development relate to different turntaking behaviours. We included 32 children diagnosed with autism and 32 linguistically matched typically developing children (mean age at recruitment respectively 32.76 and 20.27 months). Multi-level Bayesian ex-Gaussian regressions were used to model turn-by-turn conversational dynamics in terms of concurrent self-adjustment (intrapersonal autocorrelation of latencies) and interpersonal adjustment. As shown in Figure 1, we revise and advance previous meta-analytic findings. Children with autism respond faster on average than typically developing ones (ER = 24) due to higher speech overlapping, and both groups decrease response latency with development (children with ASD by 78 [54; 102] ms, every 4 months, TD 47 [30; 64] ms). Individual differences also play a role in turn-taking; the faster the response, the higher the socialization, linguistic and motor scores of the child (ERs > 20). Children and caregivers also display positive self- and interpersonal adjustment in both groups; both variables persist across 3-5 turns, creating joint "waves" of slower and then faster sequences of turns. With these findings, we advance the meta-analytic results and argue that these mechanisms of turn-taking provide useful insights into the reciprocal nature of language development.

[OS-5.2]

Multimodal verb input to children with and without hearing impairment

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Embodied theories of language point to a direct link between language and action. When interacting with their infants, caregivers synchronise their actions with nouns and verbs. These patterns have not been examined developmentally and were mostly observed in the input to infants with normal hearing (NH). Impaired access to auditory speech, as in the case of infants with hearing impairments (HI), might lead caregivers to use multimodal cues to scaffold speech. Here we explore caregivers' multimodal verb input to their NH and HI infants at 14, 22, and 36 months of age. We used the Ambrose (2016) CHILDES corpus of longitudinal video-recorded play interactions of mothers with their NH and HI infants. Thus far, we have analysed data from 13 dyads from each group when infants were 14 months-old. For each verb, we examined whether it occurred with depictive and other cues, and we specified its agent as either caregiver- or infant-led. An ANOVA showed a significant main effect for type of multimodal behaviour ($F(1, 24) = 33.841$; $p < .001$; $\eta 2 = .585$): depictive cues were used more frequently (Depictive: M = 70%, SD = 16%; Other: M = 30%, SD = 16%), and a significant main effect for agent ($F(1, 24) = 4.982$, $p < .035$; $\eta 2 = .172$): caregiver-led multimodal behaviours (M = 59% , SD = 21%) were used significantly more than infant-led (M = 41% , SD = 21%) ($p = .035$). We also found a significant Group*Agent interaction effect ($F (1, 24) = 4.673$; $p < .041$; $\eta 2 = .163$) driven by the HI Group. These results suggest that caregivers accompany their verbs with actions that depict the meaning of the verbs. Caregivers of HI infants used multimodal labelling more frequently when using verbs that referred to their own actions rather than their infants'. Once all data is coded, we will examine whether these patterns persist throughout development.

[OS-5.3]

Investigating infants' production of syllables following full cleft palate surgery: early syllable sequences as a marker of the typical vocal trajectory.

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This study examined ~10,000 vocalisations from 28 English-acquiring 14-month-olds after cleft palate (CP) repair. Each infant was analysed once 1-9 months post-surgery. All infant vocalisations produced in hour-long segments from day-long LENA recordings were phonetically transcribed and analysed alongside data from clinical assessments at 24 and 36 months. Analyses revealed sample-wide preferences: glottal articulations; voiced, plosive consonant categories; vowels with high acoustic-articulatory contrast; and an absence of fricatives until 24 months. The rarest sounds–e.g., post-alveolar fricatives–tended to be produced by infants with consistent consonants in their repertoire (produced 50+ times), suggesting they were further along the vocal trajectory than infants with fewer. Vocalisation complexity was numerated using a mean babble level (MBL) measure between 1 and 4, with the highest score allocated to vocalisations with >1 supraglottal consonant, and the lowest with only a vowel, glottal and/or glide. Initial findings revealed that palatal age (months since surgery) was a significant predictor of vocalisation frequency (intercept=4.03, p=0.003) and MBL (intercept=2.33, p=0.04) at 14-months; higher palatal ages predict higher vocalisation count and MBL. Highest within-group variability on frequency, length, and complexity of vocalisations was found between 1-3 months post-repair, while such variability seems to stabilise 4+ months after surgery. Given these results, the sample was indexed based on palatal age. The relationship between MBL and number of consistent consonants in infants' production repertoire was significant (R=058, p=0.001), as was MBL with number of mature consonants–excluding glottals and glides–produced (R=0.72, p<0.001). Findings provide evidence that phonetic measures of babble may be a rich tool for predicting and/or recognising production milestones in infants with CP, which could be valuable to parents and therapists for treating earlier ages than provisions currently target.

[OS-6.1]

Seeing Through Language: Structure of the Language Input to a Blind Child

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There is no doubt that language plays an important role in shaping lexico-semantic knowledge in blind infants and children. However, it is unclear what information from language and what learning mechanisms support their early acquisition of semantic knowledge. Previous work suggested that blind learners may use theory-like linguistic and conceptual knowledge to make inferences based on language (e.g., Kim, Elli, & Bedny, 2019). These kinds of proposals are however circular – lexico-semantic knowledge itself has to be learned first, and it has to be acquired via language input. On the other hand, there is solid evidence that even infants can track simple regularities with which words reliably co-occur in language (e.g., Wojcik & Saffran, 2015), and that these regularities can foster the development of semantically organized word knowledge in sighted children (Unger, Yim, Savic, Dennis, & Sloutsky, 2023). The current investigation built upon this evidence and investigated the semantic information available from regularities of word use in language input to a blind child. We report analyses of a large corpus of densely sampled language input to one blind child, ages 16 to 25 months (Wilson & Peters; 1988) and demonstrate that simple word co-occurrence in their input provided reliable signal from which this child could built foundations of early lexico-semantic knowledge. Most importantly, we demonstrate that if the child was to solely rely on simple associative learning mechanism to build connections between the words in their input, they would be able to differentiate between semantically related and unrelated words in 4 out of 5 (Bergelson & Aslin, 2017; Willits et al, 2013; Sirri & Rämä, 2015; Delle Luche et al, 2014; Rämä, Sirri, & Serres, 2013) studies we used in our analyses ($p < .001$). We further compare semantic information present via labeling of typical features and simple word co-occurrence statistics.

[OS-6.2]

Bridging Word and World: Vocal Iconicity in Chinese Child-Directed Speech and Child Production

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Iconicity plays an important role in language acquisition and cognition. This study aims to better understand the use of three types of vocal iconicity in Chinese adult-directed speech (ADS), child-directed speech (CDS), and child production, including sound effects (e.g., making the sound of eating), onomatopoeia (e.g., meow), and iconic prosody (e.g., looong). We analyzed a corpus of Chinese ADS and CDS (including 6740 utterances), in which mothers semi-spontaneously told the same story to an adult and their 18-monthold (N = 21) or 24-month-old (N = 19) children. We asked the following research questions: First, what are the differences in the frequency of vocal iconicity between CDS and ADS? Second, how is iconicity prosodically modulated in CDS? Third, do18- and 24-month-old children begin to produce the three types of vocal iconicity, especially iconic prosody? Our findings revealed that (1) mothers used significantly more sound effects and iconic prosody in CDS compared to ADS, but not onomatopoeias. Interestingly, mothers' iconic prosody was also acoustically more congruent with lexical meanings, such as slowing down when saying "slow" and speeding up when saying "fast"; (2) The frequency of these types of iconicity in CDS followed this order: iconic prosody > sound effects > onomatopoeias; However, children hardly produced any iconic prosody in this corpus, except or one instance of repeating mother's high pitch when saying "high". (3) While previous research shows that onomatopoeias are among the first words that young children produce, children were able to produce sound effects, but they had not yet produced lexicalized onomatopoeias by this age. These findings suggest that iconicity is more prevalent and prosodically marked in CDS than in ADS, which may help children's word-to-world mapping. Also, iconic prosody is an advanced prosodic skill that is not typically developed by two-year-old children.

[OS-6.3]

Transparent touchscreens: observing infants' and children's exploration and learning during social interactions

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Infants often engage in gaze-following behaviors when interacting with adults or children. Such gaze-following patterns are considered precursors to social interaction and language learning. Previous studies have typically used laboratory tasks to investigate infants' and children's attention to social cues and their learning during interactions with others. To enhance research feasibility of the interactive components inherent in children's everyday interactions, we introduced a dual touch screen platform known as the Dyadic Interaction Platform for children (DIPc), see Figure 1. This setup enables both partners to see each other through a transparent screen, facilitating direct eye contact, while participants can simultaneously attend to projected images of novel objects in lifelike social interactions.
We present data from two studies using the DIPc: first, we explore gaze-following patterns in children with a familiar social partner to explore differences in the extent to which children follow the gaze of their caregiver compared to their friend (age-range: 10-67 months, N=89). Second, we examine word-object learning in children during social interactions with either a peer or the child's mother (age-range: 47-67 months, N=91). Our findings indicate that, during interactions with peers, children were more likely to recognize objects on the screen upon labeling when they had actively sampled the objects by touching them on the screen beforement, which initiated naming of the object. However, they were more likely to recognize word-object pairs when they had previously observed their caregiver sample the object on screen which initiated naming of that object. The method thus revealed that children employ dynamic strategies during word-learning in face-to-face interactions, effectively bridging the gap between traditional study setups and the dynamic complexity of genuine social exchanges in a more nuanced manner than previous research.

[OS-7.1]

Cognates boost bilingual infants' early lexical acquisition: A cross-linguistic CDI study

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Over the last decades, research has shown that simultaneous bilingual children's early vocabulary does not develop independently, but that mutual concepts, denoted by "translation equivalents", are important from the onset of lexical development (De Houwer et al., 2006; Bosch & Ramon-Casas, 2014). Recent work suggests that "cognates", phonologically similar forms denoting such mutual concepts boost lexical learning very early on: Toddlers learning similar languages containing many cognates show larger vocabularies in general (Floccia et al., 2018) and cognate word pairs are known earlier than matched pairs of phonologically distant words (Mitchell et al., under review). However, to our knowledge, the present study is the first to investigate the role of the phonological similarity on the level of individual children and word form pairs. As part of a larger study, caregivers of 20 bilingual 18-month-olds filled in web-based receptive and productive vocabulary development questionnaire in French and English, (Swiss) German, Italian, Portuguese or Spanish, containing 461 translation equivalents (e.g. box-boîte-Dose-scatola-caixacaja). Phonological similarity of word forms across languages was rated via Kohnert et al.s (2004) Cross-Linguistic Overlap Scale. We ran two mixed logistic regression models, for production and for comprehension, with random effects for participants and items over all word pairs (n=9038). Both show that knowledge of a word in French can be predicted from knowledge in the child's other language (p.10). This is evidence for a specific cognate boost on the individual item level. We are currently collecting data from the same children at 24 months for larger longitudinal analyses, also including further participant characteristics (e.g. exposure to each language, parental education). We will discuss methodological challenges as well as the importance of our findings for bilingual lexical acquisition, its mechanisms, and its assessment.

[OS-7.2]

Distinguishing between foreign-language talkers: Another bilingual advantage emerging in early infancy?

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Linguistic and non-linguistic aspects of the speech signal are processed interdependently from an early age; four-month-old monolingual infants are better at telling apart talkers of a familiar language than an unfamiliar language (1). But what if the infant knows more than one language? Bilingual 9-month-olds can successfully learn face-voice pairings in an unfamiliar language when monolinguals cannot (2). However, it is unknown whether multilingualism also affects the processing of non-linguistic aspects i.e. talker discrimination at an even earlier age. Building upon previous findings, we hypothesize that bilingual 4-month-old infants will demonstrate a heightened ability to discriminate between speakers of an unfamiliar language compared to monolinguals. In the current study, bilingual 4.5-month-olds (current n=37, target n=48) were tested on their ability to tell apart talkers in a familiar language (English) compared to unfamiliar language (Polish or Spanish). Infants were tested by using a visual fixation procedure identical to that used in Fecher & Johnson (2). In line with our hypothesis, infants looked significantly longer to the screen on switch (m=8.8 seconds) than same trials (m=6.9 seconds), ($f(1,35)=4.99$, $p=.032$). In contrast to previous results with monolinguals, we observed no effect of language familiarity, and no interaction between looking time and language familiarity. In other words, our preliminary results suggest that bilingual 4.5-month-olds outperform monolingual 4.5-month-olds in telling apart talkers speaking an unfamiliar language. Why would bilinguals outperform monolinguals in this task? Greater perceptual attunement to the native language in monolinguals than bilinguals is a possible explanation. Another closely related possibility is greater sensitivity to speech contrasts in bilinguals than monolinguals. Whatever the explanation, this finding fits well with recent work demonstrating that multilingualism may influence the early development of non-linguistic aspects of the speech signal (2). Our findings contribute to a growing understanding of the mechanisms underlying bilingual children's linguistic development.

[OS-7.3]

Segmental information as a cue for bilingual input separation: vowels, consonants, and phonotactics

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Bilingual infants need to develop ways to distinguish two different languages in the input speech stream. Studies on language discrimination have suggested that rhythm plays a crucial role in this process (Sundara & Scutellaro, 2011). However, it remains unclear how languages that are rhythmically similar could be separated. A recent study by Zacharaki & Sebastian-Galles (2021) found that 4.5-month-old infants could discriminate languages based on differences in vowel distributions, suggesting that segmental information could be an important factor. However, little is known about the effectiveness of segmental information in language separation. The current study uses computational modeling to assess how segmental information (vowels, consonants, phonotactics) could be used as a cue for separation of two rhythmically similar languages: English and Dutch. The effectiveness of these cues is tested using different degrees of input mixing, thereby assessing each cue's robustness to mixed language input. Bilingual input was simulated using segmental transcriptions from English and Dutch speech corpora, which were combined in different mixing proportions. Four different probabilistic models were implemented: (1) a broad C-V model that distinguishes consonantal from vocalic segments, (2) a model based on vowels, (3) a model based on consonants, and (4) a phonotactics model which calculates biphone probabilities over combinations of segments (consonants and vowels). Figure 1 shows that, while broad C-V labels are insufficient to separate the two languages, having access to vowel information greatly increases language separation accuracy. Importantly, vowels achieve a higher accuracy than consonants. The phonotactics model achieves the best performance, showing that more complex segmental information has the potential to improve bilingual input separation. These results show that vowels are indeed effective, and, while vowels are likely the earliest segmental cue available, additional information regarding consonants and phonotactics could potentially be used for further enhancement of the infant's input separation capabilities.

[OS-7.4]

German infants' discrimination of the English /æ/-/ɛ/ contrast: evidence from a cross-sectional and a longitudinal study

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Young infants can discriminate most non-native sounds, but the discrimination ability decreases within the first year of life due to perceptual attunement. However, most studies tested infants' perception cross-sectionally, without examining within-group change. To this end, the current study tested German infants' discrimination ability of the English /æ/-/ɛ/ contrast both cross-sectionally and longitudinally using the visual habituation technique. In Experiment 1, 96 German-learning infants were tested cross-sectionally at 5-6, 8-9 and 12- 13 months. Linear mixed-effects models revealed that while the 5-6-month-olds did not discriminate the contrast, the 8-9- and 12-13-month-olds discriminated it only when sounds were changed from /ɛ/ to /æ/, in line with previous findings suggesting that changes from central to peripheral in the F1/F2 vowel space are more noticeable than in the reverse direction. Moreover, the 8-9-month-olds showed a novelty preference, while the 12-13-month-olds showed a familiarity preference. In Experiment 2, the infants tested at 5-6 months in Experiment 1 were tested again at 8-9 and 12-13 months. 15 infants completed the three experiments. Here, only the 12-13-month-olds discriminated the contrast but only when habituated with /æ/. They showed a novelty preference in Experiment 2. Overall, both study designs yielded converging results suggesting non-discrimination at 5-6 months and the gradual development of discrimination ability across the first year of their life, which challenges the assumptions of perceptual attunement. We propose that the perceptual sensitivity for a non-native vocalic contrast can improve during development. The difference in perceptual asymmetry tells us that the direction of asymmetry is not universal and can be altered by exposure. The difference in looking preference was probably due to the effect of repeated experiments, corresponding to an earlier finding. In sum, cross-sectional and longitudinal results overlap broadly; however, the effect of repeated experiments must be carefully considered when interpreting longitudinal studies.

[OS-8.1]

Comparing Joint Attention Metrics: Insights from Infant-Caregiver Interactions

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Joint attention (JA), the coordinated shared attention of an infant-caregiver interaction on an object or action of interest (Tomasello & Todd, 1983), has been linked to children's later language abilities (e.g., Yu, Suanda & Smith, 2019). However, variations in JA definition and metrics across studies pose challenges in result comparing and understanding which aspects of JA influence language acquisition. In this study, we applied two established JA metrics to the same dataset, aiming to compare various JA measures surrounding caregiver naming events (NE) and investigate their relationship with vocabulary size. Using video recordings of naturalistic toy-play interactions from 47 British-English-speaking 12-month-old infants and their caregivers, we coded JA events surrounding NE using two established coding schemes (associative account: Yu et al., 2019; social account: Gabouer and Bortfeld, 2021). Measures related to general JA event properties and NE timing were derived from both metrics. Children's vocabulary at 15 and 18 months was assessed through the CDI. JA measures from these two approaches mostly assessed different JA characteristics, measures involving NE were highly correlated and aspects of JA relating to the timing of the NE within JA predict later vocabulary size. Significant effects of different JA measures on later language abilities were found for the two accounts, and measures of social awareness showed relevance beyond effects of measures of shared focus. This study is the first to compare different JA metrics using the same dataset, investigating the relationship between different JA measures and later language abilities. The social account consistently showed that NE within JA episodes significantly influenced JA's impact on later language outcomes. We found substantial differences in the way the approaches define JA, emphasizing the complexity of JA measurement and its nuanced relationship with language development.

[OS-8.2]

Parent-reported Vocabulary and Looking-while-listening in 164 Czech Toddlers: Children Respond More Strongly to Words Reported As Known

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MacArthur-Bates CDI's have been validated against various other measures, including MLU and standardized or experimental tasks. Relations between parent-reported vocabulary and looking-while-listening have also been found, but typically did not examine the looking behaviors contrasting which individual words are reported as known or not by the children. We used looking-while-listening 164 Czech children as a part of our Czech MB-CDI (re)norming studies to obtain objective validation data. Three experiment versions were presented using the Eyelink 1000+ eyetracker to four age groups of children: A: 7-10 months (N=30), 40 items; B: 15-17 months (N=42), 60 items; C: 18-19 months (N=46), 60 items; D: 20-30 months (N=46), 80 items. Children saw pairs of pictures and heard a phrase labeling one picture of each pair. Pairs were shown twice, swapping the role of the target picture. First we examined the relations of CDI scores to looking behavior. Permutation analyses were performed for models estimating the likelihood of fixating a picture as a function vocabulary score, the target status of the picture (target vs. distractor), and their interaction. Significant sequences were found of all but the youngest group (B: 1.1-3.0s after word onset, p=0.004; C: 1.3-2.2s, p=0.05; D: 0.8-2.5s, p=0.006). Subsequent models examined whether children were more likely to fixate the pictures illustrating the words were reported as known in the questionnaires. The models estimated looking at a picture as a function of its target vs. distractor status and whether it was known to a child. Permutation analyses found significant interactions for all but the youngest group. The results demonstrate not only the general validity of parent-reported vocabulary scores, but also show that specific words reported as known elicit more pronounced responses in the online comprehension task.

[OS-8.3]

Season of Birth Effects on Early Child Language Development: The Role of Maternal Vitamin Supplementation

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Season-of-birth can affect health outcomes, yet little is known on whether it extends to language skills. Across two studies, we evaluate the impact of season-of-birth on infant language development. First, we collected CDIs of monolingual infants, born throughout the year in the Oslo region, measured at 12 (comprehension and production, n=448) and 24 (production, n=724) months. We ran beta regressions on vocabulary percentiles, modelling season-of-birth with birth dates in radians (sine and cosine), controlling for maternal education. We found significant effects of season-of-birth on 12-month-olds' production ($\chi 2$ (2)=7.67, p=.022), October births exhibited larger vocabulary sizes, while April births showed smaller sizes. In a second, preregistered study (hCps://osf.io/qn97c), we investigated whether prenatal vitamin supplementation, which protects against vitamin D deficiency and viral aggressions in expecting mothers, influences associations between season-of-birth and language and cognitive skills. We analyzed longitudinal data from the Little in Norway cohort (n=816), which included information on vitamin supplementation during pregnancy and language and cognitive skills of infants assessed on the Bayley-III at 6-, 12- and 18-months. We entered latitude of residence in the models, since extreme latitudes coincide with limited sun exposure during winter, potentially translating into reduced vitamin D levels during pregnancy. We tested for the presence of season-of-birth effects on language and cognitive scores, interacting with latitude and child's age. We found a significant main effect of season-of-birth (p=.019) for cognitive scores, but not for language scores. Yet, prenatal vitamin supplementation improved the model for expressive language (p=.010), with a significant 3- way interaction season-of-birth*latitude*supplementation (p=0.38): season-of-birth effects were significantly reduced when using prenatal supplementation. In sum, we provide evidence that the lack of maternal vitamin supplementation during pregnancy translates into season-of-birth effects on infant expressive language, potentially via vitamin D deficiency and/or reduced protection against viral aggressions to the fetus CNS during winter months.

[OS-8.4]

Leveraging Early Childhood Care centers to reduce child language development inequalities

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Around 34% of European children attend an Early Childhood Education Care setting (ECEC). But despite well-recognised impacts of the sociolinguistic environment on children's language development, the quality of care, notably regarding the educator-child interactions, is still highly heterogeneous (Eurydice, 2019). Parental trainings on evidence-based practices to foster language development have shown promising results. We here developed a RCT protocol to measure the effect of daycare center educators training on toddlers' language development, aiming to answer common limitations regarding scalability, generalizability and the age of children targeted, through the reliance on professionals and an online community training system. 179 educators and 230 20-28 month-olds from 35 French daycares were recruited. Half of the daycares' educators followed the Treatment training on language development, the other half a Control training. We first report effects on educators. Pre-training, we observed a significant positive main effect of their education level on scores to the SPEAK survey measuring language development knowledge (Suskind et al., 2018) ($p < .001$), demonstrating heterogeneity and room for improvement. Regarding training effects, scores to the two quizzes on Treatment and Control contents at Post-test showed a significant main effect of training group, demonstrating the capacity of educators to learn from our trainings ($p < .001$). As to effects on children, neither our direct tablet test of children's receptive vocabulary and word-learning abilities, nor the indirect parental vocabulary questionnaire (MBCDI) showed any effect of educators' training on children's language development at Post-test. The implementation difficulties faced by educators throughout the project, related to ECEC's difficult daily realities (like chronic understaffing) might have contributed to these findings. Our work shows a path forward in developing scalable universal language interventions, partnering with community actors. It raises questions regarding the feasibility of fostering child development through daycares without meaningful investments to improve the entire ECEC system.

[OS-9.1]

How WEIRD is that? A comparative study of language input and outcomes in Ghana

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The pervasiveness of WEIRD populations in psychological research has called into question how generalizable our theories of human development are across cultural settings (Henrich, Heine, & Norenzayan 2010). One area that has received increased attention since this call-to-arms is language input studies (Kidd & Garcia, 2022), which have repeatedly found that exposure to child-directed speech predicts individual differences in language development (Wang et al., 2020; Anderson et al., 2021). We contribute to a growing body of cross-cultural research in this field with a comparison of language input and outcome measures in Ghana and datasets drawn from other studies in the U.S. and in other African countries. We examine children whose parents had taken part in a randomized controlled trial beginning in 2008 examining the effects of secondary education access (Duflo et al., 2021; 2023). To measure the effects of this intervention on the participants' children, we developed a Twi-language vocabulary checklist for children aged 14 to 25 months (n=849) based on the American English CDI (Fenson et al., 2000). For a subset of our participants, we were also able to sample child-directed speech using LENA recording devices left with families throughout the day (n=425). We found that children in Ghana were exposed to speech less than children in the U.S. (Gilkerson et al., 2017), but more often than in other rural African settings (Katus et al., under review). Despite this, we found children's vocabulary growth to be comparable to age-matched children in the U.S., although our sample reported larger vocabularies than other African samples. Contrary to prior research, did not find a significant relationship between any of our LENA input measures and vocabulary. We believe these findings represent an important step in characterizing input and vocabulary norms across cultural settings and using and interpreting automatic recording methods like LENA.

[OS-9.2]

A longitudinal cross-cultural investigation of effects of maternal infant directed speech on infant language development in UK and Uganda

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Infant-directed speech (IDS) is typically slower-paced, higher-pitched, of higher emotional affect, greater pitch range and vowel space than adult-directed speech (ADS). Such acoustic differences draw infants' attention (Senju & Csibra, 2008), potentially facilitating infant language learning (Kuhl, 2004). IDS quantity and vowel hyperarticulation may positively predict language outcomes (Dilley et al., 2020; Hart & Risley, 1995) However, longitudinal evidence investigating cultural variation of IDS acoustic qualities, quantity and their impact on infant language development remains sparse. Most studies use small sample sizes (Masek et al., 2021) in WEIRD societies (Nielsen et al., 2017). We examine cultural variation in acoustic features of IDS and ADS (mean pitch/pitch-modulation/vowel hyperarticulation/emotional affect) and IDS quantity at 3-10 months in UK (N=129) and Ugandan (N=96) mothers. Second, we test if IDS acoustic features or quantity at 3-10 months predict infant expressive and receptive language at 15-18 months (N=115 UK;85 Ugandan). For IDS quantity, we measured proportion of time mothers produced IDS in play. For IDS/ADS acoustic features we asked mothers to talk to their infants and a local adult experimenter and to name objects eliciting corner vowels /a/, /i/ and /u/. Emotional affect content was measured using average listener-ratings of filtered speech clips. Expressive/receptive language outcomes were measured using 100 word CDIs. Oxford CDI (UK) and translations of the Kenyan Kiswahili CDI (Alcock et al., 2015) into Alur, Kiswahili and Lugbara (Uganda). Ongoing data analysis (GLMMs) shows IDS was significantly higher in mean pitch and pitch-modulation than ADS in Uganda and the UK, but this was significantly more pronounced in the UK. IDS was significantly slower than ADS in both societies, but significantly more so in Uganda. We found no grouplevel vowel-hyperarticulation in either society. Full results including IDS quantity, affect and prediction of CDI scores will be presented and implications for language development discussed.

[OS-9.3]

Questions in child-to child interactions. A study with children from diverse sociocultural groups in Argentina

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Research on the linguistic surroundings of children below the age of 2 has predominantly centered around the verbal communication of mothers in one-on-one interactions (Rowe, 2012). Nonetheless, studies conducted in indigenous and rural communities have brought to light that older children often assume caregiving and socialization responsibilities for their younger counterparts (Maynard, 2002). In a recent study, we found that children from impoverished indigenous communities in semi-urban areas (IndSemU) are exposed to a greater quantity and diversity of words from their peers compared to children in urban middle-income residential (UrbResMidd) and urban marginalized (UrbMar) groups. This investigation aims to explore the quality of speech during interactions among children from diverse sociocultural backgrounds, with a particular focus on Wh-questions given their documented impact on language development (Hoff-Ginsberg, 1985). We examine the proportion of questions, particularly Wh-questions, that children (up to 12 years old) addressed to toddlers. The corpus comprises audio recordings of spontaneous speech from 43 children: 9 from IndSemU, 12 from UrbMar, and 22 from UrbResMidd. Three recordings of 4 hours of each child's linguistic environment were carried out over the course of one year starting at 14 months (mean). The middle 2 hours of the recordings were transcribed, and analysis of the proportion of questions and Wh-questions that toddlers hear from other children, over the total amount of questions addressed to them, were carried out with CLAN program (MacWhinney, 2000). Regressions consider the sociocultural group and longitudinal variation. Preliminary results show that children from IndSemU hear a greater proportion of questions in general and of Wh-questions from other children than their peers from other sociocultural groups, with an increase with toddlers age. Further analysis will explore the answers from toddlers to these questions. Findings contribute to the description of interactional patterns involving children from different groups.

[OS-10.1]

Exploring the infant talker bias: A novel online listening preference study

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Infants prefer to listen to vowels produced with the characteristic pitch and resonances of an infant vocal tract; in lab-based experiments, this is observed in pre-babbling infants (4-5 months; Masapollo et al. 2015) and increases at the onset of babbling (6-8 months; Polka et al., 2022). This infant talker bias suggests infants gain an awareness of the mapping between articulatory gestures and their acoustic correlates as their own vocal abilities emerge. In this study, we aimed to replicate and extend these findings using a novel online testing paradigm. In a remote look-to-listen experiment conducted using Lookit, infants watched a dynamic visual patten while vowel signals were presented; four trials contained infant vowels and four had adult female vowels. We indexed infant listening by manually coding looking time on each trial. Here we present the results of an analysis of a subset of the data that match the age groups studied in Polka et al. (2022). Our mixed-effects regression model shows that babies listened longer to infant than adult vowels ($n = 44$, $p < .01$). Post-hoc Mann-Whitney U tests reveal that the preference for infant speech was observed in 6.5- to 7.5-month-olds ($n = 19$, $p < .01$), but not in 4- to 6 –month-olds; $n = 25$, $p > .05$). These results align with earlier in-lab findings showing developmental changes in infant attraction to speech signals that are similar to their own vocalizations. We will analyze data from older infants (8-12 months) and compare the manually coded data with results based on automated coding of looking obtained using facial analysis software—BabyFaceReader. We are also using BabyFaceReader to explore other potential preference indicators including arousal and smiling. The findings provide new insights into the utility and the limitations of remote testing methods in infant speech perception research.

[OS-10.2]

Infants' sensitivity to sonority sequencing: evidence from behavior and pupillary synchronization

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From around 6 months of age, infants display knowledge of their native languages (Sundara et al., 2022). However, it is not clear whether their phonotactic sensitivity is influenced by universal biases. One potential universal phonotactic bias relates to sonority sequencing, preferring that consonants rise in sonority from the edges towards the vowel (Clements, 1990) with sonority rises (e.g., /blik/) as well-formed, and falls (e.g., */lbik/) as ill-formed. Newborn brains show higher activation with rises than with falls, supporting a sonority sequencing bias (Gómez et al., 2012). We hypothesize that this bias also influences older infants' perception. Using a central fixation paradigm with eye-tracking, (1) we predicted that infants would prefer rises over falls, indicated by looking time (LT) differences. (2) We predicted that infants' pupils would synchronize better to rises over falls, as pupil size changes match the auditory input's temporal regularities (Marimon et al., 2022). Five- (n=22) and 9-month-old (n=24) German-learning infants listened to nonwords with word-initial consonant-consonant rises (e.g., dlaga) versus falls (e.g., lbaga). Crucially, these consonant-consonant clusters never occur word-initially in German. LT data revealed longer LT for rises over falls (Est: 0.71, $p<0.01$); while there was no sonority effect in the 5-month-olds (see Figure). Regarding pupillary synchronization, infants showed a significantly higher maximum cross-correlation between changes in pupil size and the auditory stimuli for rises than for falls (Est: 0.01, $p=0.01$), with no age difference (Est: -0.001, $p=0.68$). These results suggest that infants' perception is influenced by a sonority sequencing bias. While behavioral measures only indicate sensitivity to sonority in the 9-month-olds, pupillary synchronization may be a more sensitive measure, revealing sensitivity across ages. The findings highlight the need for considering potential effects of universal biases when studying infant perception.

[OS-10.3]

Computational modeling of infant word-finding from the phonetic ground up

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Since the 1990s, researchers have tested how infants detect words in continuous speech, evaluating infants' use of phonetic and distributional information. Computational modeling of this process has examined distributional information, but mostly ignores phonetics. Virtually all models presuppose that (a) parental speech realizes every phone in words' canonical pronunciations, and that (b) infants reliably recognize these phones in real-world contexts. Under these assumptions, word segmentation (over text, essentially) is only moderately difficult and can be solved to infant-plausible levels of success using diverse statistical heuristics (Bernard et al., 2020). Because everyone nevertheless knows that (a) is wrong and (b) is doubtful, computational models capable of working from the speech signal itself are needed. But models operating over acoustics are hard to build and hard to evaluate. We present an advance on both problems. A new, state-of-the-art self-supervised computational parsing model, DP-Parse (Algayres et al., 2022), is evaluated over actual natural-speech experimental stimuli (Pelucchi, Hay, & Saffran, 2009a, 2009b). The model does not compute transitional probabilities, but finds the same wordforms infants do, favoring words with high syllabic transitional probabilities despite equal occurrence frequency. We believe this is the first time infants and a model have been tested on the same acoustic word-segmentation stimuli. DP-Parse takes audio as input (here, the Italian-language sentences of Pelucchi et al.), converts the audio into a computational embedding starting from wav2vec2 (Baevski et al., 2020), trained without supervision on ~8 months' worth of speech (Bergelson et al., 2019), estimates pseudofrequencies of potential words, and computes the most likely lexical parse, using a generalization of Goldwater et al. (2009). Like infants, the model finds high-transitional-probability words more often than low-transitional-probability words. It is now possible to benchmark models against infant outcomes using the same materials, and we propose iterative testing of infants and model systems.

[PS-1.1]

Dyadic coordination of infant behaviours and caregiver responses best predict later child vocabulary

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Children show large individual differences in their vocabulary development which influence their socio-cognitive outcomes. There is robust evidence that infants' gestures and vocalisations on the one hand, and caregivers' contingent responses on the other hand, individually predict later child vocabulary. Recent studies suggest that dyadic combinations of infant behaviours and caregiver responses are more robust predictors of children's vocabularies than individual behaviours. Previous studies have not yet systematically compared the effects of different dyadic combinations, including different infant behaviours and types of caregiver responses, on children's vocabulary outcomes. We examined 114 caregiver-child dyads at 9–11 months during six minutes of free play and children's concurrent (N-CDIs) and longitudinal (N-CDIs and PPVT-III-NL) vocabulary outcomes at 2–4 years. Using robust linear models, we compared the predictive value of three subsets of predictors: 1) frequencies of infants' behaviours (vocalisations, points, and shows+gives), 2) frequencies of infants' behaviours met with caregivers' verbal responses, and 3) frequencies of infants' behaviours met with caregivers' multimodal responses for children's vocabulary outcomes. Caregivers' responses were both semantically and temporally contingent on infants' behaviours. Caregivers' multimodal responses included all contingent verbal responses that were at least partially overlapping with nonverbal behaviours, including gestures and facial expressions. We found that infants' points related to children's later receptive vocabularies ($b = 2.48$, $p < .001$), while infants' shows+gives related to children's later productive vocabularies – but only when taking the instances that elicited caregivers' multimodal responses into account ($b = 5.98$, $p < .05$). We also found that only shows+gives met with caregivers' verbal or multimodal responses related to infants' gesture repertoires measured with the N-CDI ($b = 1.53$, $p < .001$; $b = 1.20$, $p < .01$, respectively). The results highlight the importance of examining dyadic and multimodal aspects of caregiver-infant interactions when examining relations to children's vocabulary development.

[PS-1.2]

Comprehension of wh- questions in infants exposed to Palestinian Arabic

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There is a large body of work on the acquisition of long-distance dependencies, but much less is known about these dependencies in preverbal infants. We address this issue with new results from an eye-tracking study on wh- comprehension in Palestinian Arabic. For lack of research in other languages, our work builds on the studies conducted in English by Seidl et al. (2003), Perkins and Lidz (2020, 2021), a.o. We tested infants with a mean age of 18.2 months (age range: 17–19 months; N = 16, after excluding all infants for whom signal detection was below 55%) and an adult control group. We investigated the comprehension of wh- questions headed by ʔay 'which' (in sentences like ʔay ʔarnab besayyeʕ leħsʕ a:nʔ 'Which rabbit PSEUDO-VERBs the horse?' and ʔay dub leħsʕ a:n bemraʃ-uʔ 'Which bear does the horse PSEUDOVERB?, all questions with wh- movement). The use of pseudo-verbs aimed to guarantee that infants have no access to the argumental structure of the verb, as argued for younger infants by Perkins and Lidz (2020), and cannot comprehend the question based on lexical knowledge. We measured looking time at a character and not a whole event to ensure that gaze was as expected if the question was comprehended, in a departure from standard measures. The results appear in Figure 1 for the four windows in which looking time was measured (corresponding to the baseline in which participants heard 'What is happening?', and three presentations of the experimental sentence). The statistical analysis indicates that infants looked at the target character in the first presentation of the subject wh- question; in all other windows, their performance was not different from chance. This constitutes evidence for comprehension of subject wh- questions at 18.2 months, with no correlation between comprehension and vocabulary size or age within the range tested.

[PS-1.3]

Word-learning in 14-month-old Swedish-learning infants

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Previous studies have shown that infants learn words better when they are presented in infant-directed speech (IDS) than when they are presented in adult-directed speech (ADS) (e.g., Ma et al., 2011). With the switch task paradigm (Werker et al., 1998), 13- to 14-montholds learn words presented in IDS, but not when using the preferential looking paradigm (Foursha-Stevenson et al., 2017). This discrepancy can be due to differences in task demands. In the present experiment, we tested word-learning in IDS and ADS between-subjects in 14- month-old Swedish-learning infants, using a simplified version of the traditional preferential looking paradigm (Ramachers et al., 2017). Instead of labeling two objects during training and testing infants on both (as in Foursha-Stevenson et al., 2017), only one of the objects is labeled during training, while the other one is presented and introduced without labeling it (e.g.: “Look at that one!”). At test, both objects are presented, but only the previously labeled one is named, prompting the infant to look at the correct object. Participants (n = 51, 29 female and 22 male, mean age = 13.9 months, SD = 0.6, range 11.6-14.8) did not look longer towards the target compared to the non-target in the IDS condition (t[20] = -2.22, p = 0.038, M = 45.9%, 95% CI = 42.1%|49.7%), nor in the ADS condition (t[19] = 0.488, p = 0.631, M = 51.1%, 95% CI = 46.3%|55.9%). That is, no target preference was established and we were not able to confirm that IDS facilitates word-learning, nor could we demonstrate experimental word learning in 14-month-olds with the simplified preferential looking paradigm.

[PS-1.4]

JA, multimodal behaviors and their relation to language acquisition

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Joint Attention (JA) between children and their parents, are often related to the child's later language skills (e.g., Carpenter et al., 1998). However, the definitions of JA, and the way it has been operationalized, differ between studies. Studies on similar cohorts and methodologies often end up with different results (Gabouer & Bortfeld, 2021; Astor & Gredbäck, 2022). It has been suggested that JA is a Western phenomenon rather than a universal prerequisite for language acquisition (Akhtar & Gernsbacher, 2007). The present study followed 14 Swedish child-parent dyads, longitudinally between 0;9 and 3;0 years of age, including the dyads' interactional use of vocal, gestural, gaze, touch, and facial expressions. The research questions address: i) which behaviors are involved in JA; ii) which behaviors predict JA, and iii) if JA can be detected through data-driven methods. We further investigate the relationship between multimodal variables and later language skills. The results indicate that some behaviors are more frequent in JA-sequences than outside of these; and, that parental behaviors predict JA during the period 9-15 months of age. We find a data-driven factor that summarizes behaviors that are related to JA; however, this factor seems to capture dyadic shared attention rather than triadic JA. The factor is predictive of two of the language measures (SCDI and PPVT), whereas JA predicts only one of these (SCDI). Furthermore, specific behaviors such as Child-gaze-at-object, carries the same - or higher - explanatory power for later language skills than does JA. The results are discussed in relation to previous findings and future goals.

[PS-1.5]

Automatic extraction of infant vocalizations from one year home audio recordings

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We introduce an innovative methodology for the automated extraction of infant vocalizations from extended home audio recordings. Our approach relies on a neural network trained with 72 minutes of meticulously curated infant vocalization examples (babblecor corpus) and soundscape segments derived from the original audio recordings. The trained model is then employed to construct a novel database exclusively dedicated to detect infant vocalizations. Over the course of one year, from birth to first birthday, we conducted extensive audio recordings capturing the vocalizations of 15 children within the confines of their homes, amassing a data set of 3,214 hours, or 2,1 To of data, recorded with a stereophonic microphone, with a 44,100 Hz sampling rate. Employing our neural network, we systematically extract vocalization segments from these extensive recordings, providing a detailed corpus of each child's vocal productions throughout the year. This methodology not only showcases the efficacy of our approach but also highlights the potential of the resulting database for advancing research in the field of infant vocal productions.

[PS-1.6]

Babble and the Brain: Babble Becomes More Left Lateralised As Babies Gain Articulatory Experience

Florence A R Oxley, Tamar Keren-Portnoy & Eytan Zweig

University of York

How babble – babies' meaningless, adult-like consonant-vowel syllables – contributes to language development is debated. Comparing brain activity in babble and language offers valuable insights. In adults, the left brain hemisphere dominates in language processing, while the right dominates in emotional processing. One previous cross-sectional study observed analogous differential specialisation in 5-12-month-olds' babble and smiles. This has been interpreted as evidence that an innate left-hemispheric language capacity drives babble. Here, I investigated whether babble is stably left hemisphere dominant from emergence, or becomes more left lateralised with time and/or articulatory experience. Newborns show much less localised, consistent patterns of neural activity than adults: One brain area may participate in many diverse behaviours, and separate instances of one behaviour may involve different networks of brain areas. Through accumulated experience, functions are recruited to specific networks, determined by relative aptitude, and redundant connections are pruned. My study adapted and applied a rigorous, fine-grained method for analysing laterality via asymmetries in lip movements to naturalistic videos from 8 babies. I recorded babies twice before babble emergence (c.5 months) and then twice per month from babble emergence (c.6-10 months) until 12 months. I calculated Oral Asymmetry Indices indicating direction and extent of asymmetry for ~1500 babbles, smiles, and other vocal gestures. I identified the midline of the mouth using three facial landmarks and measured the area of the resulting 'hemimouths'. I used liner mixed effects models to test for effects of gesture type (babble/smile/non-babble), age, and phonological milestone attainment. Babbles were right-lateralised at emergence and became left-lateralised gradually, with differing trajectories for monosyllabic, bisyllabic, and polysyllabic babbles. This indicates experience-dependent rather than innate or maturational left lateralisation. Smiles were right stably hemisphere dominant. I propose a new, Emergentist conceptualisation of babble as an endogenously-emerging dynamic system, becoming relevant to language only through babies' own productive experiences.

[PS-1.7]

Repetition of child utterances as contingent parental input: a longitudinal study of dyadic interaction with children aged 1-3 years

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The present study investigates repetition of child utterances relating to both concurrent and longitudinal child language measures in 20 Swedish children video recorded five times between 1;0 to 3;0 y o a. The aim of the study is twofold: i) to investigate parental repetitions within and across parent-child dyads and ages; and, ii) to relate developmental trajectories of repetitive parental behavior to child scores on SCDI (Berglund & Eriksson, 2000). Repetitions constitute one aspect of contingent parental behavior, defined as semantic and temporal responses to a child's utterances or vocalizations (Conica et al., 2020). These responses are argued to encourage a child's communicative attempts as the parent either corrects or expands the child's utterance (Rowe & Snow, 2020). Much remains unexplored about changes in amount and character of repetitions, and how they affect language skills over time. Though repetitions of child utterances increase during the child's first and second year (Masur & Rodemaker, 1999; Che et al., 2018), they have also been found to decrease as the child's language develops (Rondal, 1980). In Casla et al. (2022), repetitions at 1;9 were positively correlated to concurrent child vocabulary (measured by CDI), but Conica et al. (2020) found a negative concurrent correlation at 2;0 to child vocabulary diversity and MLU in interaction, and no correlation to any concurrent CDI measures. Positive longitudinal relations to later child MLU and vocabulary size has been identified (Che et al., 2018; Casla et al., 2022). By examining repetitions at five time points spanning over the preverbal stage up to the use of complex sentences, this study addresses the developmental aspects of parental contingency and whether repetitions decrease or change form as the child's language improves. The results will be related to parental impact on, and adaptation to, child language development over time.

[PS-1.8]

Classifying Infant Vocalizations in Audio Recordings through Transfer Learning and Image Processing Techniques

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The identification and classification of infants' vocalizations (into canonical vs non-canonical babbling vs adult/other) in audio recordings can play crucial role in understanding infants' language and speech development in various learning environments. Recent research indicates that deep learning models such as convolution neural network (CNN) trained from 'scratch' can be utilized to accomplish various audio classification tasks including classifying infants' vocalizations. However, to achieve high classification accuracy, models trained from scratch require large number of vocalization instances. This study addresses this limitation and examines whether pre-trained vision deep learning models, using transfer learning with spectrogram images of vocalization audio clips as input, can achieve better accuracy in classifying infant vocalizations. An open-source labelled database of infant and adult vocalization recorded in a home environment for English-speaking families (infants wore Lena vests for 12-hour periods at 3, 6, 9, and 18 months of age) was used for this task. Despite few audio clips of infant and adult vocalizations being available, the classification accuracies of various vision deep learning models, used in the current study, ranged between 64.50% to 82.77%, which is higher, as compared to previously used models when trained with same number of audio clips, i.e., between 55% and 71.42% of accuracy.

[PS-1.9]

The neural correlates of natural speech rhythm processing in Arabic, French and bilingual infants

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To what extent does the native language shape the encoding of continuous speech in early development? This study aims to better understand the impact of prosody on neural responses in populations of monolingual and bilingual infants across different rhythm class languages, specifically stress-based (Arabic) and syllable-based (French). We will compare infants at different stages of development, 6 and 20 months. Six-month-old infants are thought to rely heavily on lexical stress and syllables for word recognition [1,2]. However, this effect is mostly observed in isolated words, and the age at which infants recognize these accentuated words depends on their native language [3,4,5]. Studying developmental differences across languages is critical because most language acquisition research has concentrated on WEIRD languages [6]. Besides, cross-linguistic comparisons allow us to assess whether neural specialization occurs and evolves in the encoding of rhythmicity in speech and if this process is language-specific. 3.5-month-old bilingual infants are already more sensitive to within rhythmic class variations than monolinguals [7]. This behaviorally tested sensitivity to rhythm in bilinguals might reveal early differences in cortical encoding of speech between monolinguals and bilinguals. To assess how neural specialization to the native rhythm develops in monolingual and bilingual infants, we will use mTRF applied to EEG data collected while infants are presented with natural continuous speech, either in their native language or a foreign one or their two native languages [8,9,10]. We evaluate the accuracy of an audio signal-to-cortical response matching predictive full model based on different regressions, including acoustic (i.e., syllables, lexical stress, speech envelope, and phonetic features) and linguistic features (i.e., word onset, sentence onset, word comprehension, grammatical categories) to extract the importance of rhythmic variables in speech encoding. P.S : The poster will resume the theoretical and methodological aspects of the study and present the results of a pilot study in adults as well as preliminary data in French monolingual and bilingual infants of both ages at the time of the conference.

[PS-1.10]

Investigating German-speaking 30-month-olds' sensitivity to vowel- and consonant mispronunciations of early words: A pupillometry study.

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According to the Division of Labor Theory consonants are more important for lexical processing than vowels, the so-called C-bias (Nespor et al., 2003). The developmental patterns of the C-bias vary cross-linguistically (Nazzi & Cutler, 2019). In Romance languages (French, Italian, Spanish), it emerges before 12 months of age. In Germanic languages, the picture is rather mixed: In English, the C-bias is not to be found until the age of 30 months; in Danish there is even a V-bias, and in German there is no bias at 20 months. This study asks whether German-learning 30-month-olds show a C-bias when processing mispronunciations of early acquired words. We measured children's pupil size while they viewed 30 test trials, each consisting of a picture and a corresponding auditory label which was either (1) correctly pronounced (COR; e.g., baby, [be:bI]), (2) mispronounced in the initial consonant (CMP; e.g., [ze:bI]), or (3) the stressed vowel (VMP; e.g., [by:bI]). Eighteen filler trials ensured that children heard more than 50 percent correctly pronounced words. Assuming a C-bias, we expected larger pupil dilations for CMP compared to VMP and to COR. So far, data from 16 children (5 girls, mean age: 29.4 months, range: 27.3–31.1) have been analyzed. The final sample of 30 children will be complete by the time of the conference. Preliminary results show significantly smaller pupil dilations for CMPs than COR (Fig. 1). The direction of this effect is surprising. Moreover, the pupil dilations in CMPs tend to be smaller than in VMPs, which hints at processing differences between vowels and consonants. Overall, we find indications for a C-bias in German 30-month-olds, similar to findings in English. Potential explanations for the unexpected direction of the effect are currently explored.

[PS-1.11]

Exploring the language input to infants in a multilingual society in Africa

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Many infants worldwide grow up in bi/multilingual environments, exposed to two or more languages. While research on bilingual language input and its impact on language development has progressed in recent years, most available studies primarily concentrate on infants from the so-called “WEIRD” (Western, Educated, Industrialized, Rich, and Democratic) social context. In Africa, a less-WEIRD social context, multilingualism is the norm for many infants, whose language experiences, including the input and input characteristics, may differ from those in Western contexts. Yet, the nature of language input to infants growing up in Africa has rarely been investigated. In this study, we explored the language input of 3 to 12-month-old infants (N = 121) being raised in a bi/multilingual environment in Ghana (Sub-Saharan Africa), a non-Western social context. The study focused on the nature of these infants’ input regarding the number of languages of exposure, input providers, and factors that may influence the number of languages exposed to and the relative amount of input received in each language. Data were collected using both a parental language background questionnaire and diary logbook in Accra, Ghana’s capital. Results revealed consistency between the questionnaire and logbook, indicating the measures’ reliability. Results showed that Ghanaian infants were exposed to between two and six languages, and regularly engaged with two to six regular input providers, and the two were correlated. Regarding the relative amount of input in the languages that most infants were exposed to, namely, Ghanaian English, Akan, Ewe, and Ga, we found that infants receive less direct than indirect input in Ghanaian English, while no such difference was observed for Akan, Ewe, and Ga. Our findings shed light on the language environment and input to African infants raised in multilingual societies. The findings further suggest an impact of social and cultural contexts on infants' linguistic experience.

[PS-1.12]

Enhancement of Phonological Features in Infant-Directed Speech Matches Time-Course of Feature Acquisition

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Infants start acquiring native phoneme categories within their first year of life, potentially aided by parental adaptations in infant-directed speech (IDS). In the brain, acquired phonemes are represented as bundles of so-called phonological features (Mesgarani et al., 2014), which become activated upon phoneme perception. Here, we are asking whether parents enhance features when interacting with infants. We conducted a longitudinal analysis of maternal feature enhancement in 98 mother–infant dyads using time-aligned phonological transcripts of IDS at 7, 11, and 24 months of infant age. We examined two measures that were recently shown to relate to feature acquisition (Menn et al., 2023): First, the durations of features in speech, as features often span multiple successive phonemes making them longer than individual phonemes. Second, the temporal convergence of feature durations and prosodic modulations (prosodic similarity). Mixed-effects models revealed enhancements in duration ($t = -8.53$, $p < .001$) and prosodic similarity of phonological features ($t = -16.21$, $p < .001$) in IDS compared to adult-directed speech (ADS). Notably, feature enhancements in IDS decreased with infant age (both $p < .001$), and the trajectory at which features become ADS-like differed between features (both $p < .001$). Why do parents enhance particular phonological features for a longer period in infancy? We assessed a potential relationship between the developmental trajectory of IDS feature enhancement and the order of feature acquisition in infancy, taken from our cross-sectional electroencephalography results. Strikingly, maternal enhancement of phonological features decreased faster for those features acquired at an earlier age (duration: $t = -3.06$, $p = .002$; prosodic similarity: $t = 12.25$, $p < .001$). In sum, results indicate a dynamic interplay between parental enhancements of phonological features and infants' feature acquisition. We suggest that parental enhancements of phonological features in IDS in duration and prosody aids infants' feature acquisition—analogous to prosodic bootstrapping.

[PS-1.13]

Children's familiarity with objects shapes caregiver-child joint attention and learning

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The novelty of an object for a child impacts how parents interact with and talk about the object to their children, and how children handle objects. Furthermore, parental input such as object labelling, and characteristics of parent-child interaction such as joint and sustained attention impacts children's vocabulary size. Against this background, the current study examines the features of parent-child interaction and parent labelling when they naturally interact with objects varying in their familiarity to the child, and how these factors influence children's learning of the labels for these objects. In particular, we investigated whether (i) parents lead more instances of joint attention (JA) when playing with novel relative to familiar objects, (ii) parents preferentially label novel relative to familiar objects and (iii) children's learning of novel word-object associations is affected by the frequency of labelling and children's sustained attention toward the objects. We recruited 31 parent-child dyads (14-23 months old), who were asked to play with four different toys – two familiar and two novel to the children (but familiar to the parents). We examined parent and child eye-movements using head-mounted eye trackers and parent labelling behaviour. Following that, we tested children's recognition of the labelled novel objects. We found (i) that children led fewer instances when the object is novel to them, and (ii) parents labelled familiar objects more than novel objects during play. Furthermore, (iii) children did not show any recognition of novel objects' names learnt; and thus, novel word-object recognition was not related to the frequency of object labelling or children's sustained attention. Our findings may provide support to the view that children are active participants in their daily interactions, which may prompt parents to follow their children during play sessions and that these qualities of parent-child interaction does not currently influence novel word learning in toddlers.

[PS-1.14]

Variables influencing conversational interchanges during group interactions in nursery-schools.

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This study aims at characterizing multimodal conversational interchanges that take place in group activities. While children's active participation in back-and-forth conversations could promote their linguistic development (Justice et al., 2018; Kidd & Rowland, 2021), their linguistic experiences differ quantitatively and qualitatively according to children's exposure to teachers' verbal utterances, even within the same group (Chaparro-Moreno et al., 2019; Perry, 2018). Additionally, most studies have been conducted with middle-SES English-speaking populations (Degotardi, 2021), while more diverse samples have been underexplored on this topic. In this study we examined the interactions between 19 teachers and their group of two-year-old children in Spanish nursery-schools (the children from 7 classrooms were from low SES backgrounds). Children's linguistic level was measured with the Spanish version of the MacArthur CDI (López-Ornat et al., 2005). We explored the frequency of conversational interchanges considering the focus of each utterance produced by the teacher (group or single child) and children's participation (number of utterances that each child produces). Preliminary analyses showed that children´s frequency of participation in conversational interchanges could be explained by teacher-related variables (number of utterances directed to each child), child-related variables (their linguistic level), structural variables (classroom ratios) and SES. We discuss the need to analyze group interaction and the possibility to promote active participation in group-directed activities.

[PS-1.16]

Learning in an interest-driven context: the effect of young children's selective interests across language development

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Parents often report their children being intensely interested in certain objects from their environment. As primary caregivers, they play a vital role in nurturing these interests; due to which children are also shown to learn better. While such interests develop young as 18 months, it is unknown how these interests are sustained across early childhood, and how they influence language development and daily interactions. Against this background, we present two studies that (a) takes a longitudinal look at the development of children's interests in particular object categories, and subsequent effect on their vocabulary, and (b) examines whether children's interests modulate quality of parent-child interactions and subsequent novel word retention. (a) The first study measured fifty-six parent reports of children's category-specific vocabulary knowledge and interests at two timepoints in development – 18 and 24 months. We found that parents report that children's category-specific interests are sustained over a 6-month period, and that these interests at 18 months predict the size of the category-specific vocabulary at 24 months. (b) In the second study, seventy-nine parent-child dyads (children 24-30-months-old) participated in a shared book-reading task, where the dyads read two books; one of high and one low interest to the child, with one novel word-object mapping in each book. We also examined children's later recognition of newly-introduced word-object mappings. Our results show that quality of interaction varied as a function of children's interest in the books; however, we found no effect of interest or interaction quality on novel word learning, though children successfully learnt the novel word. Taken together, we show that children's sustained individual interests during their formative years influence the trajectory of their category-specific vocabulary size, and later, their selective interests also influence the quality of interaction during shared book-reading, although its direct influence on word learning is no longer apparent.

[PS-1.17]

Does babbling shape speech sound discrimination? An ERP investigation

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Behavioral studies have shown improvements in the perception of speech sounds following the onset of their production (e.g. 1;2;3). Thus, babbling onset might produce a perceptual reorganization, linked to the setting of perception/production loops for speech perception. In an ongoing study, we test this hypothesis with an Event-Related Potentials (ERP) investigation comparing the electrophysiological signatures of speech sound discrimination before and after babbling onset. Ten-month-old infants participate to a multi-feature oddball paradigm recording ERPs with 11 active electrodes (F7, F3, Fz, F4, F8, C3, Cz, C4, P3, Pz, P4). In this task, standard syllables “pa” are presented 80% of the time. Deviant stimuli are presented 10% of the time and either fall into participants’ production patterns (‘deviant 1’: “ta”) or fall outside from participants’ production patterns (‘deviant 2’: “ka”). Analyses will assess possible differences in the ERPs elicited by deviant 1 vs deviant 2. The target sounds were selected based on a preliminary parental survey targeting speech sound production. Following this survey (participants n=15), the sound /p/ is produced by 75% of 10-month-old French-learners; /t/ by approximately 50% and /k/ by 6%. Capitalizing on this pattern, we aim to recruit two groups of participants (n=25 each): Group 1, including infants producing both /p/ and one out of two deviants; Group 2 (control group), including infants producing none of the target sounds or only one out of 3. For each participant, babbling is home-recorded using the LENA system and a 90-minutes sample is human-transcribed. Preliminary results from a cohort of 14 participants (Group 1=5, Group 2=9; MA=10m18d) did not reveal any difference in the processing of the two deviants, in any of the two groups. Participant recruitment and testing are ongoing, and full group sizes are aimed for the conference.

[PS-1.18]

Native and non-native vowel discrimination in 6-month-old Norwegian infants

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The theory of perceptual narrowing proposes that infants come into the world sensitive to a wide range of speech contrasts, and gradually become attuned to the speech in their native language, while losing the ability to discriminate contrasts not present in their language (Werker & Tees, 1984). However, the empirical evidence for this claim predominantly comes from English-speaking infants (Singh et al., 2022). To investigate perceptual narrowing in a so-far understudied language, this preregistered study examined N=67, monolingual, full-term, 6-month-old Norwegian infants' ability to discriminate a native /y-i/ and a non-native British /ʌ-æ/ vowel contrast, in two eye-tracking experiments using a habituation-dishabituation paradigm. As attunement towards the native language has been suggested to occur between 6-9 months of age (Tsuji & Cristia, 2014), we expected that infants would discriminate both contrasts. In the native-contrast experiment, infants were first exposed to /by/, and, after reaching a habituation criterion, proceeded to the test phase that alternated /by/ and /bi/. A similar procedure was used for the non-native /gæ/-/gʌ/ contrast. Infants' looking times to the novel vs. habituated test trials were used in mixed-effect models. These revealed that, on a group level, infants' looking times were not indicative of discrimination of either the native ($\chi2=0.74$, $p=.39$) or non-native contrast ($\chi2=0.63$, $p=.43$). Bayesian t-tests suggested moderate evidence in favor of the null (BF native=0.25; BF non-native=0.24). Yet, infants' discrimination-scores (proportion of looking to novel trials over total looking time; Bergmann & Cristia, 2018) correlated negatively between the native and non-native tasks (Spearman=-.36, $p=.04$; Fig. 1). Thus, while we found no group effects of contrast discrimination, at 6 months, to the best of our knowledge, this is the first paper demonstrating evidence for perceptual reorganisation of the vowel space within the same infants.

[PS-1.19]

The effects of visual context on word learning in 14- to 19-month-old children

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During early language acquisition, children's word usage is highly bound to situational and thus visual contexts (Hoff, 2013). Moreover, studies show that 2- to 3-year-olds are better at word-learning and generalisation when stimuli are presented in the same context–same objects around and same background colour respectively (Axelsson & Horst, 2014; Vlach & Sandhofer, 2011). This suggests that a certain invariance of visual context helps children when learning new words. However, this has never been tested experimentally in younger children. We compare word learning in 14- and 19-month-olds using visually distinct (C1: change in object orientation and background) and identical (C2) object pictures in a fast-mapping eye-tracking paradigm. During the learning phase, two objects are presented with their label. During the test phase, both objects appear side-by-side with one label. We calculate the mean proportion of target looking (PTL) in pre- and post-naming phases in test phases. If children have learned to associate meaning to form, we expect a naming-effect to manifest as an increase in PTL in the post-naming phase. Analyses (mixed model and Wilcoxon tests) of 41 subjects suggest that 14- to 19-month-olds might benefit from context change when learning new words, while they struggle when context doesn't change. This could be due to an increase in attention during learning in C1. Alternatively, changing the background might help children better infer the target concept by separating it from its context (as our stimuli use highly naturalistic backgrounds). Considering these results, we conducted a variation of our first study using the same stimuli for C1 but maximising the learnability of the stimuli of C2 by using grey backgrounds in the pictures (ongoing analysis). We will discuss and compare the results of both experiments in light of other research on language development showing enhanced learning under conditions of variability.

[PS-1.20]

Effects of uncertainty on word learning in 2-year-old infants and adults

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Variability modulates word learning. Variability in the visual context can boost and variability in the number of alternative referents or stimulus dimensions hinder infants' ability to learn words. We hypothesize that these conflicting findings can be accounted for by the notion of entropy of the learning situation. Entropy is a measure of uncertainty, with situations that involve more alternative events or where events occur with equal frequency having higher entropy than situations with fewer alternative events or where events occur with unequal frequencies. While studies suggest that higher uncertainty makes learning more difficult for adults5,6, the way uncertainty affects infants' word learning has so far not been directly tested. German-speaking adults (N=48) and 26-mo German-learning infants (N=48) participated in a familiarization-switch paradigm. Participants in the High Entropy condition saw three object-label pairs that occurred with the same frequency during the familiarization (x10/x10/x10). Participants in the Low Entropy condition saw the same three object-label pairs with different frequencies (x5/x10/x15). Participants were then tested on Same-, Switch- and Novel trials. To assess whether entropy affects learning, we compared participants' performance on the target object-label pair that occurred with the same frequency in both conditions (x10). We measured participants' pupil size at test. Adults' and infants' pupils dilated significantly more in the Novel and Switch trials than in Same trials, showing that participants learned the three words. When seeing the target object-label pair at test, adults' and infants' pupils dilated significantly more in the High Entropy than in the Low Entropy condition. Our results show that learning words is not only influenced by the frequency of occurrence of single object-label pairs but also by the predictability of the learning situation as a whole. Infants and adults appear to learn words better in more predictable situations.

[PS-1.21]

Composition and evolution of the first lexicon: grammatical categories, semantic classes and speech acts.

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The first words that children produce can be categorised in many ways, e.g. grammatical category, semantic classes, but also which speech act they perform. The composition of the first two categories has been investigated in many questionnaire studies. For instance, their lexicon shows a noun bias: in many languages, there are more nouns than verbs or even than other grammatical categories (Labertoniere & Skoruppa, 2022). Social words and verbs are also very prominent. Early productions also seem more likely to belong to certain semantic classes, words for objects being easier to conceptualise and thus learn than words for actions (Gentner, 1982). Besides, children's first words seem to be context bound: in the first steps of acquisition, they struggle to generalise the meaning of a word to different situations (Caselli et al., 1995; Hoff, 2013). We seek to, on the one hand, pool all the information on the composition and evolution in time of the lexicon (for grammatical category, semantic roles and speech acts) of children aged 1;0-3;0; on the other hand, get a better understanding of the role that context of production plays in their early productions. To this end, we code and analyse corpus data (from the CHILDES database) from 10 French-learning children aged 1 to 3 years old. First, we compare the distribution of the different grammatical categories, semantic classes (objects, actions and social words) and speech acts in three different age groups: 1;0 – 1;6 (before naming explosion), 1;6 – 2;0 (beginning of naming explosion) and 2;0 – 3;0 (beginning of syntax). Second, we examine if certain contexts are more favourable to word production and investigate whether certain semantic or grammatical classes correlate with certain contexts. We expect to observe first an abundance of social terms followed by a noun bias, with verbs and then adjectives appearing later.

[PS-1.22]

The developmental pattern of native and non-native speech perception during the 1st year of life in Japanese infants

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Language development during the 1st year of life is characterised by perceptual attunement: following language-general perception, a decline in the perception of non-native phonemes and a parallel increase in or maintenance of the perception of native phonemes (Kuhl et al., 2005, 2006). Most evidence documenting these patterns comes from behavioral studies designed to test perception of the same contrast in two groups of infants acquiring different native languages, such that one group of infants is tested on non-native and another group on native perception of that contrast. Since these are two different groups of infants who are in addition exposed to completely different types of input beyond the speech sound contrast tested, it is more difficult to assess the relation between non-native and native discrimination compared to an assessment in the same group of infants with the same linguistic experience. The present study, leveraging the presence of documented patterns of native improvement and non-native decline in Japanese, therefore assessed the native and non-native speech perception in Japanese-acquiring monolingual infants from six- to 12-months of age. Results demonstrated a decline in non-native speech perception evident in discrimination of non-native /r/-/l/ contrast at 10- ($N=30$, $t(29) = -3.00$, $p < .01$), but not at 12-months ($N=31$, $t(30) = 1.14$, $p = .27$). Additionally, a parallel increase in native speech perception was demonstrated evident in an absence of native phonemic vowel length discrimination at six- ($N=30$, $t(29) = -1.85$, $p = .07$), and 10-months ($N = 30$, $t(29) = -1.12$, $p = .27$) and a discrimination of this contrast at 12-months ($N=32$, $t(31) = -3.48$, $p < .01$). These results, based on a different experimental design, corroborate theoretical proposals on two hallmarks of perceptual attunement: a decrease in non-native and a facilitation in native speech perception during the first year of life.

[PS-1.23]

Minimal-pair associative word-learning in 18- and 24-months-old: an eye-tracking study

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The first two years of human life constitute a critical period for language development, where infants build their phonological categories and exhibit increasing word-learning abilities. Here, we aim to better understand the interaction between these two processes by exploring infants' sensitivity to voicing distinctions during a minimal-pair associative word-learning task. Specifically, 18- and 24- month-old infants performed an audiovisual looking while listening task during which they were presented with two pseudo-words differing only by the voicing of their initial consonant, associated with two pseudo-objects. After a familiarization phase, a visual choice test evaluated the recognition of the two novel word-object associations and some familiar word-object pairs. The proportion of looking-time towards the target was measured using eye-tracking. We expected longer looking time to targets in 24-month-olds compared to 18-month-olds, suggesting a facilitatory effect of consolidated phonological categories in minimal pair associative word learning skills. This research will provide important insights into the interplay between early phonetic perception and the development of core associative learning mechanisms required for successful language development.

[PS-1.24]

Word-level stress processing in infants and toddlers

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Syllable stress can help to distinguish words in a variable-stress language like German. Adult native listeners of German make use of this stress information in word comprehension. Here, we asked whether already language learners use syllable stress for identifying words. We recorded looking times during a looking-while-listening task from infants (4 to 15-month-olds, N 69) and toddlers (2.5 to 4 year-olds, N 28). Participants saw displays of two pictures (e.g., a car and a baby) while hearing a spoken noun referring to one of both objects (target). The disyllabic noun was either correctly stressed on the first syllable (“BAby"), or it was incorrectly stressed on the second syllable (“baBY”). Infants did not show robust evidence for label-object associations. They did not reliably fixate the named target more than the other object (distractor). This replicates previous failures to show word comprehension in this young age group. By-item analysis of the infant data pointed to more fixations towards the target when presented with the correctly stressed noun. However, this was not confirmed by by-participant analysis. Toddlers showed robust word comprehension. Across both conditions, they fixated the named target more than the distractor. Moreover, toddlers were sensitive to the prosodic modulation. They reliably looked more to the target when presented with the correctly stressed noun than when presented with the incorrectly stressed noun. In sum, our results show restricted replicability of word comprehension in infants but revealed a trend that first word representations in German-learning infants might be already specified for syllable stress. Toddlers show robust processing of stress cues on word-level.

[PS-1.25]

Beyond Babble: Investigating Predictors of Toddler Intelligibility in adults and children

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Very few studies have examined how listeners process children's spoken utterances. But recent work has shown that both adults and children find adults easier to understand than toddlers (Yu et al., 2023). This has been taken as evidence for a disconnect between children's productions and their underlying representations of the phonological forms of words (Cooper, 2018). But what makes some toddlers more intelligible than others? We investigate three predictions regarding toddler intelligibility: 1) Children with larger vocabularies should be easier to understand, as these children may be more linguistically advanced (Kehoe et al., 2018), 2) Girls should be easier to understand, as girls tend to develop more advanced language skills earlier than boys (Adani & Cepanec, 2019), 3) Children and adults should find the same toddlers easy to understand, because children's representations of words are thought to be of the adult form (Cooper, 2018). Here, we investigate these predictions by using an eye-tracking procedure to test adults' (n=49) and 2.5 year olds' (n=48) abilities to understand words produced by typically developing English-learning toddlers with no reported speech and language delays. Stimuli for the current study included recorded utterances of 32 words produced by a set of typically developing children (n=28) at 2.5 years old. The results of our well-powered study provided no support for our key predictions. As expected, adults outperformed adults in our eye-tracking tasks. But the vocabulary size of the toddler speaker did not predict how intelligible they are to adults or their age-matched peers; neither did the gender. Further, adults and children did not find the same toddlers intelligible. These surprising findings leave many questions unanswered regarding how perception and production are linked during development, and how we might predict which toddlers will be most intelligible, and what this means for subsequent development.

[PS-1.26]

Beyond Boundaries: Statistical Learning in Word Segmentation among Monolingual and Bilingual Infants

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Identifying words in speech is crucial for language acquisition (Hohle, Bijeljac-Babic, & Nazzi, 2019). Despite challenges, infants use acoustic and distributional cues for segmentation (Thiessen, Hill, & Saffran, 2005). Statistical learning is vital, especially for bilingual infants who must navigate conflicting cues between languages (Weiss, Schwob, & Lebkuecher, 2019). The present study aimed to investigate how monolingual and bilingual infants segment two interleaved artificial languages using statistical information. To do this, four different artificial languages were created two in which the interleaved languages were congruent (Exp.1), and two in which they were incongruent (Exp. 2). In the congruent experiment there was no overlap in syllables between the two languages, and if the statistical information in both languages was aggregated, transitional probabilities remained 1.0 within words, and .33 between words, meaning the languages could potentially be understood and segmented together as one big language. In the incongruent experiment, the two languages shared 4 out of 12 syllables. This means that if the statistical information present in the two languages was aggregated, the syllabic transitional probabilities would change both within and between words, making segmentation in each language difficult. Preliminary analyses of 41 bilinguals and Thirty-seven monolinguals (Mage= 366 days; SD=67 days; Range= 236-449; 43 females) revealed that in Exp. 1 when the interleaved artificial languages were congruent, bilingual infants successfully segmented words, showing a familiarity preference, while monolingual infants did not. Similarly, in Experiment 2, with interleaved incongruent artificial languages, bilingual infants distinguished between heard words and part words, displaying this time a novelty preference. Monolingual infants did not show evidence of word segmentation. These results demonstrate that bilingual infants are capable of tracking two distinct sets of statistical information simultaneously even when having conflicting information whereas monolingual infants struggled to segment speech when presented with two interleaved languages.

[PS-1.27]

Verbal and conceptual vocabulary development in Czech-learning children with cochlear implants

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A cochlear implant (CI) is a neuroprosthetic device that provides hearing to individuals with sensorineural hearing loss. Especially in prelingually deaf children, its contribution to successful L1 acquisition is undeniable, although language outcomes vary widely within this population. The objective of our study is to assess the vocabulary development of implanted children of hearing parents in spoken Czech and in Czech sign language and to identify some of the factors that may contribute to the variation in language outcomes. Following Thal et al. (2007) who showed that the American-English CDI provides valid measures of language development in CI children throughout the first three years post-implantation, we use the Czech adaptation of MacArthur-Bates CDI:WS (Smolík et al. 2017). We adjusted the questionnaire to include answer options “says”, “says and signs”, “signs”. The questionnaire is aimed at early implanted children whose hearing age (HA) is 16 to 30 months. The questionnaires are being completed online by parents in quarterly intervals. To date we have collected data from fifteen children in a first session, seven of whom already contributed data also in a second session (mean age 45.5 months; HA 24 months at first assessment; mean age at first CI surgery 21 months). Data collection is still underway, by the time of the conference we expect to have data from at least one session from 30 children, with a second or even a third session from approximately half of them. The preliminary data confirm the great variability in outcomes observed in CI children acquiring other languages, with 2 children out of the current 15 performing above the 98th percentile of the hearing population matched for HA. The data will be discussed in more depth at the conference, following a quantitative analysis of the contributing factors and a qualitative inspection of the individual trajectories.

[PS-1.28]

Pacifier Use is associated with reduced word comprehension in early childhood

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This study investigates the effect of pacifier use on infants' vocabulary development. Bruderer et al. (2015) showed that infants having a teething toy in their mouth displayed a temporary reduction in their perception of non-native speech sound contrasts. Building upon this idea, we further explored whether sustained (rather than momentary) pacifier use (instead of teething toys) may affect vocabulary development. We first evaluated associations between retrospective reports of pacifier use and vocabulary sizes, as assessed via parental reports (CDIs). We found that greater and later pacifier use is linked to smaller vocabulary sizes, potentially due to the disruptions in somatosensory feedback affecting the establishment of phonetic representations (Muñoz et al., 2024). We addressed the study limitations (reliance on retrospective pacifier usage reports and indirect parental assessments of vocabulary size), by running a second, pre-registered (https://osf.io/3gh5z) study, where we used eye-tracking to directly measure vocabulary comprehension in 64 infants aged 9-18 months, and measured whether it was associated with concurrent reports of pacifier use. We adopted a mixed-effects model, controlling for maternal education and sex, and found that infants with higher pacifier use showed reduced proportion of looking time towards named targets ($z=3.33$, $SE=0.03$, $p < .001$; Figure 1.a). We also observed that older children had higher looking times at target images ($z=-2.92$, $SE=0.06$, $p = .003$; Figure 1.b). Our findings, measuring vocabulary comprehension directly and using concurrent measures of pacifier use, confirmed and extended findings that increased pacifier use associates with lower vocabulary size, as reported in Muñoz et al. (2024). The research underscores the importance of considering infant pacifier use and the potential association with early language development.

[PS-1.29]

Early word learning skills in toddlers with Down syndrome: An eye-tracking study

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Word learning requires mapping sound sequences to a referent. Previous studies suggest that phonotactic frequency is one of the factors that shapes word learning. Typically-developing European Portuguese-learning toddlers, unlike at-risk toddlers, learned new labels of unknown objects only if labels contained high frequency native sound sequences, but not low frequency or illegal sound sequences in their native language. In the current study we focused on toddlers with Down syndrome (DS), a population with largely understudied early word-learning skills. The eye gaze of twelve (mean age 22 months, range 19-35 months, 5 female) European Portuguese-learning toddlers with DS was assessed in a word learning task. The task included a training phase (an object is labeled 6 times, and another object is presented, but unlabeled) and a test phase (both objects presented, while listening to a familiar or unfamiliar label). Labels were C1VC2V disyllabic sequences in 3 conditions: high frequency C1 and C2, low frequency C1 and C2, and an illegal word onset. At the end of the test phase, one control trial was introduced, presenting two known objects side-by-side (e.g., ball, bed) while one is being named. Control items were familiar words for toddlers at 18 months of age. First, a mixed-model analysis (including age as a factor) revealed that DS toddlers show no difference in proportion of looking time (PLT) for the control items before and after naming ($t=.18$, $p=.8$). Additionally, their PLT to the target after naming was not different from chance level ($t(11)=.9$, $p=.8$). Second, a mixed-model analysis on PLT to the target showed no difference between familiar and unfamiliar objects, nor test conditions (all $ts<1.3$, all $ps>.2$). The study suggests that, unlike typically-developing toddlers, DS toddlers demonstrate a significant delay in word learning skills, and possibly low sensitivity to phonotactic patterns in their native language.

[PS-1.30]

Preferences for L1-accented speakers in Czech-learning toddlers: behavioral and neural indices

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Perceptual biases favoring L1- ("native") over L2-speakers ("non-native") are present from early on and affect social behavior and cultural learning. Toddlers are more likely to take a toy or food from an adult who speaks their native rather than a foreign language (1, 2). It has been replicated the preference for L1-accented friends in Czech preschoolers (3). Some studies indicate that multilingual exposure may attenuate these biases (4), while others find no such effects (5). The present study asks whether the bias towards L2-accented speakers is present in Czech-learning toddlers, and whether it is modulated by bilingual exposure. We have designed a behavioral toy-taking experiment and a neural speech tracking paradigm. The predictions are as follows: 1) the Czech-learning children will show preferences for toy offered by L1-accented speaker rather than L2-accented speaker in Czech (we predict the effect of accent, with the language being identical in both conditions); 2) the toddlers' neural tracking of speech will be more accurate for the L1-accent than for the L2-accent (measured as coherence in the theta and delta band, tracking of the syllabic and word rate, and/or as suppressed alpha power in the native condition indicating attention, 6), 3) the effects will be smaller in bilingual than in monolingual group. Data collection is currently underway, aiming at samples of 20 monolingual and 20 bilingual 23-25-month olds. The preliminary results will be discussed at the conference and related to findings in the literature to date.

[PS-1.31]

The use of coarticulatory cues for syllable-final minimal pair word-learning by 14-month-old infants

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Discrimination of the consonant place of articulation contrast in word-final coda position (bat vs back) is acquired late compared to word-initial consonants (Swingley, 2005). Multiple acoustic-phonetic cues code the place contrast, but their informativeness heavily depends on the coarticulatory context or the particular vowel-consonant combination: formant trajectories (reflecting dynamic coarticulation) in the vowel preceding the /p-t/ final place contrast are qualitatively more similar for /i/ (e.g., heap-heat) than for /u:/ (hoop-hoot), which increases perceptual confusion (Ohala & Ohala, 1998). Similarly, cue strength of the burst (reflecting articulator position) differs across contexts (Walley & Carrell, 1983). Infants' use of different cue types in word-learning is not yet well understood, particularly for coda contrasts (Nazzi & Bertoncini, 2009). Using the habituation-switch procedure, the current study compares infants' (N=40, mean 13.5 months [range: 13.3-14.9]) learning of object-label associations for the non-word pair /ba:p-ba:k/ — a context where both formants and burst are presumably informative— in conditions of differing cue availability during habituation. Experiment 1's habituation phase included exemplars from 10 speakers containing only the formant cue and no burst, while Experiment 2 included both. Test phases were identical and included both cues. We compared looking times when the object-label pairing during habituation was switched at test versus when the object-label pairing remained the same. In the two test trials following habituation, infants in Exp. 1 looked significantly longer to the Same than to the Switch pair (11.9s vs. 9.7s), whereas infants in Exp. 2 showed the opposite pattern (Same: 5.7s, Switch: 9s). The unexpected direction of the effect in Exp. 1 could be caused by the presence of the burst at test that was missing during habituation. Overall, the results indicate that infants are able to learn minimal pairs using a single acoustic coarticulatory formant cue.

[PS-1.32]

Talking hormones: Prenatal testosterone levels from neonate hair samples predict language development in the first year of life

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There is a common understanding that biological sex plays a role in early language development. These sex-related differences have been partially attributed to children's interindividual differences in sex hormone levels, yet less is known about the early impact of prenatal sex hormones: Specifically, testosterone levels increase in male fetuses during the second trimester of pregnancy, while it remains nearly constant in females. These fetal testosterone levels have been identified as an organizing mechanism for the emergence of sex-related differences in the human brain. Furthermore, first evidence suggests that fetal testosterone levels drawn from amniotic fluid during amniocenteses predicts early vocabulary development at the age of 2 years. In extension of these findings, the current study aims to investigate whether prenatal testosterone levels from neonates' hair samples, reflecting hormone levels during the second and third trimesters, can explain language development during the first year of life. To this end, we assessed prenatal testosterone levels in neonates (n = 32, 19 females; target sample n = 50) through hair samples collected 2 weeks after birth. In addition to their testosterone levels (mean = 2.34 pg/mg, SD = 2.21), we longitudinally assessed infants' language skills using the Bayley Scales of Infant and Toddler Development at 6 months of age (mean test score = 113.7, SD = 8.49). Step-wise regression analysis revealed prenatal testosterone levels to significantly predict infants' language performance at 6 months ($p < 0.05$), while biological sex alone did not predict language outcome. These findings show first that prenatal sex hormone levels can be captured by neonate hair samples reflecting hormonal changes during the last trimesters of pregnancy (with hair growth starting from the 14th week gestation). Second, they show that these prenatal hormonal levels have an explanatory value in early language development.

[PS-1.33]

The role of word properties in early word learning in Polish monolingual infants

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There are various mechanisms underlying early word learning. Previous research has shown that the properties of the words themselves may impact how early children acquire them – words that are more frequent, concrete (or imaginable) or have higher association with babies are also acquired earlier across several languages (Braginsky et al., 2019; Hansen, 2017). However, so far these effects have not been investigated in Polish infants using language-specific ratings of word properties. The present study aims to extend previous research by investigating psycholinguistic predictors of early word learning in Polish monolingual infants using data from the Polish adaptation of the MacArthur-Bates Communicative Development Inventories (CDI; Smoczyńska et al., 2015). We created a language-specific database containing the subjective frequency, concreteness, imageability and babiness ratings collected from over 1900 native Polish speakers for Polish CDI items – each participant rated 100 words in terms of one property and each word had at least 28 separate ratings. Then, using norming data from the Polish CDI including over 3,500 children aged 8-36 months, we fitted logistic regression models to investigate the contribution of each word property to the age at which children acquire the word. We included separate models for concreteness and imageability due to the high correlation between the variables. Results indicate that words that are more frequent, more concrete (or imaginable) and associated with babies are produced and understood by more children but – given the interactions with age – these effects differ depending on the development stage. This study extends the results of the previous research on the mechanisms of early word learning to Polish. Furthermore, the database of word properties, created specifically for Polish CDI items, may contribute to future research in this field.

[PS-1.34]

Neural attunement to native vowels across preterm and fullterm newborns

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While newborns can recognize their mother's voice and native language, there might be more to intrauterine language development than tuning in to the global language patterns: prenatal learning seems to pertain even to smaller-sized structures such as individual vowels and syllables (Partanen et al. 2013 PNAS). While behavioural and neuroimaging literature reports various language-specific abilities at birth (Mampe et al. 2009 Curr Biology, Moon et al. 2013 Acta Pediatrica, Abboub et al. 2016 Brain Lang, May et al. 2018 Dev Sci), it remains unknown when exactly the attunement to native linguistic patterns sets on. Here we aimed to test at what gestational age the newborn cortex distinguishes between minimally contrastive native-language syllables. EEG in response to naturally-produced vowels was recorded and analysed from a total of 99 infants, born between the 32th and 42th gestation weeks, who were tested a few days after birth (mean = day 3, range 1 to 16 days). Infants were assigned to one of two conditions: the durational condition with the [ɛ]-[ɛː] contrast, and the spectral condition with the [ɛ]-[a] contrast, both representing a phonemic change in Czech, the infants' native language. We analysed the amplitude of primary ERPs to vowel onset and offset as well as the amplitude of the mismatch response (MMR). Linear mixed-effect modelling revealed that the sensory processing of the acoustic vowel differences, indexed by reliably different onset and offset ERPs, develops earlier for the durational than for the spectral contrast, at 38w4d GA and 39w2d GA, respectively. A reliable MMR response was found for the durational contrast across preterm and fullterm ages, and interestingly, shifted from a positive pMMR, in the youngest preterm infants to a negative nMMR, in the oldest fullterm infants. These newborn findings are in line with perceptual development in Czech-learning infants in the first year of life (who have more robust processing of vowel duration compared to spectrum), as well as with the characteristics of Czech (prenatal) IDS (which exaggerates duration contrasts).

[PS-1.35]

Can Brazilians get it? The perception of European Portuguese statement and question intonation by Brazilian Portuguese-learning infants

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This study investigates Brazilian Portuguese-learning infants' perception of the prosodic distinction between statements and yes-no questions in European Portuguese (EP). In Portuguese, unlike in English, the difference between statements and yes-no questions relies only on prosodic features. Although EP and Brazilian Portuguese (BP) present roughly the same syntactic structure for these sentence types, they display different intonational grammars. In both BP and EP, statements show a falling melody at the utterance edge. However, yes-no questions in (standard) EP are characterized by a falling-rising contour, whereas in BP varieties they show either a rising (northeast region), or a rising-falling contour (southern region; Frota et al., 2015). Nine 5-6-month-old (mean age 5.6 months) BP-learning infants (exposure to BP 95-100%) participated in a visual habituation paradigm to test intonation discrimination. Following previous studies (Frota et al., 2014; Sundara et al., 2015), infants were habituated with a string of pseudo-words with bisyllabic sonorant sequences with initial stress, produced by a female EP native speaker in infant-directed-speech. Infants were habituated either to a statement or question intonation pattern. The test phase consisted of two trials: "same" and "switch" (different from habituation). The ongoing BP data was compared with the EP data for same age infants (Frota et al., 2014). A mixed-model analysis revealed a significantly longer looking time to the "switch" than to the "same" trials (intercept= 6.8, "switch" estimate=2.3, t=2.4, p=.01), wherein EP- and BP-learning infants did not differ. Thus, BP-learning infants can discriminate the EP contrast not present in their variety. These findings add to previous work (Sundara et al., 2015; Czeke et al., 2019), where Basque-learning, but not English- or German-learning infants, discriminated the EP prosodic contrast, suggesting that infants might be more sensitive to differences in statement/question intonation when acquiring languages where prosody alone conveys the sentence type distinction.

[PS-1.36]

Does language experience shape accent adaptation abilities in toddlers?

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Monolingual 25-month-olds reliably recognize words in unfamiliar accents. And those who receive multi-accent input or have larger vocabularies are better at accent adaptation. But how about bilingual children? On one hand, bilinguals tend to have smaller vocabularies in one of their two languages when compared to monolinguals, but on the other hand, they tend to encounter more variety of accented speech. Here, we directly compare monolingual and bilingual toddlers' (22-24 months) accent adaptation abilities. To avoid a ceiling effect, we include multiple accents and test children's ability to activate lexical representations in the absence of visual references. In the experiment, participants saw two images side-by-side on a screen and heard a label. On some trials, the named target appeared on-screen (Target Present), sometimes the target was replaced by an object sharing its colour properties (Colour-matched Distractor), and sometimes neither presented object matched the target or its properties (Target Absent). Notably, Colour-matched trials required children to access the spoken targets when the visual target was absent. Half the participants heard a locally-dominant accent (Canadian English), with others hearing a mix of four unfamiliar accents. We predict monolinguals and bilinguals to perform similarly in the Target Present and Target Absent trials, regardless of accent condition. But in Color-matched trials, we predict both groups will perform more poorly in the unfamiliar-accent condition, and that the degree of this impact will vary by group. Preliminary results with monolinguals (N=15; target N=24) support our first prediction, supporting research that shows at this age children can cope with unfamiliar accents spontaneously. However, monolinguals look longer at the colour-matched object only in the familiar-accent condition, suggesting that children's accent adaptation ability is not fully robust under more challenging listening conditions. Ongoing data collection with bilinguals will shed light on how linguistic experience impacts children's speech processing ability.

[PS-1.37]

Do infants encode the tone of voice associated with novel word forms?

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When exposed to a novel word form to what extent do infants encode and remember the tone of voice (TOV) that accompanied that word? Some models suggest that paralinguistic information is encoded in infants' early representations of words whereas other models predict that infants might only retain linguistically-relevant (or phonological) information. In Experiment 1, we tested 18- and 22-month-old infants (N=52) in a preferential looking paradigm. In the exposure phase, infants listened to two nonsense words (blinko and doegap) produced by three different speakers. One word was spoken in a positive TOV, and the other was spoken in a negative TOV. At test, they were presented with stylized cartoon images of a positively and negatively affected face on opposite sides of the screen and were cued in a neutral affect to either "Look blinko" or "Look doegap". Infants looked significantly longer to the target (M=.58) in the 1-second window after word onset, t(51)=2.89, p=.006. In Experiment 2, we set out to replicate our findings with a new group of 18- and 22-month-olds (N=64). In this version of the task, infants did not look significantly longer to the target at test (M=.53), t(63)=1.13, p =.263, however, they showed a numerical tendency to look longer at the happy face when it was the target compared to when it was the distractor. Following the eyetracking portion of Experiment 2, we carried out an object selection task. Infants were re-exposed to the same positively and negatively affected words accompanied by images of novel objects. When infants were prompted to select between the objects, they showed no preference. Taken together, our results do not provide convincing evidence that infants store TOV information along with novel word forms. Possible changes that could be employed in future studies to make our measure more sensitive will be discussed.

[PS-1.38]

Does the quality of caregiver input predict IDS preferences at 8 months?

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Infants' preferences for infant-directed speech (IDS) have been well-documented in the literature (see ManyBabies Consortium, 2020). Although there is general agreement that these early preferences, driven by IDS' enhanced prosodic properties, may facilitate language learning, factors that drive individual differences in IDS preferences are less understood. The current study examines whether the proportion of IDS infants hear in their environment predicts their IDS preferences. IDS preference data and language input data were collected from 33 typically-developing monolingual English-learning 8-month-olds (18 male, 15 female). Infants' IDS preferences were tested using a head-turn preference procedure and stimuli and methodology as outlined in ManyBabies1 (ManyBabies Consortium, 2020). Infants' natural language environment was captured using a LENA speech pedometer across two 8-hour sessions, on two consecutive days. Using methods adapted from Lany and Shoaib (2020), 40 five-minute segments with the highest adult word count (i.e., >110 words) were selected from each 8-hour recording session. From each 5-minute segment, the first 30-second clip that contained speech to the infant was coded for caregiver speech type (IDS vs adult-directed speech (ADS)). Proportion of IDS was then calculated for each infant. Consistent with extant literature, infants listened significantly longer to IDS (M=10.59s; SD=3.79) than ADS (M=9.62s; SD=3.37), t(32)=2.70, p=.01, d=.469), although there was considerable variability in the degree to which infants preferred IDS. Preliminary data also suggests substantial variability in the proportion of IDS heard by our participants (X= ~60%). Remaining LENA data, which has already been collected, is currently being coded. Current data promise to enhance our understanding of the evolving role parent speech type plays in the development of these ecologically relevant speech preferences. Implications of this dynamic interplay between the quality of caregiver input and infants' emerging language skills, especially for infants at risk for developmental delays, will be discussed.

[PS-2.1]

The reliance upon temporal modulation cues in consonant and vowel change detection at 6 and 10 months of age

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The auditory system encodes the phonetic features of languages by processing spectro-temporal modulations in speech, which can be described at two time scales: relatively slow amplitude variations over time (AM, further distinguished into the slowest <8–16 Hz and faster components 16–500 Hz), and frequency modulations (FM, oscillating at higher rates about 600–10 kHz). While adults require only the slowest AM cues to identify and discriminate speech sounds, infants have been shown to also require faster AM cues (>8–16 Hz) for similar tasks. Using an observer-based psychophysical method, this study measured the ability of 6-month-olds, 10-month-olds, and adults to detect a change in the vowel or consonant features of consonant-vowel syllables when temporal modulations are selectively degraded. Two acoustically degraded (vocoder) conditions were designed, replacing FM with pure tones in 32 frequency bands, and then extracting AM in each band with two different low-pass cut- off frequencies: (1) half the bandwidth (Fast AM condition), (2) <8 Hz (Slow AM condition). Results showed that across the three age groups, the proportion of participants able to detect phonetic category change did not differ between the vowel and consonant conditions. However, age-related differences were observed for vowel categorization: while the 6- and 10-month-olds did not differ from one another, they both independently differed from adults. Moreover, for consonant categorization, 10-month-olds were more impacted by acoustic temporal degradation compared to 6-month-olds, and showed a greater decline in detection success rates between the Fast AM and Slow AM conditions. The degradation of FM and faster AM cues (>8 Hz) appears to affect consonant processing at 10 months of age. These findings suggest that between 6 and 10 months, infants show different developmental trajectories in the perceptual weight of speech temporal acoustic cues for vowel and consonant processing, possibly linked to phonological attunement.

[PS-2.2]

Impact of moderate prematurity on early speech perception and minimal-pair word-learning, preliminary results from a 2-year longitudinal study

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Around 15 million children are born prematurely every year, and most of them are moderate preterms (born between 32 and 36 weeks; WHO, 2023). Prematurity has long-term negative effects on cognitive and language outcomes (De Jong et al., 2015; Gervain, 2015). Indeed, compared to full-term newborns, moderate preterms show impaired cortical encoding of speech sounds (François et al., 2021). Here, we present preliminary results of a longitudinal study examining the impact of moderate prematurity on early speech perception and vocabulary acquisition from birth to 24 months. We use EEG recordings and eye-tracking data to investigate the relationship between early auditory perception and language learning abilities. EEG recordings of cortical and subcortical responses are collected simultaneously during a passive listening task (Bidelman, 2015). Specifically, blocks of high stimulation rate (3.45 Hz) alternated with blocks of low stimulation rate (1.47 Hz) to allow the analysis of the Frequency Following Response and the Mismatch Negativity, respectively. These data will enable us to examine the auditory hierarchy of speech perception during early development. We also collect eye-tracking data to explore infants' associative word-learning abilities during a word-learning task involving two pseudo-words, forming a minimal pair based on a voice onset time (VOT) distinction of the initial consonant. Combining electrophysiological, behavioral, and neurodevelopmental measures will allow us to better understand the complex relationship between early speech perception and vocabulary acquisition and evaluate the impact of prematurity. The results of our study will help identify early biomarkers of language delay in moderate preterm infants, paving the way for essential early interventions.

[PS-2.3]

Toddlers' Word Recognition: Comparing a Story-based Pupillometry Paradigm to a Looking-While-Listening Paradigm

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Typically developing toddlers often do not (yet) pronounce all words correctly, for example, pronouncing the Dutch word bloem 'flower' as *[bum]. What underlies these deviations remains unclear (Levelt et al., 2023). One factor may be children's lexical representations. Lexical representations have often been studied using the Looking-While-Listening paradigm (LWL: Swingley & Aslin, 2000). In the LWL paradigm, children see one target and one distractor image while their eye gaze is measured. They hear a sentence (i.e., Kijk! Het is een X! 'Look! It's a X!') in which the target is pronounced correctly (e.g., [blum]) or with deviation (e.g., *[bum]). A bigger proportion of looks to the target for correct compared to deviation trials would imply detailed representations. In this project, the LWL paradigm is adjusted to a story-based pupillometry paradigm (see Vissers et al., 2021). In this story-based paradigm, children see one target image while they hear stories with targets in correct or deviant pronunciations. During the stories their pupil sizes are measured, with larger pupil sizes reflecting surprise (Zhang & Emberson, 2020). Larger pupil sizes for deviation compared to correct trials then indicate detailed representations. Pupillometry is possibly more sensitive (Zhang & Emberson, 2020) and fine-grained (Sirois & Jackson, 2012) compared to eye tracking. In addition, using no distractors in the story-based paradigm eliminates effects of distractors (Zettersten et al., 2022). Lastly, the paradigm is less repetitive compared to the LWL paradigm, possibly affecting children's attention. Data will be presented comparing findings of the LWL paradigm and the story-based pupillometry paradigm. It is expected that the story-based paradigm shows a similar pattern of results compared to the LWL paradigm but allows for more fine-grained analyses. Overall, this study informs about the level of detail in children's lexical representations and contributes to our knowledge about paradigms to test word recognition.

[PS-2.4]

Comprehension and production of number and tense agreement by French-learning 40-month-old children

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Few studies on subject-verb agreement in young children (and mainly based on spontaneous production analysis and parental reports) are available in French, especially comparing number and tense in comprehension and production. However, an asymmetrical pattern, with plural verb forms more easily understood than singular forms and conversely in production, was found in 5-10-year-old children. Concerning tense, children produced consistently 3rd person singular in present tense earlier (27-month-olds) than perfect and near future (34-month-olds). Here we compared 40-month-old monolingual French-learner's ability to understand and produce (n=30) number and tense agreement between subject and verbs (with double markers: e.g. la-SINGULAR fille mord-SINGULAR 'the girl bites'). Six verbs were presented with a noun phrase in four conditions, to allow both number (3rd person present singular versus plural) and tense (perfect versus near future) comparisons. Children first did a picture elicitation task, and then matched sentences to dynamic gifs in a pointing task. Data were not normally distributed, requiring non-parametric tests (one- and paired-sample Wilcoxon signed rank tests). For number (present), both singular and plural were understood above chance ($p=.002$, $p<.001$), but no significant difference was found between them in comprehension ($p=.222$), whereas singular was produced significantly more than plural (52% versus 22%, $p<.001$). For tense, past ($p<.001$) was understood significantly above chance but not future ($p=.109$), with a significant difference between them ($p=.006$), whereas both were still poorly produced with no significant difference (33% and 31%, $p=.830$). Our results show that French-learning 40-month-olds still show more difficulties in future comprehension and future and perfect production, as well as an asymmetry between 3rd persons singular and plural comprehension and production. We will discuss the reasons in connection with crosslinguistic literature, analyze and discuss links between our experimental results and children's performance on standardized language tests, as well as children's errors and effects of prompting.

[PS-2.5]

Sensitivity to mispronunciations in newly learned words in French-learning 12-month-old infants

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Nespor et al. (2003) proposed that consonants and vowels carry different functions in language processing, vowels being more important for prosodic and syntactic processes and consonants for lexical-related processes. The C-bias in lexical processing is supported by adult and infant studies in several languages including English or French, although some cross-linguistic variations exist (see Nazzi & Cutler, 2020, for a review). It has also been proposed that the C-bias is related to vocabulary learning (e.g., Von Holzen, Nishibayashi & Nazzi, 2018). The present study tests this proposal, by teaching French-learning 12-monthold infants a new word, determining their sensitivity to consonant and vowel mispronunciations, and then assessing whether their differential sensitivity to the two kinds of mispronunciations predicts later vocabulary learning. More specifically, we used a version of the switch task (Stager & Werker, 1998; Singh et al., 2016) to teach 34 French-learning 12-month-olds a new word (either /pu/, /bu/, /py/, or /by/, counterbalanced across infants) in sentential contexts, and then, once habituated, test them on isolated word forms corresponding either to the correct pronunciation, a consonant mispronunciation or a vowel mispronunciation. Results show that infants' average looking times (LTs) for mispronunciations are longer than for correct pronunciations (10.96 versus 9.41s, $p = .039$, 1-tailed), but there was no difference between the LTs for Cand V-misps (11.00 versus 10.91, $p = .47$, 1-tailed). Furthermore, correlations between the difference in LTs for C- and V-misps and comprehension and production vocabularies at 12 (concurrent) and 16 months (evaluated with French versions of the CDI) failed to reach significance. The present findings first suggest that the task was difficult for our 12-month-olds, who potentially would have needed more time to learn the words (12 infants showing familiarity rather than novelty effects), and is currently being replicated in 16- month-olds.

[PS-2.6]

Investigating a potential link between semantic prediction and action prediction in toddlers

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Previous research has demonstrated that children from a very young age can predict upcoming words based on semantic information (Mani & Huettig, 2012) and physical movements based on knowledge about actions (Hunnius & Bekkering, 2010). However, the potential connection between predicting language and predicting non-linguistic actions remains an intriguing question. The present study aimed to investigate the relationship between toddlers' abilities to predict semantic meaning and non-linguistic action movements. Drawing on the integrated theory of language production and comprehension by Pickering and Garrod (2013), which posits that language production and comprehension share underlying cognitive mechanisms with action and action perception, we hypothesized that there is a positive relationship between toddlers' ability to predict physical actions and their ability to predict semantic information. 85 2-year-olds participated in the study. Using an eye-tracking visual world paradigm, toddlers were exposed to auditory sentences containing semantically constraining verbs (e.g., "eat"), along with four pictures (where only one picture corresponded to the verb, e.g., a picture of chocolate). This set-up allows us to assess toddlers' ability to predict semantic meaning. To assess their capacity for predicting actions, toddlers watched videos in which a hand would grab one object (e.g., a spoon) and move it to a corresponding object (e.g., a bowl of soup), together with two unrelated objects. Proceeding with the hypothesis that linguistic prediction and action prediction rely on shared, domain-general predictive mechanisms in the brain, we expect that toddlers who exhibit better abilities to predict physical actions will also display a better ability to predict semantic information. Our findings can shed light on the cognitive foundations of predictive processing in early language and action perception, providing valuable insights into the development of these cognitive capacities in early childhood. Pre-registration: https://osf.io/t8m3q

[PS-2.7]

Multimodal Attention and Word Learning in Children with ASD

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Children with autism spectrum disorder (ASD) experience social attentional deficits and sometimes significant language delays, generally involving difficulties in vocabulary acquisition (Arunachalam & Luyster, 2015). However, the link between attention and word learning (WL) in ASD children remains unclear. Here, we assessed this question by recording 3- and 4.5-year-old ASD (N=22) and typically developing (TD, N=25) children eye gaze patterns during a dyadic, word-teaching interaction (an adult gazing and naming a visible object) and a subsequent WL test. In the learning phase, a speaker looks at one of two objects and names it three times (x2). At test, the two objects are presented side by side while the speaker's voice asks for one of them: first for the named object, and then for a new word (mutual exclusivity test). Children underwent this process two times. Group results from the learning phase showed equivalent attention to the face, target- and distractor-object, yet revealed lower number of shifts between the face and the target-object in ASD than TD children [$F(1, 45) = 6.27$; $p = .016$]. In the test phase, the TD group showed evidence of WL [$F(1, 22) = 22.49$; $p < .001$], while in the ASD children, only the older (4.5yo) group learned the new words [$t(17) = 2.12$; $p = .049$]. Last, individual analyses revealed that number of shifts between face and target-object correlated with WL performance in the TD ($p = .017$), but not ASD group ($p > .1$). Attention to speaker's face, eyes or mouth did not correlate with WL performance ($ps > .1$). These results reveal a delay in ASD children's WL skills, and most importantly, they suggest that the formation of new word-object labels in ASD children may be hindered by reduced attentional shifting between the face and the target object of a scene.

[PS-2.8]

Participation in an online music program could enhance vocabulary production in toddlers with cochlear implant (CI) at six months after CI's activation

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Research in the last decades have shown that children's active involvement in musical activities could have beneficial effects on children's language development. Children with cochlear implant (CI) show large individual differences in language outcomes due to environmental and individual factors, and early participation in musical activities may be a protective factor. The aim of the present study is to investigate the effects of a 12-week online music program for toddlers with CI and their mothers on children's early vocabulary production in the first months after CI's activation. The program consisted of playful activities to be performed online by the mother and her child at home, starting three months after CI's activation. The musical stimuli were characterized by rhythms, pitches and melodies. Activities included listening, movement, playing instrument, and turn taking. Ten toddlers with CI (Mage=13.9 months, SD=7.68) who participated in the program (CIs-T) were compared to ten toddlers with CI (Mage=17.7 months, SD=8.35) who did not participate in the program (CIs-C). Children's expressive vocabulary skills were assessed using the Mac-Arthur Bates Communicative Development Inventories (MB-CDI) at three months (T1), at six months (T2) and at twelve months (T3) after CI's activation. An increase in the lexical production from T1 to T2 emerged for both groups. However, Friedman tests showed that the difference in the vocabulary size between T1 and T2 was significant only for the CIs-T group (χ^2=6.40, df=1, p<.01). Children with CI display a growth in lexical production early after the CI is activated. Furthermore, participation in an online music program could help foster toddlers with CI's vocabulary. Additional longitudinal data could clarify the potential benefits of the music program in the long term.

[PS-2.9]

The emergence of combinatorial language processing in infancy

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The ability to combine elements into a hierarchical structure is a key component of human language. Although syntax shows a slow acquisition trajectory that extends beyond childhood, early syntactic combinatorial capacity emerges before the age of two years, potentially forming the basis for later development. How this combinatorial capacity develops in infancy is, however, still poorly understood. To this end, we conduct an eye-tracking study to assess the ability of 10- to 14-month-olds to process minimal syntactic two-word combinations (i.e., adjective-noun phrases). In the adjective position, we use color words with which infants are familiarized prior to testing in a sparse linguistic context. After training, infants are tested using an intermodal preferential looking paradigm on novel objects of the trained colors, which are presented to the infant together with an auditory adjective-noun phrase. The auditory stimulus is presented simultaneously with two visual stimuli, the target depicting an object representing the combinatorial phrase and a distractor representing the target sentence in a decomposed manner. We hypothesize that if infants can successfully process the adjective-noun phrase, they will look longer at the target compared to the distractor. Data collection is still ongoing, but initial pilot data suggest that infants as young as 11 months of age can process these combinatorial phrases. This study will allow us to examine early combinatorial language processes in infants, which may be a first step into later syntactic development.

[PS-2.10]

Neural tracking of nursery rhymes: development and relations with vocabulary outcomes

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Speech consists of regularities at different timescales. A recent discovery is that brain oscillations align their activity to modulations in the speech signal, which already occurs during infancy. The degree to which infants exhibit this neural tracking can be linked to their language development. For example, cross-sectional research demonstrates that the neural tracking of stressed syllables in nursery rhymes at 10 months, but not at 14 months, predicts vocabulary outcomes at 24 months (Menn et al., 2022). This raises several questions: How does neural tracking develop across different frequency bands (i.e., at the stressed syllable, syllable, and phonological rates) from infancy to toddlerhood, and is neural tracking at each rate and age predictive of children's language outcomes? To address these questions, we turn to the longitudinal YOUth cohort study following Dutch children during pregnancy into childhood, aiming to capture meaningful individual differences in neural tracking across development. EEG measurements were collected at three time points (at 5 months, 10 months, and around 3 years of age). During these measurements, children viewed clips in which two female actors alternately sang Dutch nursery rhymes. Language outcomes were assessed at the final wave (around 3 years) using the Peabody Picture Vocabulary Test (PPVT-III-NL) and the Dutch version of the Communicative Development Inventory (N-CDI). Data collection has been completed (>500 children participated). In the coming months, we will analyse the development of neural tracking from infancy to toddlerhood at the three frequency bands of interest. We will also assess the predictive value of the degree of neural tracking at each frequency band and age group for children's expressive and receptive vocabulary outcomes around 3 years. Our study seeks to confirm and expand upon existing findings by examining a larger, longitudinal group of neurotypical children and sampling at three time intervals into early childhood.

[PS-2.11]

Evidence of word segmentation abilities in German-learning 5-to-6-month-olds

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To learn new words, infants must first determine where words begin and end in continuous speech. Infants start extracting words from fluent speech between 6 and 7.5 months of age (in English, Jusczyk & Aslin, 1995). Like their English- and Dutch-learning peers (Jusczyk et al., 1999; Houston et al., 2000; Kuijpers et al., 1998; Kooijman et al., 2009), German-learning infants show a listening preference for trochaic over iambic words by 6 months (Höhle et al., 2009) and are able to segment words from a speech stream following the trochaic stress pattern of their native language (Marimon et al., 2022; Höhle & Weissenborn, 2003). In this study, we used pupil dilation to investigate German-learning infants' ability to segment bisyllabic nonce words from natural speech. We tested German-learning 5- to 6-month-olds (n = 14, target N = 30) in a central fixation paradigm with eye-tracking. Infants were familiarized with passages containing two nonce words used as verbs (e.g., rieken /ri:kən/, pahlen /pa:lən/) until they had accumulated 45 s of listening time to each. Then they were tested on four isolated words: two familiar (rieken, pahlen) and two novel (wühnen /wy:nən/, tuhpen /tu:pen/). Preliminary results show that while the difference in looking time between novel vs. familiar test trials was not significant ($p = .88$), infants pupils did dilate significantly more to novel than to familiar words at test ($p < .01$). Our results provide the earliest evidence of bisyllabic word segmentation in German-learning infants (5-6 months of age) from natural speech passages using pupil dilation - which we find is a more sensitive measure to index infants' segmentation abilities compared to the traditional measures based on looking time.

[PS-2.12]

Longitudinal changes in parental consonant production in infant-directed speech and infants' early speech production from 6 to 12 months

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Previous research suggests that properties of infant-directed speech (IDS) might be beneficial for infants' language development (Golinkoff et al., 2015). However, consonants have gained less attention than prosodic and vowel-based properties (McMurray et al., 2013). In the current study, we examined voice onset time (VOT) – a distinguishing cue for stop consonant contrasts – in IDS and adult-directed speech (ADS), and its relation to infants' speech production from 6 to 12 months. We collected data from a longitudinal sample of n=48 Norwegian parent-infant dyads. Parents' IDS and ADS were recorded in-lab at three timepoints (infants' age: 6, 9, 12 months), and the VOTs of a total of 7,295 stop consonants (/b-p/, /d-t/, and /g-k/) were measured. In addition, at each timepoint, parents reported, through an online questionnaire, their infants' production of the same consonants, as well as their babbling. Hypotheses were preregistered, and we used full-null model comparisons to minimise type I-errors in the analyses. Results of our mixed models demonstrated that, while controlling for speaking rate, parents' VOT is longer in IDS vs ADS for voiceless stops ($\chi2=77.8$, $p <.001$), but shorter for voiced stops ($\chi2=76.0$, $p <.001$), and IDS, as compared to ADS, features overall less distinct consonant contrasts ($\chi2=17.5$, $p <.001$). Further, VOT in IDS becomes more similar to ADS with infants' age (voiceless $\chi2=36.3$, $p <.001$, Fig. 1; voiced $\chi2=8.09$, $p <.01$), however, we find no relationship between parents' VOT and infants' consonant production or babbling (p's >.05). A potential explanation is that less distinct productions of contrastive consonants in Norwegian parents' IDS suggest that parents' modulations in speech to infants would be motivated by attentional and affective aims rather than didactic purposes.

[PS-2.13]

A longitudinal investigation of the acoustic properties of infant-directed speech to Norwegian 6–18-month-old infants

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The acoustic expression of caregivers' infant-directed speech (IDS) has been suggested to engage infants' attention and promote language acquisition (Golinkoff et al., 2015). Yet, IDS might differ across cultures, and longitudinal studies are sparse and conflicting with respect to whether IDS changes across development. Here, we addressed these issues by examining the longitudinal trajectory of a range of prosodic-segmental features of IDS, and compared these to adult-directed speech (ADS), in Norwegian parents of 6–18-month-old infants. Sixty-nine families participated in the study. Throughout five sessions across one year, parents were recorded reading a picture-book to their infant (IDS), and to an experimenter (ADS). The book was designed to control for the linguistic content and context of speech. Acoustic analyses of a total of 54,594 vowels and 22,958 phrases compared IDS to ADS. Results showed that, irrespective of infants' age, mothers and fathers used higher pitch, wider pitch range, slower articulation rate, and longer, more variable and less distinct vowels in IDS than ADS. Only fathers' IDS featured overall increased vowel spaces, an effect that might have been circumvented in mothers, who appeared to expand their vowel space in IDS with infants' age. As infants developed over one year, parents' IDS, compared to their ADS, featured a wider pitch range, larger vowel space areas, and shorter vowels, while pitch, articulation rate, and vowel variability and distinctiveness remained relatively stable. This suggests that Norwegian IDS follows similar characteristics as typically reported in the literature (Cox et al., 2020), but also corroborates findings that vowel categories are more variable and less distinct in IDS. Moreover, speech directed to Norwegian infants is expressed with some acoustic features that are dynamic across development, and others that are static. Future studies should examine whether observed trajectories of different acoustic measures impact the functions of IDS.

[PS-2.14]

The influence of intonation on word recognition in German 18-24-month-olds

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German infants have been shown to be able to segment trochaic words from speech from around nine months of age [1-4]. These studies have highlighted the role of intonation in this task: [2] and [4], for instance, demonstrated that only high-pitched stressed syllables are interpreted as onsets of trochaic units by German nine-month-olds. Here we test whether such an initial reliance on high-pitched stressed syllables in German infants also pertains to referential word recognition. If this is the case, we predict faster recognition of objects on screen when they were produced with high-pitched stressed syllables (H*L-%, as in falling declarative intonation) as compared to low-pitched stressed syllables (L*H-^H%, as in rising question intonation). We designed a looking-while-listening study, in which German 18-24-month-olds saw 16 pairs of colourful objects side-by-side on screen ([5]); labels for object-pairs were matched for grammatical gender but differed in the onset consonant ([6]). One of the objects was named at the end of a falling declarative (H* L-%) or rising polar question (L* H-^H%); intonation was manipulated within-subjects, within-items. Objects appeared 1.5sec before sentence onset (cf. [7]) and trials ended 3.5sec after target word onset. The target and its position on screen were counterbalanced across lists; trials were pseudo-randomized. Fixations were extracted at 60Hz and analysed using fasttrack ([8]) and gamms ([9]). Preliminary analyses of 12 German children (19-24 months, mean=21.2, SD=2.4) showed earlier target fixations with increasing age and initially more fixations to the target in trials with a fall (H*L–%) compared to a rise (L*H-^H%), which was significant 953- 1148ms after target onset. Later on, the pattern reversed. Hence, intonation influences German infants' referential word recognition, such that targets with high-pitched stressed syllables are recognized earlier. In future work, we plan to include more varied sentences and word prosodic structures ([10]).

[PS-2.15]

Acoustic features of vowels in mothers' speech to their infants between 4–13-month infants, in relation to phonological abstraction and receptive vocabulary

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The speech directed toward infants is a key contributor to their language development. This study concerns the possible relationship between caregivers' vowel productions in Infant-Directed Speech (IDS) and infants' phonological abstraction and/or vocabulary development. Specifically, we examined whether mothers' productions of the corner vowels, /i, u, a/ in IDS to their infants at 4, 7, 10, and 13 months displayed (i) acoustic hyper-articulation, i.e., greater F1/F2 vowel triangle area circumscribed by the centroids of the three vowels (e.g., Kuhl et al., 1997), in IDS than in their Adult-Directed Speech (ADS) and/or (ii) greater hyper-dispersion, i.e., greater dispersion of tokens within each of the three vowels (e.g., Cristia & Seidl, 2014), in IDS than in ADS. These IDS vs ADS vowel characteristics were then compared with a measure of infants' early phonological abstraction at 4, 7 and 10 months (Altuntas et al., submitted 2023), and of infants' receptive vocabulary (Jones et al, 2022; Kalashnikova, Schwarz & Burnham, 2016) at 13 months. There was greater dispersion in IDS than ADS for all three vowels across all four ages (except /u/ at 7 months) but, despite shifts in the positions of IDS vowels over age, vowel hyper-articulation was only present in IDS to 7-month-olds. Neither hyper-articulation nor hyper-dispersion in IDS predicted infants' receptive vocabulary at 13 months, but there was a significant correlation between infants' phonological abstraction at 4 months and mothers' hyper-articulation at 7 months suggesting that early phonological ability may be associated with their later responsiveness to IDS vowel differentiation around the period (7 to 10 months) when perceptual attunement to native vowels emerges (e.g., Polka & Werker, 1994). These results suggest there may be a hitherto unexamined relationship of early phonological abstraction with later IDS vowel qualities, and even with later perceptual attunement, a possible relationship that begs further investigation.

[PS-2.16]

Early processing measures in mono- and multilingual infants and their link to later language skills

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Decades of research have uncovered how infants' perception and processing abilities bootstrap language acquisition and correlate with later language skills, both in children with typical development and language disorders (see systematic review by Cristia et al. 2014). However, the clinical potential of infant language processing measures is far from being fully exploited, as most correlations and comparisons hold only on the level of groups, not individuals (Cristia et al. 2014). Furthermore, to our knowledge, such correlations between infant processing and later language outcomes have not been studied extensively in multilingual populations. As part of a larger project following mono- and multilingual children longitudinally during their first three years, we adapted three seminal processing tasks to visual fixation via automated eye-tracking, and tested 69 infants at 8-9 months of age (37 French monolinguals, 32 multilinguals exposed to French and one or two additional languages). We used an adapted habituation-to-criterion procedure with a test phase (12 trials) optimized for interpretation on an individual level (following Houston et al. 2007). We selected one non-linguistic, low-level auditory processing task (frequency modulation detection, Chodhoury & Benasich, 2011) and two rather subtle phonological perception tasks, one on specific phonetic categories (discrimination of /sa/-/ʃa/, Nittrouer 2001), and one on a more universal phonological phenomenon (consonant invariance, Hochmann et al. 2014). We are currently monitoring children's vocabulary through cross-linguistic parental CDIs at 12, 18 and 24 months, as well as grammar and phonology at 24 months. Interestingly, only the auditory processing task elicited a robust discrimination response, regardless of language status (see details of mixed model analyses for all three tasks in Table 1). By the time of the conference, we will have finished data collection and present and discuss analyses showing correlations with earlier processing abilities, and contrast them with other early measures (pragmatics and gesture development).

[PS-2.17]

Home speech environment of Japanese infants from six- to 12-months: evidence from day-long recordings study

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One crucial environmental factor in language development is the speech input that a child receives (Hart & Risley, 1995) especially during the first three years of life (Gilkerson & Ricards, 2009). Previous evidence identified socio-economic status (SES) as a driving force of observed variability in speech input quantity (Dailey & Bergelson, 2022). However, high SES in previous studies is often confounded with Western culture. We here assess input quantity to infants growing up in Japan, a non-Western culture with average SES comparable to Western industrialized countries. Previous evidence suggests significant cultural differences in quality of speech input to infants between American and Japanese caregivers (Fernald & Morikawa, 1993), but research on speech quantity is limited. We examined the quantity of adult speech input to Japanese-acquiring monolingual urban infants from high SES families. Data were collected from 30 infants longitudinally every three-months starting at infants' age of six- until 18-months, allowing us to additionally assess the evolution of input quantity over time. At each timepoint, infants' home speech environment was recorded for two days in a row via a wearable audio recorder. We estimated the frequency of adult speech per recording hour at infants' ages of six-, nine-, and 12-months (using ALICE, Räsänen et al., 2021). The results demonstrated stability in the frequency of speech input from six- to 12-months (6m: N=29, Median =20.5%, SD=7.03; 9m: N=26, Median=17.6, S=5.3, and 12m: N=25, Median=19.6, SD=5.77), with no significant age differences, p=.31. The overall quantities reported are consistent with findings from urban high SES North American families (Median=16.41%, Cristia, 2022) suggesting that speech input to infants growing up in high SES environments is comparable between North American and Japanese samples. In the next step, we will assess how the observed quantity of speech affects developmental patterns of infants' native and non-native speech perception.

[PS-2.18]

Do caregivers modulate their pitch to indicate the spatial position of objects?

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Even newborns are sensitive to abstract cross-sensory correspondences: They map higher pitch to a higher vertical position in space and lower pitch to a lower vertical position. Preliminary unpublished data suggested that adults align pitch and visuo-spatial height within their infant-directed speech. Adults – who imagined talking to an infant – used a higher pitch for pseudo-nouns (e.g. “temu”) when this noun refered to an object at an upper position at a screen rather than when the same noun referred to an object at a lower position. In our planned pre-registered study, we ask whether caregivers use respective spatial-specific pitch modulations in the speech they produce to direct their children’s attention towards objects at different spatial positions. Together with their 8- to 23-month-old child, caregivers saw four different objects in each corner of a screen. Preceding this presentation, caregivers read a sentence. They should produce this sentence to guide the attention of their child to one of the four objects when they appeared (e.g., “Look at the bird.”). Our acoustic analysis of the pilot data revealed that caregivers’ pronunciation of the noun, as well of the preceding sentence, reflected spatial height. Utterances for a noun presented at an upper position received higher pitch compared to utterances for the same noun presented at a lower screen position . We follow up on these results using the same visual-search task within a more standardized lab environment, testing caregivers and children between 18 to 24 months. Data collection just started, but we are confident that we can present preliminary data by the start of WILD. Prospectively, we aim to get more insights into developing language-space associations during early language acquisition.

[PS-2.19]

Chinese Child-Directed Speech Is Faster and More Fluent Than Adult-Directed Speech

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Child-directed speech (CDS) is often believed to have a slower speaking rate and to be more fluent than adult-directed speech (ADS), but is this true across languages and all utterances? This study investigated the differences in speaking rate and fluency between Chinese CDS and ADS. We analyzed a corpus of Chinese ADS and CDS including forty mothers telling the same story to their 18- or 24-month-old children and an adult. We manually annotated 6740 utterances in this corpus and extracted the fluency measures including speech rate (including utterance-internal silent pauses), articulation rate (excluding utterance-internal silent pauses), frequencies of silent pauses, filled pauses, repairs, and repetitions. We found that: First, CDS was generally more fluent than ADS, with fewer silent and filled pauses. Second, there were no significant differences in speaking rate between CDS and ADS for short utterances, but CDS was significantly faster than ADS for longer utterances. Moreover, there were age-related differences in speaking rate in relation to utterance length. Specifically, at 18 months, there were no significant differences in speech rate between CDS and ADS when the utterances were shorter than 10 syllables ($N = 2533$, $p's > 0.06$). However, CDS was significantly faster than ADS for utterances longer than 11 syllables ($N = 518$, $p's < 0.05$). At 24 months, when utterances were less than 4 syllables, there were no significant differences in speech rate between CDS and ADS ($N = 941$, $p's > 0.1$). However, CDS was significantly faster than ADS for utterances longer than 5 syllables ($N = 1976$, $p's < 0.05$). These findings highlight language-specificity in the temporal aspects of CDS. As Chinese CDS is not slower but can be faster than ADS, we should consider cross-linguistic differences when it comes to slowing down as a common feature of CDS.

[PS-2.20]

The length of breastfeeding does not affect age of reaching developmental milestones

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Both literature reviews (e.g. Smith, 2015) and cohort studies (e.g. Dee et al., 2007; Kim & Choi, 2020; Lenehan et al., 2019; Vestegaard et al., 2007) indicate that even short-term breastfeeding (up to 3 months) can have a significant positive impact on cognitive development. Our study analysed data from 1073 healthy Polish monolingual children aged 1 to 40 months, all of whom were born full-term with a birth weight between 2100 and 5050 grams. The data were reported by highly educated mothers (all obtained bachelor degrees). A mobile app called 'StarWords - every word counts' (Mieszkowska et al., 2022) was used to collect longitudinal data on the age at which non-linguistic milestones such as crawling and walking, and linguistic milestones such as babbling, production of first words, and combining words into sentences were reached. We also collected data on breastfeeding practices, including whether the child was still being breastfed at the time of reporting and the length of breastfeeding. Additionally, some mothers completed standardized parental questionnaires on language development (Marchman & Dale, 2023), including CDI-I (n = 56), CDI-II (n = 181), and CDI-III (n = 29). The results showed that 95% of participating mothers initiated breastfeeding and breastfed for a relatively long time (M = 10.5 months, Me = 11 months). We found no correlation between the length of breastfeeding and the age of reaching developmental milestones (all p-values > .09), nor between breastfeeding and the scores of the CDIs (all p-values > .44). Additionally, we found no differences in the age of reaching specific motor and linguistic milestones between infants who were breastfed and those who were not at the ages of 1, 3, 6, 9, 12, 15, 18, 21, and 24 months. We conclude that among a sample of highly educated mothers, breastfeeding may have no additional impact on reaching early language milestones.

[PS-2.21]

A direct, tablet-based test of language development for French toddlers usable in non-lab settings

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Available measurement tools constitute a hard limit for experimental protocols. In this study, we aimed to fill in a gap in available language tests for young children usable outside the lab, by developing a reliable direct language measure for French toddlers that was quick, automatized and administrable by non-researchers for use in larger-scale studies. Our touchscreen-based test measured vocabulary comprehension (similar to Friend & Keplinger, 2003, 2008), and novel word learning abilities, in 25 minutes. Trained support staff tested 175 20-28 month-olds (Mage=25), in their daycare centers, accompanied by an educator. Parents filled in the online version of the French MBCDI productive vocabulary questionnaire. Our test showed high compliance rates (children answered 90% of trials), and increasing accuracy with age (see Figure). Although our novel word learning task showed mixed results and requires additional work to be adapted to younger children, scores to our vocabulary task showed good psychometric properties. Analyses revealed good convergent validity between our two tablet measures and the MBCDI (Pearson r.vocabulary=0.43, $p < .001$). The low variability of our sample did not allow us to assess sensitivity to individual variation although we did find trends of increased accuracy with higher SES or monolinguals. One important application of our tool is the use as a pre-post measure in interventional contexts, and we therefore developed 2 versions of our test matched in difficulty. A pre-post measurement separated by 4 months showed that pre-test vocabulary scores significantly predicted post-test scores ($p < .001$). Taken together, these results show the usability of our touchscreen test with children as young as 20 months. Moreover, its high portability, minimal training requirements and short length allowed us to use it in a RCT language intervention based in 35 daycare centers, demonstrating its adaptedness to larger-scale naturalistic settings.

[PS-2.22]

No evidence of native sound discrimination in Norwegian 9–month-old infants using an eye-tracking habituation paradigm

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The study explored whether 9-month-old Norwegian infants exhibit perceptual narrowing, a phenomenon where infants discriminate native language sounds but struggle with non-native ones. This developmental shift, typically occurring between 6 and 12 months, has been documented in various languages but is lacking in Norwegian infants. We tested monolingual Norwegian infants on their ability to distinguish the Norwegian vowel contrast /y - i/ (n=57) and two consonant contrasts /d - ɖ/ and /b - d/ (n=28). The experiment utilized a habituation-dishabituation paradigm, similar to Houston et al. (2007), where infants were habituated to a specific sound and measuring their looking time when presented with alternating novel and habituated sounds (novel condition) versus repeated habituated sounds (habituated condition). The experiment was fully gaze contingent and only infants that habituated within 24 trials and had at least 1200ms of looking time in at least one trial in each condition (novel or habituated) were included. Log-transformed looking times were entered in linear mixed-effects regressions, with the test condition as an independent variable, controlling for age, sex, and maternal education. Surprisingly, the results showed no significant differences in looking time between novel and habituated trials for both vowel and consonant contrasts (vowel: z = 0.88, se = 0.07, p = 0.38; consonants: z = -0.75, se = 0.08, p = 0.45). These findings suggest two possibilities: either 9-month-old Norwegian infants haven't fully developed stable discrimination of native speech sounds, or their response patterns to familiar versus novel stimuli differ, making traditional habituation paradigms insufficient to demonstrate their sound discrimination capabilities. We also plan to perform time-series analyses through pupillometry data.

[PS-2.23]

Screen Time and Early Language Development in Bulgaria

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Screen Time and Early Language Development in Bulgaria An important line of research focuses on the association between digital media use and language development during early childhood. Existing literature however, it is prone to several biases – under-representation of non-Western cultures and of children under the age of 3, in both academic studies and guidelines on digital media; and a focus on vocabulary growth as the sole metric for communicative development. This recent study was conducted in Bulgaria in 2021-23 offering insights into the evolving relationship of language development and media use in the post-Covid family realities. Language development was assessed via the short form of the Bulgarian adaptation of. Parents of 421 children aged 16 to 36 months provided information online to the short form of the CDI Words & Sentences inventory and a questionnaire on digital use. First exposure to screen media occurred early, M = 15.89 months, and their daily TV exposure ranged from 0 to 5 hours, M = .91. They also used smartphones (M = .53 hours) and tablets (M = .14 hours. The average cumulative daily screen time for children was M = 1.59 hours. A stepwise linear regression showed that children's age (beta = .74), gender (beta = .14) and daily screen time (beta = .14) made significant unique contributions as predictors of vocabulary. Parental education level and digital time no significant contributions. In a logistic regression on word combinations all three child-related variables made a unique statistically significant contribution to the model and none of the parent variables did. Finally, a stepwise linear regression identified parents' screen time (beta = .27) followed by age (beta = .19) as significant predictors of children's screen time. The results are interpreted within the specific cultural and media context in the country and child rearing practices.

[PS-2.24]

Do maternal cortisol levels as well as infants' cortisol levels influence language development at twelve months of age?

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The influence of stress experienced by both mothers and infants before and after birth has been shown to affect a child's language and overall cognitive development (Caparros-Gonzales et al., 2019; Finegood et al., 2017; Mumm et al., 2023). Notably, elevated levels of cortisol, the primary stress hormone, have been identified to have an impact on children's neurodevelopment (Caparros-Gonzales et al., 2019; Finegood et al., 2017). Recent research highlighted a positive association between higher prenatal maternal cortisol levels, measured through fasting blood samples, and early language development in children, assessed through parental reports (Mumm et al., 2023). The aim of the present study is to further evaluate the association between pre- and postnatal hair cortisol levels and infants' language abilities at the age of twelve months. Hair samples were collected from German-speaking mothers and their children (target sample n = 35) at two weeks and twelve months after birth to measure cortisol levels. The infants' receptive and expressive language skills at twelve months of age were assessed using the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III; Reuner & Rosenkranz, 2014). Building upon previous research, we expect higher pre- and postnatal maternal cortisol levels to positively affect infants' language and cognitive development at the age of one year. Conversely, we hypothesize that elevated pre- and postnatal hair cortisol levels in infants will be associated with lower language abilities. Results will be added soon.

[PS-2.25]

Colour or category? Investigating second label learning in monolingual and bilingual infants

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The mutual exclusivity bias refers to the tendency to map novel labels onto novel objects using one-to-one mapping. When applied to familiar items, the mutual exclusivity bias can also be used to learn the label for object characteristics. Previous research investigated this by presenting infants with a novel label being applied to a familiar animal in an unusual colour (i.e., aqua-coloured dog; Kandhadai et al., 2017). Monolingual participants interpreted the label as referring to colour, whilst bilingual participants interpreted it as a second-category label (i.e., another word for dog). However, infants have also demonstrated an animal bias for proper noun learning (Sorrentino, 2001), therefore, potentially increasing infants' willingness to accept a second label when applied to animals. The present eye-tracking study replicates and extends this previous research to investigate whether monolingual and bilingual 17-to-19-month-old infants differ in their interpretation of a novel label when it is applied to familiar animals (cat and dog) and inanimate objects (ball and shoe) presented in unusual colours. Monolingual and bilingual infants were found to interpret the novel label as referring to a second-category label when the stimuli were animals, but not when the stimuli presented were objects. However, there was substantial variation between participant responses which cannot be explained by language background. Subsequently, gender, vocabulary size, knowledge of colour words, and early executive functions have been investigated as potential sources for explaining the variance in the results. Additionally, novel labels were found to hinder infants' recognition of familiar labels in familiar target trials; whilst consistent use of familiar labels improved identification, implying that additional labels may disrupt prior knowledge access.

[PS-2.26]

Knowledge retention after taking part in a parental intervention on supporting multilingual development

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Parent-directed interventions can improve the child-directed speech and thereby enhance children's language development (Reese et al., 2010). Multilingual children experience limited language input in any single language, thus, bilingual families are an important target group for parent-directed early language interventions (Luk & Bialystok, 2013). Previous studies rarely re-test participants' knowledge after an extended period, while limited existing evidence suggests that knowledge retention may be low (Sowa et al., 2021). We designed a research-based online intervention for expectant Polish-speaking parents living in Norway and tested parental knowledge about language development and parental behaviors that promote it immediately before (T1) and after (T2) the intervention. We randomly assigned N = 74 parents to experimental (n = 40) or control (n = 34) conditions. Repeated measures ANOVA showed a significant effect of time ($F(72,1) = 30.27$, $p < .001$) and a significant effect of the interaction between time and group ($F(72,1) = 11.79$, $p < .001$), indicating that parental knowledge increased and that the increase was significantly more prominent in the experimental group. We further investigated knowledge retention in a subset of participants (N = 40, n_exp = 15, n_cont = 25) by adding to the model the level of parental knowledge when their children were about 9 months old (T3). A repeated measures ANOVA revealed a significant effect of time ($F(37,2) = 16.54$, $p < .001$) and a significant effect of group ($F(38,1) = 4.86$, $p = 0.034$), indicating an increase in knowledge that was retained over about 9 months (from T1 to T3). Post-hoc analysis showed no difference between knowledge at the posttest (T2) and knowledge at 9 months of children's age (T3) in either group, showing no knowledge attrition over time. Our intervention can be seen as an effective way of improving parental knowledge about language development in a multilingual context.

[PS-2.27]

Exploring the Impact of Syllable Complexity on Canonical Proportion in Children: Insights from a Multilingual and Cross-cultural Study

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One sign of early phonological development is the increasing prevalence of canonical syllables (consonant+vowel; Oller et al., 1998). A recently proposed metric is canonical proportion (CP): the proportion of a child's speech-like vocalisations containing clear consonant-vowel transitions (Cychosz et al., 2021). Initial analyses of 129 children suggested that CP relates to age non-linearly, continuing to develop well beyond the appearance of children's first words; and that it varies as a function of the ambient language structure (Hitczenko et al., 2023). Here we investigate CP further, considering potential effects of multilingualism (i.e., being exposed to 2+ languages). With the help of citizen scientists, we crowdsourced the annotation of 256,842 clips extracted from speech-like vocalisations by 371 children (2-77 months: 178 boys). The resulting dataset represents children from Bolivia (n=44), France (10), Mexico (10), Papua New Guinea (46), Solomon Islands (198), Vanuatu (40), and the USA (California 3, Indiana 10, New York 10). Children's CP appears to depend on age, mono-/multilingualism, and ambient language complexity (Figure1). First, a generalised linear model was fit to the monolingual data, declaring age in interaction with complexity (as in Hitczenko, languages were categorised as allowing only simple, moderately complex, or complex syllables following Maddieson, 2013). Second, a Levene Test confirmed significant difference in variance of CP between monolinguals and multilinguals ($F = 11.47$, $p<.005$). Our first analysis confirmed Hitczenko's observation that CP develops more slowly in languages that allow more complex syllables, possibly due to the challenge posed by learning the complex syllables. Previous research suggests that children often mirror the characteristics of their ambient language in their canonical babbling (Andruski et al., 2014). In a subsequent analysis, significant differences in variance between monolinguals and multilinguals were observed, and the reasons for these differences will be discussed.

[PS-2.28]

Imitation of relative clauses in Czech children with developmental language disorder

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Sentence imitation (SI) is a sensitive marker of developmental language disorder (DLD; Riches, 2012), revealing difficulties in syntactic structures, as children should imitate only mastered structures (Poll et al., 2013). While children with DLD have difficulties using relative clauses (RCs; De López et al., 2014), this study compares them with the use of adjectival nominal phrases. In Czech, both wh-words and adjectives follow adjectival declension. Sixty-three monolingual Czech speaking children with DLD (6;5-9;6, M = 8;10) were gender- and vocabulary-matched with TD children (3;7-6;7, M = 6;1). They completed SI task involving 32 RCs and 16 simple sentences with adjectival phrases. The study analyzed avoidance strategies, error types, and scored the grammaticality of using relative pronouns/adjectives within the sentence core. Generalized linear mixed-effects models revealed a greater tendency in children with DLD to avoid the target structure ($z = -3.096$, $p = 0.002$), with a reinforced difference between the scores gained in RCs and sentences with adjectival phrases (interaction group*construction: $z = -2.959$, $p = 0.003$). Moreover, children with DLD used the target structures less grammatically ($z = -5.099$, $p < 0.001$) with a weakened difference between the scores gained during the imitation of structures (interaction group*construction: $z = 2.564$, $p = 0.010$). RCs modifying an isolated noun phrase and simple sentences were the most frequently used another wh- and grammatical structure, respectively. Children with DLD exhibited higher rates of wh-word omissions ($\chi 2 (2) = 12.27$, $p < 0.001$) and non-inflected wh-word substitutions (214 cases vs. 94 cases) than TD children. Children exhibited similar error types and avoidance strategies, but increased avoidance of target structures and omissions of relative pronouns indicated greater syntactic difficulties with RCs in children with DLD. Challenges with adjectival declension were suggested by the non-inflected wh-word substitutions and ungrammatical target structures.

[PS-2.29]

Infant Adaptations to Diverse Language Environments

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Infants adapt to the external world by sampling it. The more variable the environment, the more sampling (exploration) is required. Infants who regularly hear two or more languages are likely to be exposed to more varied language input than infants who regularly hear one language. These 'bilingual' infants may also receive less input from each language. Given these exogeneous sampling constraints, how do bilingual infants keep pace with their monolingual peers? We propose that they do so by placing more weight on gathering information (exploring) and rapidly orienting towards speakers (because visual input facilitates language learning). In support of this proposal, it had been found that infants raised in bilingual homes switch attention between visual stimuli faster and more frequently than infants raised in monolingual homes (D'Souza et al., 2020). But this may have been due to some effect of trial and/or non-language (e.g., cultural) difference. To rule this out and obtain a more in-depth understanding of infant adaptations to bilingual environments, we have analysed within-trial moment-by-moment eye-tracking data and investigated whether attention switching is associated with a continuous measure of language experience. We found that infants whose language environment was dominated by English switched attention between visual stimuli less frequently, $\chi2(5) = 53.90$, $p < .001$. Crucially, these infants fixated more on novel over familiar stimuli (as expected, based on the infant literature), whereas infants from more diverse language environments continuously switched attention between visual stimuli, irrespective of whether the stimulus was familiar or novel, placing more weight on gathering information (exploring) than prior expectations. Since the study was carried out in a laboratory setting, we are also investigating how infants explore their natural environment. Pilot data from this ongoing naturalistic and interactionist study will also be presented, alongside a computational model that explains and predicts empirical data.

[PS-2.30]

Sociolinguistic variation in Chilean Spanish speaking children and their caregivers: evidence of sensitivity to subtle sociophonetic traits in language development

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Previous studies show that the acquisition of variation begins early in our lives. The process is mainly characterized by a strong correlation between the linguistic production of children and their main caregivers, and that is dependent on the type of variable under analysis in which both, linguistic and social factors are involved (Foulkes et al., 2005; Miller, 2013; Roberts 1994; Smith et al., 2007, 2009). This developmental sociolinguistics study aims to analyze the acquisition and use of two of the most salient variable sociophonetic traits in Chilean Spanish: allophonic variation of /tʃ/ phoneme, and variable production of /tr/ consonant cluster. This is of interest at least because of three reasons: (a) it allows us to look at the acquisition of variation, considering fine-grained phonological details that differentiate among variants that bear social meaning, (b) to explore potential language change-in-progress, and (c) because, to our knowledge, there is no previous literature on how children acquire those variables, and how adults use them in child-directed speech. Caregiver-child dyads (ages 5;9-6;6) were audio-recorded in their houses over 4-5 one-hour sessions while they were interacting alone (i.e., playing, doing homework, preparing meals, etc.), using lavalier microphones. Each token was identified and manually delimited on Praat by native speakers of Chilean Spanish, while subsegmental acoustic measures were performed automatically using a Praat script. A total of 1,250 occurrences were analyzed and coded by linguistic and extralinguistic factors. Our results confirm the correlation between children and caregivers' usage patterns attested in previous studies, even at a subsegmental level. Standard variants were largely predominant; although, interestingly, based on variants characterization proposed by Figueroa et al. (2013), we see a potential change-in-progress when subsegmental analysis is carried out: middle-class groups tend to produce variants that get close to the prestigious ones. Finally, we observe a geographic origin effect.

[PS-2.31]

Talker familiarity effects on toddler word recognition in linguistically-diverse settings

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Familiar-talker advantages in word recognition and language processing are well-documented (e.g. Holmes et al., 2018; Barker & Newman, 2004), supporting exemplar models of speech processing. Yet despite greater lifetime exposure to their own caregivers' speech, toddlers recognize words more readily in the dominant linguistic variety of their community, and not the variety spoken by caregivers (Floccia et al., 2012). If voice familiarity advantages do not extend to non-locally-dominant varieties, their role in theories of speech processing bears revisiting. In this study, we investigate the effect of voice familiarity when talkers speak the same locally-dominant variety (Exp. 1) and when the familiar talker has a different accent (Exp. 2). In an eyetracking task, monolingual 16-month-olds hear targets named ("Look! Where's the banana? Can you find it?") in the voices of their own pre-recorded caregiver and an unfamiliar speaker of the locally-dominant variety. Here we report results from Exp. 1 (n=24), as Exp. 2 is ongoing (n=4). Growth curve analyses indicate an effect of Voice Familiarity on target looking (β=0.058, SE=0.017, z=3.46, p<0.001); participants fixated the target more when named in their caregiver's voice. In this condition, target looking both increased more sharply (Voice x linear time term: β=0.65, SE=0.21, z=3.13, p<0.01), indicative of faster processing, and exhibited shallower response curvature (Voice x quadratic term: β=-1.46, SE=0.21, z=-6.93, p<0.001) in which target fixations remained high longer compared to the unfamiliar voice condition (see Fig. 1). In the context of this evident familiar-voice advantage in Exp. 1., Exp. 2 will provide an interesting comparison. Here, a familiar voice advantage would be an important counterpoint to accent processing accounts proposing consistent advantages for prestige/locally-dominant varieties. Alternatively, if the familiar talker advantage depends on the variety the talker speaks, this would call into question its ubiquity and the evidentiary support it provides for exemplar-based models.

[PS-2.32]

Newborns' neural tracking of infant-directed and adult-directed speech in native and foreign language

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The human brain is tuned to spoken language already at birth.1,2 Moreover, shortly after birth, infants can distinguish their mother's language from unfamiliar languages and have enhanced responses to familiar over unfamiliar rhymes.1,3 In behavioral studies, infants prefer to listen to infant-directed speech (IDS) to adults-directed speech (ADS) most robustly in their native but also in a foreign language4. Recent studies demonstrated that this preference has correlates at the neural level.5,6 Studies testing neural responses to speech in infants mostly use IDS stimuli7, but it is debatable whether IDS (compared to ADS) preserves, exaggerates or diminishes prosodic differences between languages. In the present experiment, we test whether newborns show differential neural tracking of a native over a foreign, rhythmically different, language, and whether the language effect is more/less prominent in IDS or in ADS. We assess the neural tracking of native and non-native speech in newborns (aged 1–5 days) of Czech-speaking mothers (intended n = 60, collected n to date = 27). Newborns' neural activity was recorded in sleep, from 6 EEG channels. Each infant listened to natural recordings of a children's story in two rhythmically different languages, Czech (lacking acoustic cues to word-level stress) and Russian (with acoustically salient word-level stress), in IDS or ADS. We predicted that newborns would exhibit more accurate and/or stronger neural tracking of Czech, their native language, evident in larger inter-trial phase coherence (ITC), and total power, respectively. Figure 1 shows preliminary ITC data. This language-specific effect would be prominent specifically in the theta band corresponding to the syllable rate (acoustically prominent) and less so in the delta band corresponding to the word rate (not acoustically prominent). We further tested whether this native-language effect would interact with speech style, i.e. ADS vs. IDS. So far, we collected data from 27 infants, and at the workshop we will present preliminary results from the complete sample.

[PS-2.33]

Revisiting the debate: Is cross-situational word learning too computationally complex for infants in the real world?

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In highly simplified lab settings, infants can resolve referential ambiguity by tracking co-occurrence probabilities across situations (cross-situational word learning, henceforth CSWL). But is CSWL possible in the real world? Work using the Human Simulation Paradigm (HSP) – where participants watch muted videos with a beep occurring each time a 'mystery word' is uttered – suggests multiple labelling utterances do not improve word learning; instead, infants acquire words from a single encounter. But the original HSP lacks ecological validity. First, overt guesses after each labelling instance may introduce memory and/or attentional strategies into the learning process. Second, muted videos remove the visual prosody between labels and events in the visual scene – information that has been shown to support early referent-label mapping. It is possible that infants could use this information to limit the range of hypotheses to be considered in CSWL. In Experiment 1, we address this first point. Adults watched 20-s vignettes of caregivers teaching target words to their 11- or 18-month-olds. A visual cue indicated the mystery word's occurrence. Participants (n=72) watched either 1 or 6 vignettes before making a guess. Participants' performance was much stronger after watching 6 vignettes, suggesting cross-situational information helps resolve referential ambiguity. In Experiment 2 (pre-registered), we asked whether visual prosody supports cross-situational word learning, and whether multilingualism might strengthen CSWL skills. We included muted (as in Experiment 1) as well as low-pass filtered trials (obscuring word identity but retaining visual prosody). Preliminary results (n=73; target n=144) support both of our predictions. Participants' accuracy is higher with low-pass filtered speech than muted vignettes and bilinguals outperform monolinguals. Though not yet statistically significant, the effect of low-pass filtered speech is stronger in interactions with 11- than 18-month-olds, in line with research suggesting that visual prosody cues to labelling intent are stronger in speech to younger infants.

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